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THE CONFEDERATED TRIBES of THE COLVILLE RESERVATION

POST OFFICE BOX 150-NESPELEM WASHINGTON 99155 PHONE (509) 634-4711

August 23, 2001

Certified Mail
Return Receipt Requested

Susan Butler
PO Box 9336 Stn
Prov Govt
Victoria, British Columbia
V8W 9M1

Re: **Freedom of Information and Protection of Privacy Act Request**

Dear Ms. Butler:

On behalf of the Confederated Tribes of the Colville Indian Reservation (Colville Tribes) and pursuant to British Columbia's Freedom of Information and Protection of Privacy Act, RSBC 1996, Chapter 165 (FOIPPA), I am hereby submitting our request for any and all documents, records or materials, including electronic or email communications, within the possession, custody or control of the Ministry of Water, Land and Air Protection which refer, reference or relate to the following:

1. Cominco Ltd. metallurgical facilities in Trail including, without limitation, any documents, records or materials which concern, refer or relate to enforcement actions or permit violations against Cominco Ltd. during the period of time from January 1, 1990 to date that in any way relate to violations or alleged violations of applicable environmental laws.

2. The following permits for the Cominco Trail Operations:

   a. Air Permit PA-02690
   b. Air Permit PA-02691
   c. Air Permit PA-02692
   d. Effluent Permit PE-05309

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e. Effluent Permit PE-02753
f. Storage Permit PS-11532
g. Landfill Permit PR-05175
h. Pulpmill Sludge Composting Permit AR-15631

3. All permits for air emissions, effluent discharge, PCB storage, or any other permit not included within item No. 2 above that was issued by an environmental agency from January 1, 1990 to date for Cominco Trial Operations.

As provided in the FOIPPA, we would appreciate your response to this request within thirty (30) business days. If any part of this request is denied, please list the specific exemptions which are claimed for withholding information along with an identification of the records being withheld. If some but not all records are being withheld as exempt, please provide all nonexempt portions which are reasonably segregable. If we do not receive a response within this time, we will treat this request as denied.

It is not our intent to impose an unnecessary administrative burden upon you or your staff. We would be pleased to work with you to explain or reformulate this request as necessary to comply with its terms. As a matter of comity, we request that you waive reproduction or other fees as the Colville Tribes is acting in its sovereign capacity. However, if this request would result in review or copying which would exceed $25 U.S., please contact us by telephone so we may discuss the response and associated costs.

Thank you for your cooperation and reconsideration. If you have any questions, please do not hesitate call me.

Sincerely yours,

Gary Passmore, Manager
Environmental Trust Department

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PERMITS and
AMENDMENTS

ph.

TO: Mr. J. McLaren
Regional Manager
Environmental Protection Division
Ministry of Environment, NELSON

ATTENTION: Mr. Carl Johnson, Head, Industrial Section

FROM: Mr. K. Ferguson
Mining and Metallurgy
Environmental Protection
Conservation & Protection
Environment Canada, NORTH VANCOUVER

SUBJECT: Cominco Ltd. PE-2753 Amendment dated October 31/90

NO. OF PAGES: 3 including this header

DATE: December 5, 1990

Carl

easy to accommodate stuff

90.12.05

Environmental Protection
Conservation & Protection

224 West Esplanade
North Vancouver, BC V7M 3H7

PE-2753

December 5, 1990

4487-37/C685

Mr. J. McLaren
Regional Manager
Environmental Protection Divison
Kootenay Region
Ministry of Environment
310 Ward Street
NELSON, BC
V2L 5S4

Dear Mr. McLaren:

Re: Application for Amendment pursuant to the Waste Management Act on behalf of Cominco Ltd. dated October 31, 1990

Reference is made to a letter from your office dated November 15, 1990 regarding the subject application for a one-year extension of the variance from the conditions of PE-2753 with some modifications. Variances were required to provide time for the Company to implement its extensive modernization program. We understand this additional extension is needed to allow unanticipated modifications to the new lead QSL smelter prior to final commissioning.

We note that, for the most part, this application reflects more stringent conditions than the previous variances orders. We are particularly pleased that the 'six-month rolling average' for measuring compliance has been eliminated in favour of a 'never to be exceeded limit'. This is an important improvement. The limit for dissolved lead for Sewer I and the limits for suspended solids for Sewers II, III and 07, however, are higher than the last variance conditions. The Company needs to justify these increased level requirements using operational monitoring data. Although we understand the purpose for the amendments, we emphasize the requirement to reduce metal levels in the effluents as soon as possible.

The current water quality monitoring data from the station located on the Columbia River immediately upstream of the confluence with the Pend-d'Orielle River indicate lead, cadmium and zinc levels do not meet water quality guidelines for the protection of aquatic biota. When the QSL smelter is in full operation, a detailed review of the water quality data for the Waneta site will be undertaken to determine if water quality guidelines for the protection of aquatic biota are being met. At that time, a decision will be made as to the need for further water quality studies.

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Mr. J. McLaren
Environmental Protection Division, Nelson
PE-2753

You may also be aware that the Washington State Department of Ecology has been studying the levels of metals in the sediments of Franklin D. Roosevelt Lake.

We would appreciate updates on the progress of the lead smelter modifications, and look forward to the attainment of compliance with the terms of the original permit conditions.

Thank you for giving us the opportunity to comment on this application. Mr. K. Ferguson of our staff may be contacted at 666-2399 for further discussion regarding this matter. Your continued cooperation is appreciated.

truly,

M. Ito
Director
Pollution Abatement & Compliance Branch

cc: G.F. Kenyon, Cominco Ltd., Trail
T. Tuominen, IW, North Vancouver

BRITISH COLUMBIA

Ministry of Environment, Lands and Parks

Environment and Lands
Kootenay Region

MEMORANDUM

To: Carl Johnson
Head, Industrial Section
Pollution Prevention

Date: February 19th 1999

File: PE 2753

Re: Amendment to Cominco's Monitoring Program

In addition to some minor changes to wording of the old permit document (November 29 1978), I ask that hardness be included in the monitoring program for both discrete effluent samples collected on the NAPS schedule and the quarterly toxicity tests. The rationale for this is that hardness is a modifying factor in the response aquatic organisms to metals concentrations. Since there is a large discrepancy in hardness of the effluents versus that of the receiving waters and the nature of a regulated river results in large fluctuations in dilution of effluent at any given time, the ministry needs this data to evaluate impacts to aquatic life in those receiving waters.

I actually spoke to the Pacific Environmental Science Centre Toxicologist Graham van Aggelen to confirm the need to gather this data. He concurs that the hardness data would greatly assist in assessing toxicity of the effluents and potential impacts to the receiving environment.

Let me know if you have any further questions.

Julia Beatty Spence, R.P.Bio.
Head, Environmental Assessment Section
Kootneya Region

JBS/

Province of
British Columbia
MINISTRY OF ENVIRONMENT
LANDS AND PARKS

BC
Environment

#401 -333 Victoria Street
Nelson, British Columbia
V1L 4K3
Telephone:(604)354-6333
Main Fax: (604)354-6332
EP Fax: (604)354-6367

DEC 1 1 1996

File: PE-02753

REGISTERED MAIL

Cominco Ltd.-Cominco Ltee
500 - 200 Burrard Street
VANCOUVER BC V6C 3L7

Dear Permittee:

Notice of Correction to Permit PE-02753
Issued under the provisions of the Waste Management Act
S.B.C. 1982 C.41, in the name of
COMINCO LTD.-COMINCO LTEE

This is to advise you that the following correction has been made to the subject permit:

Page 6 - Paragraph 1 - "Outfall II" changed to "Outfall III"

Please remove and destroy the original page in your permit package and replace it with the revised version enclosed.

Yours truly,

R.J. Crozier, R.P. Bio.
Regional Waste Manager
Kootenay Region

/sf
Enclosure
cc: Department of Fisheries & Oceans - Bonnie Antcliffe
Cominco, Trail - Bob Abbey
Environment Canada - Al Colody and Sharon Larson
WA State Dept. of Ecology - Claude Sapinton

ENVIRONMENTAL PROTECTION
DEC 17 1996
NELSON, B.C.

TRAIL TIMES LTD.
1163 CEDAR AVE.
TRAIL. BC V1R 4B8
(604) 364-1416

12/3/96

File: PE-02753
Regional Waste Manager
401-333-Victoria Street
Nelson. BC V1N 4K3

Phone: 354-6333 Account: Ad Taker: Andrea
Start Date: 12/4/96 Insertions: 0 Class:
Stop Date: 1/1/4

Words: 216 CASH 97.20 + 6.81 = 104.01 Rate: 1

PRICE: $104.01
AMOUNT PAID: $0.00

AMOUNT DUE: $104.01

NOTICE OF A MAJOR AMENDMENT TO PREMIT NO. PE-02753ISSUED UNDER THE PROVISIONS OF THE WASTE MANAGEMENT ACT. S.B.C. 1982. c. 41IN THE NAME OF COMINCO LTD.-COMINCO LTEETake notice that a minor amendment to Permit Number PE-02753 for discharges to the Columbia River from Cominco's Ltd.'s smelter at Trail, British Columbia. The amendment consists of:(a) a phased in reduction of the authorized discharges of metal bearing effluents into the Columbia River as a result of the installation and anticipated startup of the new lead smelter and related projects in the spring of 1997:(b) modifications to the monitoring programs for both effluent and river water:(c) an Effluent Management Plan will be developed by Cominco that will focus on resolution of the remaining effluent and water quality issues over the next 5 years.This permit may be appealed by persons who consider themselves aggrieved by this decision in accordance with Part 5 of the Waste Management Act. Written notice of intent to appeal must be received by the Regional Waste Manager within twenty-one (21) days of the date of this decision.A copy of the Amended Permit may be viewed at Environmental Protection. B.C. Environment. #401-333 Victoria Street. Nelson. BC. V1L 4K3 during normal business hours.Dated at Nelson. British Columbia this 2nd day of December. 1996.R.J. Crozier. R.P. BioRegional Waste Manager

NOTICE OF A MAJOR AMENDMENT TO PERMIT NO. PE-02753
ISSUED UNDER THE PROVISIONS OF
THE WASTE MANAGEMENT ACT, S.B.C. 1982, c.41,
IN THE NAME OF COMINCO LTD.-COMINCO LTEE

Take notice that a minor amendment to Permit Number PE-02753 for discharges to the Columbia River from Cominco's Ltd.'s smelter at Trail, British Columbia. The amendment consists of:
(a) a phased in reduction of the authorized discharges of metal bearing effluents into the Columbia river as a result of the installation and anticipated startup of the new lead smelter and related projects in the spring of 1997;
(b) modifications to the monitoring programs for both effluent and river water;
(c) an Effluent Management Plan will be developed by Cominco that will focus on resolution of the remaining effluent and water quality issues over the next 5 years.

This permit may be appealed by persons who consider themselves aggrieved by this decision in accordance with Part 5 of the Waste Management Act. Written notice of intent to appeal must be received by the Regional Waste Manager within twenty-one (21) days of the date of this decision.

A copy of the Amended Permit may be viewed at Environmental Protection, BC Environment, #401-333 Victoria Street, Nelson, BC, V1L 4K3 during normal business hours.

Dated at Nelson, British Columbia this 2nd day of December, 1996.

R.J. Crozier, R.P. Bio.
Regional Waste Manager

/sf

NOTICE OF APPROVAL AE-14388
ISSUED UNDER THE PROVISIONS OF
THE WASTE MANAGEMENT ACT, S.B.C. 1982, c.41,
IN THE NAME OF COMINCO LTD. - COMINCO LTEE

Take notice that Approval AE-14388 has been issued. The approval consists of extending authorization for discharges from Cominco's Trail Lead Smelter to the Columbia River to September 30, 1996.

This approval was requested by Cominco Ltd. because authorization to discharge under Permit PE-02753 expires on December 31, 1995.

In addition this approval, reflecting recent improvements, places more stringent limits on the discharge of tail slag to the Columbia River.

The nine month extension authorized by this approval will provide the Ministry of Environment, Lands and Parks the necessary time to amend Cominco's discharge permit to include long term requirements for environmental protection.

A copy of the approval may be viewed at Environmental Protection, Ministry Environment, Lands and Parks, #401 - 333 Victoria Street, Nelson, B.C., V1L 4K3 during normal business hours.

Dated at Nelson, British Columbia this 21st day of December, 1995.

Carl Johnson for

R.J. Crozier, R.P. Bio.
Regional Waste Manager

/sw

Province of
British Columbia
MINISTRY OF ENVIRONMENT, LANDS AND PARKS

BC Environment

#401 - 333 Victoria Street
Nelson, British Columbia
V1L 4K3
Telephone: (604) 354-6333
Main Fax: (604) 354-6332
EP Fax: (604) 354-6367

DEC 22 1995

File: PA-02691

REGISTERED MAIL

Cominco Ltd. - Cominco Ltee
500 - 200 Burrard Street
Vancouver, British Columbia
V6C 3L7

Dear Permittee:

Enclosed is Amended Permit PA-02691 issued under the provisions of the Waste Management Act. Your attention is respectfully directed to the conditions outlined in the permit. An annual permit fee will be determined according to the Waste Management Permit Fees Regulation.

This permit does not authorize entry upon, crossing over, or use for any purpose of private or Crown lands or works, unless and except as authorized by the owner of such lands or works. The responsibility for obtaining such authority rests with the permittee. It is also the responsibility of the permittee to ensure that all activities conducted under this permit are carried out with due regard to the right of the third parties and comply with other applicable legislation that may be in force.

This permit may be appealed by persons who consider themselves aggrieved by this decision in accordance with Part 5 of the Waste Management Act. Written notice of intent to appeal must be received by the Regional Waste Manager within twenty-one (21) days of the date of this decision.

Administration of this permit will be carried out by staff from our Regional Office located at #401-333 Victoria Street, Nelson, British Columbia, V1L 4K3, (telephone: (604) 354-6355). Plans, data and reports pertinent to the permit are to be submitted to the Regional Waste Manager at Nelson, British Columbia.

Yours truly,

R.J. Crozier, R.P. Bio.
Regional Waste Manager
Kootenay Region

/sw
ENCLOSURE

PROVINCE OF
BRITISH COLUMBIA

Environmental Protection
#401-333 Victoria Street
Nelson, British Columbia
V1L 4K3
Telephone: (604) 354-6355

MINISTRY OF ENVIRONMENT,
LANDS AND PARKS

PERMIT
PA-02691

Under the Provisions of the Waste Management Act

COMINCO LTD. - COMINCO LTEE
500 - 200 BURRARD STREET
VANCOUVER, BRITISH COLUMBIA
V6C 3L7

is authorized to discharge contaminants to the air from a lead smelter located Trail, British Columbia, subject to the conditions listed below. Contravention of any of these conditions is a violation of the Waste Management Act and may result in prosecution.

1. AUTHORIZED DISCHARGES

1.1. This subsection applies to the discharge of contaminants from the **SINTER PLANT STACK IDENTIFIED AS S-1** as shown on the attached Site Plan A. The Site reference number for this discharge is **E102898.**

1.1.1. The maximum authorized rate of discharge is 8,000 m^3/min.

1.1.2. The characteristics of the discharge shall not exceed:

SO_2	Control Regime as per Subsection 2.5
Total Particulate	400 mg/m^3
Lead	23 mg/m^3

NOTE: All air and gaseous volumes specified in Subsections 1.1.1 and 1.1.2 above are at standard conditions which are:

Standard Temperature = 293.15^0 K
Standard Pressure = 101.325 KPa
Water Vapour zero unless otherwise stated

R. J. Crozier, R. P. Bio.
Regional Waste Manager

Date Issued: September 9, 1975
Date Amended:
(most recent) DEC 22 1995

1.1.3. The authorized works are ducts, fans, stack, ammonia absorption plant and related appurtenances located approximately as shown on the attached Site Plan A.

1.1.4. The location of the facilities from which the discharge originates is Lot 1, Plan 4926, Kootenay District.

1.1.5. The location of the point of discharge is Lot 1, Plan 4926, Kootenay District.

1.1.6. This emission source will reduce in operating frequency in 1997 and the emission of contaminants from this source will be controlled as defined in Subsection 2.4. Stack S-1 may continue to be used as an emergency stack for the new Kivcet lead smelter. The Sinter Plant stack may be used for venting the new SLAG FUMING FURNACE once a new baghouse is installed.

1.2. This subsection applies to the discharge of contaminants from the **LEAD BLAST FURNACES AND OLD DROSSING PLANT STACK AND/OR THE NEW KIVCET FURNACE, FEED DRYING FACILITY AND NEW DROSSING PLANT, IDENTIFIED AS S-32** as shown on the attached Site Plan B. The site reference number for this discharge is **E102899.**

1.2.1. The maximum authorized rate of discharge is 15,500 m^3/min.

1.2.2. The characteristics of the discharge shall not exceed:

SO_2	Control Regime as per Subsection 2.5
Particulate	23 mg/m^3
Lead	7 mg/m^3

NOTE: All air and gaseous volumes specified in Subsections 1.2.1 and 1.2.2 above are at standard conditions which are:

Standard Temperature = 293.15^0 K
Standard Pressure = 101.325 KPa
Water Vapour zero unless otherwise stated

1.2.3. The authorized works are fans, ducts, stack, baghouse, bypass stack and related appurtenances located approximately as shown on the attached Site Plan B.

1.2.4. The location of the facilities from which the discharge originates is Lot 1, Plan 4926, Kootenay District.

1.2.5. The location of the point of discharge is appurtenant is Lot 1, Plan 4926, Kootenay District.

R. J. Crozier, R. P. Bio.
Regional Waste Manager

1.3. This subsection applies to the discharge of contaminants from the **SINTER PLANT WET MIX DRYERS STACK IDENTIFIED AS S-8** as shown on the attached Site Plan B. The site reference number for this discharge is **E102900.**

1.3.1. The maximum authorized volume which may be discharged is 3,500 m^3/min.

1.3.2. The characteristics of the discharge shall not exceed:

SO_2	Control Regime as per Subsection 2.5
Lead	7 mg/m^3

NOTE: All air and gaseous volumes specified in Subsections 1.3.1 and 1.3.2 above are at standard conditions which are:

Standard Temperature = 293.15^0 K
Standard Pressure = 101.325 KPa
Water Vapour zero unless otherwise stated

1.3.3. The authorized works are fans, ducts, stack, wet impingers and related appurtenances located approximately as shown on the attached Site Plan B.

1.3.4. The location of the facilities from which the discharge originates is Lot 1, Plan 4926, Kootenay District.

1.3.5. The location of the point of discharge is Lot 1, Plan 4926, Kootenay District.

1.3.6. This emission source will reduce in operating frequency in 1997 and the emission of contaminants from this source will be controlled as defined in Subsection 2.4.

1.4. This subsection applies to the discharge of contaminants from the **OLD SLAG FUMING FURNACES OR THE NEW SLAG FUMING FURNACE BAGHOUSE STACK IDENTIFIED AS S-40** as shown on the attached Site Plan A. The site reference number for this discharge is **E102901.**

1.4.1. The maximum authorized rate of discharged is 6,500 m^3/min.

R. J. Crozier, R. P. Bio.
Regional Waste Manager

1.4.2. The characteristics of the discharge shall not exceed:

SO_2	Control Regime as per Subsection 2.5
Zinc	11.5 mg/m³

NOTE: All air and gaseous volumes specified in Subsections 1.4.1 and 1.4.2 above are at standard conditions which are:

Standard Temperature = 293.15° K
Standard Pressure = 101.325 KPa
Water Vapour zero unless otherwise stated

1.4.3. The authorized works are fans, ducts, stack, baghouse and related appurtenances located approximately as shown on the attached Site Plan A.

1.4.4. The location of the facilities from which the emission originates is Lot 1, Plan 4926, Kootenay District.

1.4.5. The location of the point of discharge is Lot 1, Plan 4926, Kootenay District.

1.5. This subsection applies to the discharge of contaminants from **SINTER AND COKE CONVEYING, HANDLING, CRUSHING AND STORAGE VENTS IDENTIFIED AS S-2, S-3, S-4, S-5, S-6, S-7, S-9, S-10, S-11 AND S-13** as shown on the attached Site Plan B. The site reference number for this discharge is **E222624.**

1.5.1. The maximum authorized volume which may be discharged is 4,815 m³/min.

1.5.2. The characteristics of the discharges shall not exceed:

Particulate	23 mg/m³

NOTE: All air and gaseous volumes specified in Subsections 1.5.1 and 1.5.2 above are at standard conditions which are:

Standard Temperature = 293.15° K
Standard Pressure = 101.325 KPa
Water Vapour zero unless otherwise stated

1.5.3. The authorized works are fans, ducts, 10 stacks, 10 wet scrubbers and related appurtenances located approximately as shown on the attached Site Plan B.

1.5.4. The location of the facilities from which the discharge originate is Lot 1, Plan 4926, Kootenay District.

R. J. Crozier, R. P. Bio.
Regional Waste Manager

1.5.5. The location of the points of discharge is Lot 1, Plan 4926, Kootenay District.

1.5.6. These emission sources will reduce in operating frequency in 1997 and the emission of contaminants from this source will be controlled as defined in Subsection 2.4.

1.6. This subsection applies to the discharge of contaminants from **SINTER PLANT VENTILATION FANS IDENTIFIED AS S-17 TO S-31 INCLUSIVE** as shown on the attached Site Plan B. The site reference number for this discharge is **E211970.**

1.6.1. The maximum authorized volume which may be discharged is 1,500 m^3/min.

1.6.2. The characteristics of the discharges shall not exceed:

Particulate 23 mg/m^3

NOTE: All air and gaseous volumes specified in Subsections 1.6.1 and 1.6.2 above are at standard conditions which are:

Standard Temperature = 293.15^0 K
Standard Pressure = 101.325 KPa
Water Vapour zero unless otherwise stated

1.6.3. The authorized works are fans, ducts, 10 stacks, 10 wet scrubbers and related appurtenances located approximately as shown on the attached Site Plan B.

1.6.4. The location of the facilities from which the discharge originate is Lot 1, Plan 4926, Kootenay District.

1.6.5. The location of the points of discharge is Lot 1, Plan 4926, Kootenay District.

R. J. Crozier, R. P. Bio.
Regional Waste Manager

1.7. This subsection applies to the discharge of contaminants from **SINTER PLANT DRYER AND SINTER MACHINE FEED CONVEYORS AND NODULIZER VENT STACKS IDENTIFIED AS S-12, S-14, S-15 AND S-16** as shown on the attached Site Plan A. The site reference number for this discharge is **E22625.**

1.7.1. The maximum authorized volume which may be discharged is 1,500 m^3/min.

1.7.2. The characteristics of the discharges shall not exceed:

Particulate 23 mg/m^3.

NOTE: All air and gaseous volumes specified in Subsections 1.7.1 and 1.7.2 above are at standard conditions which are:

Standard Temperature = 293.15° K
Standard Pressure = 101.325 KPa
Water Vapour zero unless otherwise stated

1.7.3. The authorized works are fans, ducts, 10 stacks, 10 wet scrubbers and related appurtenances located approximately as shown on the attached Site Plan B.

1.7.4. The location of the facilities from which the discharge originate is Lot 1, Plan 4926, Kootenay District.

1.7.5. The location of the points of discharge is Lot 1, Plan 4926, Kootenay District.

1.7.6. These emission sources will reduce in operating frequency in 1997 and the emission of contaminants from this source will be controlled as defined in Subsection 2.4.

R. J. Crozier, R. P. Bio.
Regional Waste Manager

1.8. This subsection applies to the discharge of contaminants from the **SINTER AND COKE CONVEYING AND STORAGE VENTS IDENTIFIED AS S-57, S-58 AND S-59** as shown on the attached Site Plan B. The site reference number for this discharge is **E222626.**

1.8.1. The maximum authorized volume which may be discharged is 390 m^3/min.

1.8.2. The characteristics of the discharge shall not exceed:

Lead	23 mg/m^3

NOTE: All air and gaseous volumes specified in Subsections 1.8.1 and 1.8.2 above are at standard conditions which are:

Standard Temperature = 293.15^0 K
Standard Pressure = 101.325 KPa
Water Vapour zero unless otherwise stated

1.8.3. The authorized works are fans, ducts, 3 stacks and related appurtenances located approximately as shown on the attached Site Plan B.

1.8.4. The location of the facilities from which the emissions originate and to which Appendix 08 is appurtenant is Lot 1, Plan 4926, Kootenay District.

1.8.5. The location of the points of discharge is Lot 1, Plan 4926, Kootenay District.

1.8.6. These emission sources will reduce in operating frequency in 1997 and the emission of contaminants from this source will be controlled as defined in Subsection 2.4.

R. J. Crozier, R. P. Bio.
Regional Waste Manager

1.9. This subsection applies to the discharge of contaminants from **LEAD BLAST FURNACE AND SLAG FURNACE VENTS, AND GRANULATING LAUNDER VENTS IDENTIFIED AS S-33, S-34, S-35, S-36, S-42, S-49, S-51 AND S-52** as shown on the attached Site Plan B. The site reference number for this discharge is **E222627.**

1.9.1. The maximum authorized volume which may be discharged is 6,000 m^3/min.

1.9.2. The characteristics of the discharge shall not exceed:

Lead	7 mg/m^3

NOTE: All air and gaseous volumes specified in Subsections 1.9.1 and 1.9.2 above are at standard conditions which are:

Standard Temperature = 293.15^0 K
Standard Pressure = 101.325 KPa
Water Vapour zero unless otherwise stated

1.9.3. The authorized works are fans, ducts, 8 stacks and related appurtenances, approximately located as shown on the attached Site Plan B.

1.9.4. The location of the facilities from which the emissions originates is Lot 1, Plan 4926, Kootenay District.

1.9.5. The location of the points of discharge is Lot 1, Plan 4926, Kootenay District.

1.9.6. These emission sources will reduce in operating frequency in 1997 and the emission of contaminants from this source will be controlled as defined in Subsection 2.4.

R. J. Crozier, R. P. Bio.
Regional Waste Manager

1.10. This subsection applies to the discharge of contaminants from the **OLD SLAG FUMING FURNACES GRANULATING LAUNDER VENT IDENTIFIED AS S-47** as shown on the attached Site Plan B. The site reference number for this discharge is **E102907**.

1.10.1. The maximum authorized volume which may be discharged is 450 m^3/min.

1.10.2. The characteristics of the discharge shall not exceed:

Particulate 23 mg/m^3

NOTE: All air and gaseous volumes specified in Subsections 1.10.1 and 1.10.2 above are at standard conditions which are:

Standard Temperature = 293.15° K
Standard Pressure = 101.325 KPa
Water Vapour zero unless otherwise stated

1.10.3 The authorized works are fans, duct, stack and related appurtenances, located approximate as shown on the attached Site Plan B.

1.10.4. The location of the facilities from which the emission originates is Lot 1, Plan 4926, Kootenay District.

1.10.5. The location of the point of discharge is Lot 1, Plan 4926, Kootenay District.

1.10.6. This emission source will reduce in operating frequency in 1997 and the emission of contaminants from this source will be controlled as defined in Subsection 2.4.

1.11. This subsection applies to the discharge of contaminants from the **No. 2 and No. 6 CRANE AISLE VENTS IDENTIFIED AS S-37 AND 3-53** as shown on the attached Site Plan B. The site reference numbers for this discharge are **E102908** and **0260071**.

1.11.1. The maximum authorized volume which may be discharged is 3,400 m^3/min.

1.11.2. The characteristics of the discharge shall not exceed:

Lead 7 mg/m^3

NOTE: All air and gaseous volumes specified in Subsections 1.11.1 and 1.11.2 above are at standard conditions which are:

Standard Temperature = 293.15° K
Standard Pressure = 101.325 KPa
Water Vapour zero unless otherwise stated

R. J. Crozier, R. P. Bio.
Regional Waste Manager

1.11.3. The authorized works are fans, ducts, 3 stacks and related appurtenances located approximately as shown on the attached Site Plan B.

1.11.4. The location of the facilities from which the emissions originate is Lot 1, Plan 4926, Kootenay District.

1.11.5. The location of the points of discharge is Lot 1, Plan 4926, Kootenay District.

1.11.6. These emission sources will reduce in operating frequency in 1997 and the emission of contaminants from this source will be controlled as defined in Subsection 2.4.

1.12. This subsection applies to the discharge of contaminants from the **SLAG FUMING FURNACES AREA VENTS IDENTIFIED AS S-47A AND S-47B** as shown on the attached Site Plan B. The site reference number for this discharge is **E211972**.

1.12.1. The maximum authorized volume which may be discharged is 180 m^3/min.

1.12.2. The characteristics of the discharge shall not exceed:

Lead	7 mg/m^3
Zinc	7 mg/m^3

NOTE: All air and gaseous volumes specified in Subsections 1.12.1 and 1.12.2 above are at standard conditions which are:

Standard Temperature = 293.15^0 K
Standard Pressure = 101.325 KPa
Water Vapour zero unless otherwise stated

1.12.3. The authorized works are fans, ducts, 2 stacks, 2 baghouses and related appurtenances located approximately as shown on the attached Site Plan B.

1.12.4. The location of the facilities from which the emissions originate is Lot 1, Plan 4926, Kootenay District.

1.12.5. The location of the points of discharge is Lot 1, Plan 4926, Kootenay District.

1.12.6. These emission sources will reduce in operating frequency in 1997 and the emission of contaminants from this source will be controlled as defined in Subsection 2.4.

R. J. Crozier, R. P. Bio.
Regional Waste Manager

1.13. This subsection applies to the discharge of contaminants from the **FUME LEACH SOLIDS PREPARATION BAGHOUSE IDENTIFIED AS S-41** as shown on the attached Site Plan A. The site reference number for this discharge is **E102910.**

1.13.1. The maximum authorized volume which may be discharged is 130 m^3/min.

1.13.2. The characteristics of the discharge shall not exceed:

Zinc	7 mg/m^3

NOTE: All air and gaseous volumes specified in Subsections 1.13.1 and 1.13.2 above are at standard conditions which are:

Standard Temperature = 293.15° K
Standard Pressure = 101.325 KPa
Water Vapour zero unless otherwise stated

1.13.3. The authorized works are fans, ducts, stack, baghouse and related appurtenances located approximately located as shown on the attached Site Plan A.

1.13.4. The location of the facilities from which the emission originates is Lot 1, Plan 4926, Kootenay District.

1.13.5. The location of the point of discharge is Lot 1, Plan 4926, Kootenay District.

1.14. This subsection applies to the discharge of contaminants from **NEW COAL PREPARATION PLANT STACKS IDENTIFIED AS CV-1 and CV-2** on the attached Site Plan K. The site reference numbers for this discharge are **E222684 and E222685.**

1.14.1. The maximum authorized volume which may be discharged is 100 m^3/min.

1.14.2. The characteristics of the discharge shall not exceed:

Particulate	46 mg/m^3

NOTE: All air and gaseous volumes specified in Subsections 1.14.1 and 1.14.2 above are at standard conditions which are:

Standard Temperature = 293.15° K
Standard Pressure = 101.325 KPa
Water Vapour zero unless otherwise stated

1.14.3. The authorized works are coal drying, pulverizing and conveying system, fans, ducts, 2 stacks, 2 cyclones, 2 baghouses and related appurtenances located approximately as shown on the attached Site Plan B.

R. J. Crozier, R. P. Bio.
Regional Waste Manager

1.14.4. The location of the facilities from which the emissions originate is Lot 1, Plan 4926, Kootenay District.

1.14.5. The location of the points of discharge is Lot 1, Plan 4926, Kootenay District.

1.15. This subsection applies to the discharge of contaminants from the **HOLDING POT COMBUSTION GAS STACK (S-50A)** as shown on the attached Site Plan B. The site reference number for this discharge is **0260074**.

1.15.1. The maximum authorized volume which may be discharged is 1,360 m^3/min.

1.15.2. The characteristics of the discharge shall not exceed:

Particulate 23 mg/m^3

NOTE: All air and gaseous volumes specified in Subsections 1.15.1 and 1.15.2 above are at standard conditions which are:

Standard Temperature = 293.15^0 K
Standard Pressure = 101.325 KPa
Water Vapour zero unless otherwise stated.

1.15.3. The works authorized are fans, ducts, 2 stacks, and related appurtenances located approximately as shown on the attached Site Plan B.

1.15.4. The location of the facilities from which the emissions originate is Lot 1, Plan 4926, Kootenay District.

1.15.5. The location of the points of discharge is Lot 1, Plan 4926, Kootenay District.

1.15.6. This emission source will reduce in operating frequency in 1997 and the emission of contaminants from this source will be controlled as defined in Subsection 2.4.

R. J. Crozier, R. P. Bio.
Regional Waste Manager

1.16. This subsection applies to the discharge of contaminants from the **ARSENIC RECOVERY SECTION (ANTIMONY PLANT) VENT IDENTIFIED AS R-14** as shown on the attached Site Plan C. The site reference number for this discharge is **E102923**.

1.16.1. The maximum authorized volume which may be discharged is 250 m^3/min.

1.16.2. The characteristics of the discharge shall not exceed:

Arsenic 7 mg/m^3

NOTE: All air and gaseous volumes specified in Subsections 1.16.1 and 1.16.2 above are at standard conditions which are:

Standard Temperature = 293.15° K
Standard Pressure = 101.325 KPa
Water Vapour zero unless otherwise stated

1.16.3. The authorized works are fans, ducts, stack, baghouse and related appurtenances located approximately as shown on the attached Site Plan C.

1.16.4. The location of the facilities from which the emission originates is Lot 4, Plan 4926, Kootenay District.

1.16.5. The location of the point of discharge is Lot 4, Plan 4926, Kootenay District.

1.17. This subsection applies to the discharge of contaminants from **54 MISCELLANEOUS LEAD SMELTER SOURCES IDENTIFIED AS NUMBERS 1 TO 54 INCLUSIVE** as shown on the attached Site Plan B. The site reference number for this discharge is **E211974**.

1.17.1 The maximum authorized volume which may be discharged is 5,800 m^3/min.

1.17.2. The characteristics of the discharge shall not exceed:

These discharges are typical building ventilation, sanitation vents, compressor intake and exhaust vents, steam vents and ash pulverizer vents.

NOTE: All air and gaseous volumes specified in Subsections 1.17.1 and 1.17.2 above are at standard conditions which are:

Standard Temperature = 293.15° K
Standard Pressure = 101.325 KPa
Water Vapour zero unless otherwise stated

R. J. Crozier, R. P. Bio.
Regional Waste Manager

1.17.3. The authorized works are fans, ducts, stacks, a baghouse associated with the ash pulveriser vent (No. 16) and related appurtenances located approximately as shown on the attached Site Plan B.

1.17.4. The location of the facilities from which the emissions originate is Lot 1, Plan 4926, Kootenay District.

1.17.5. The location of the points of discharge is Lot 1, Plan 4926, Kootenay District.

1.17.6. A number of these miscellaneous emission sources will reduce in operating frequency in 1997 and the emission of contaminants from this source will be controlled as defined in Subsection 2.4.

1.18. This subsection applies to the discharge of contaminants from **15 MISCELLANEOUS LEAD SMELTER SOURCES IDENTIFIED AS NUMBERS 1 TO 15 INCLUSIVE** as shown on the attached Site Plan A. The site reference number for this discharge is **E211975**.

1.18.1. The maximum authorized volume which may be discharged is 1,200 m^3/min.

1.18.2. The characteristics of the discharge shall not exceed:

These sources are typical building ventilation, sanitation vents and laboratory fume hood ventilation.

NOTE: All air and gaseous volumes specified in Subsections 1.18.1 and 1.18.2 above are at standard conditions which are:

Standard Temperature = 293.15^0 K
Standard Pressure = 101.325 KPa
Water Vapour zero unless otherwise stated

1.18.3. The authorized works are fans, ducts, stacks and related appurtenances located approximately as shown on the attached Site Plan A.

1.18.4. The location of the facilities from which the emissions originate is Lot 1, Plan 4926, Kootenay District.

1.18.5. The location of the point of discharges is Lot 1, Plan 4926, Kootenay District.

R. J. Crozier, R. P. Bio.
Regional Waste Manager

1.19. This subsection applies to the discharge of contaminants from 78 **MISCELLANEOUS SOURCES FROM THE LEAD REFINERY, SILVER REFINERY, AND ANTIMONY PLANT NUMBERED 1 TO 78 INCLUSIVE** as shown on the attached Site Plan C. The site reference number for this discharge is **E211978**.

1.19.1. The maximum authorized volume which may be discharged is 3,200 m^3/min.

1.19.2. The characteristics of the discharge shall not exceed:

These sources are typical building ventilation, sanitation ventilation, tank vents, fume hood vents, firebox vents, steam vents, pot vents and burner vents.

NOTE: All air and gaseous volumes specified in Subsections 1.19.1 and 1.19.2 above are at standard conditions which are:

Standard Temperature = 293.15^0 K
Standard Pressure = 101.325 KPa
Water Vapour zero unless otherwise stated

1.19.3. The authorized works are fans, ducts, vents, stacks, baghouses on sources 25 and 26 and related appurtenances located approximately as shown on the attached Site Plan C.

1.19.4. The location of the facilities from which the emissions originate is Lot 4, Plan 4926, Kootenay District.

1.19.5. The location of the points of discharge is Lot 4, Plan 4926, Kootenay District.

R. J. Crozier, R. P. Bio.
Regional Waste Manager

1.20. This subsection applies to the discharge of contaminants from **27 MISCELLANEOUS SOURCES FROM THE CARPENTER SHOP, PAINT SHOP, ENGINEERING BUILDING, AND CHANGE ROOM IDENTIFIED AS NUMBERS 1 TO 27 INCLUSIVE** as shown on the attached Site Plan D. The site reference number for this discharge is **E211979**.

1.20.1. The maximum authorized volume which may be discharged is 450 m^3/min.

1.20.2. The characteristics of the discharge shall not exceed:

These sources are typical building ventilation, sanitation ventilation, sawdust burner ventilation and steam vents.

NOTE: All air and gaseous volumes specified in Subsections 1.20.1 and 1.20.2 above are at standard conditions which are:

Standard Temperature = 293.15° K
Standard Pressure = 101.325 KPa
Water Vapour zero unless otherwise stated

1.20.3. The authorized works are fans, ducts, vents, cyclone on emission Number 19 and related appurtenances located approximately as shown on the attached Site Plan D.

1.20.4. The location of the facilities from which the emissions is Lot 1, Plan 4926, Kootenay District.

1.20.5. The location of the points of discharge is Lot 1, Plan 4926, Kootenay District.

1.21. This subsection applies to the discharge of contaminants from **55 MISCELLANEOUS SOURCES FROM THE RESEARCH - LIBRARY BUILDING AND ASSAY OFFICE IDENTIFIED AS 1 TO 55 INCLUSIVE** as shown on the attached Site Plan E. The site reference number for this discharge is **E211981**.

1.21.1. The maximum authorized volume which may be discharged is 1,200 m^3/min.

R. J. Crozier, R. P. Bio.
Regional Waste Manager

1.21.2. The characteristics of the discharge shall not exceed:

These sources are typical building ventilation, laboratory fume hoods, steam vents and sanitation vents.

NOTE: All air and gaseous volumes specified in Subsections 1.21.1 and 1.21.2 above are at standard conditions which are:

Standard Temperature = 293.15^0 K
Standard Pressure = 101.325 KPa
Water Vapour zero unless otherwise stated

1.21.2. The authorized works are fans, ducts, vents, stacks, and related appurtenances located approximately as shown on the attached Site Plan E.

1.21.3. The location of the facilities from which the emissions originate are Lots 1 and 4, Plan 4926, Kootenay District.

1.21.4. The location of the points of discharge are Lots 1 and 4, Plan 4926, Kootenay District.

1.22. This subsection applies to the discharge of contaminants from **8 MISCELLANEOUS SOURCES FROM THE METAL PRODUCTS FABRICATION PLANT IDENTIFIED AS NUMBERS 1 TO 8 INCLUSIVE** as shown on the attached Site Plan F. The site reference number for this discharge is **E211983.**

1.22.1. The maximum authorized volume which may be discharged is 60 m^3/min.

1.22.2. The characteristics of the discharge shall not exceed:

These sources are typical melting pot vents, steam vents, burner vents and sanitation vents.

NOTE: All air and gaseous volumes specified in Subsections 1.22.1 and 1.22.2 above are at standard conditions which are:

Standard Temperature = 293.15^0 K
Standard Pressure = 101.325 KPa
Water Vapour zero unless otherwise stated

1.22.3. The authorized works are fans, ducts, vents, stacks, and related appurtenances located approximately as shown on the attached Site Plan F.

1.22.4. The location of the facilities from which the emissions is Lot 4, Plan 4926, Kootenay District.

1.22.5. The location of the points of discharge is Lot 4, Plan 4926, Kootenay District.

R. J. Crozier, R. P. Bio.
Regional Waste Manager

1.23. This subsection applies to the discharge of contaminants from **87 MISCELLANEOUS SOURCES FROM THE MANUFACTURING SHOPS AND WAREHOUSE IDENTIFIED AS 18 TO 104 INCLUSIVE** as shown on the attached Site Plan G. The site reference number for this discharge is **E211984**.

1.23.1. The maximum authorized volume which may be discharged is 653 m^3/min.

1.23.2. The characteristics of the discharge shall not exceed:

These sources are typical building ventilation, degreasing unit ventilation, sanitation vents, steam vents, foundry grinding area vents, furnace and oven vents and heat treatment vents.

NOTE: All air and gaseous volumes specified in Subsection 1.23.1 above are at standard conditions which are:

Standard Temperature = 293.15^0 K
Standard Pressure = 101.325 KPa
Water Vapour zero unless otherwise stated

1.23.3. The authorized works are fans, ducts,vents, stacks, cyclones on Numbers 81 and 82, baghouse on Number 83 and related appurtenances located approximately as shown on the attached Site Plan G.

1.23.4. The location of the facilities from which the emissions originates is appurtenant is Lot 1, Plan 4926, Kootenay District.

1.23.5. The location of the points of discharge is Lot 1, Plan 4926, Kootenay District.

1.24. This subsection applies to the discharge of contaminants from the **LEAD REFINERY SCRUBBER IDENTIFIED AS R-1A** as shown on the attached Site Plans A and F. The site reference number for this discharge is **E206935**

1.24.1. The maximum authorized volume which may be discharged is 4,760 m^3/min.

R. J. Crozier, R. P. Bio.
Regional Waste Manager

1.24.2. The characteristics of the discharge shall not exceed:

Particulate	100 mg/m^3
Total Arsenic	7 mg/m^3
Lead	7 mg/m^3
Gaseous Fluoride	7 ppm

NOTE: All air and gaseous volumes specified in Subsections 1.24.1 and 1.24.2 above are at standard conditions which are:

Standard Temperature = 293.15^0 K
Standard Pressure = 101.325 KPa
Water Vapour zero unless otherwise stated

1.24.3. The authorized works are fans, ducts, scrubber, two old baghouses to be replaced with two new baghouses in 1996, stack and related appurtenances located approximately as shown on the attached Site Plans A and F.

1.24.4. The location of the facilities from which the emission originates is Lot 4, Plan 4926, Kootenay District.

1.24.5. The location of the point of discharge is Lot 4, Plan 4926, Kootenay District.

1.25. This subsection applies to the discharge of contaminants from 7 **MISCELLANEOUS STACKS ASSOCIATED WITH THE SMELTER FEED PLANT IDENTIFIED AS S-60, S-61 AND S-63 TO S-67 INCLUSIVE** as shown on the attached Site Plan A. The site reference number for this discharge is **E211987**.

1.25.1. The maximum authorized volume which may be discharged is 4,320 m^3/min.

1.25.2. The characteristics of the discharge shall not exceed:

Particulate	100 mg/m^3

NOTE: All air and gaseous volumes specified in Subsections 1.25.1 and 1.25.2 above are at standard conditions which are:

Standard Temperature = 293.15^0 K
Standard Pressure = 101.325 KPa
Water Vapour zero unless otherwise stated

1.25.3. The authorized works are fans, ducts, stacks, wet scrubbers and related appurtenances located approximately as shown on the attached Site Plan A.

R. J. Crozier, R. P. Bio.
Regional Waste Manager

1.25.4. The location of the facilities from which the emissions originate is Lot 1, Plan 4926, Kootenay District.

1.25.5. The location of the points of discharge is Lot 1, Plan 4926, Kootenay District.

1.26. This subsection applies to the discharge of contaminants from the **SHORT ROTARY FURNACE IN THE LEAD REFINERY ALLOY PLANT IDENTIFIED AS R-2A** as shown on the attached Site Plan C. The site reference number for this discharge is **E215799**.

1.26.1. The maximum authorized volume which may be discharged is 1,100 m^3/min.

1.26.2. The characteristics of the discharge shall not exceed:

Particulate	23 mg/m^3
Lead	7 mg/m^3
Total Arsenic	7 mg/m^3
Gaseous Fluoride	7 ppm

NOTE: All air and gaseous volumes specified in Subsections 1.26.1 and 1.26.2 above are at standard conditions which are:

Standard Temperature = 293.15^0 K
Standard Pressure = 101.325 KPa
Water Vapour zero unless otherwise stated

1.26.3. The authorized works are fans, ducts, baghouse and related appurtenances located approximately as shown on the attached Site Plan C.

1.26.4. The location of the facilities from which the emission originates is Lot 4, Plan 4926, Kootenay District.

1.26.5. The location of the point of discharge is Lot 4, Plan 4926, Kootenay District.

R. J. Crozier, R. P. Bio.
Regional Waste Manager

1.27. This subsection applies to the discharge of contaminants from **VENTILATION ASSOCIATED WITH THE LEAD OPERATIONS CRUSHING PLANT IDENTIFIED AS CP-1** as shown on the attached Site Plan A. The site reference number for this discharge is **E215800**.

1.27.1. The maximum authorized volume which may be discharged is 200 m^3/min.

1.27.2. The characteristics of the discharge shall not exceed:

Particulate	20 mg/m^3
Lead	7 mg/m^3

NOTE: All air and gaseous volumes specified in Subsections 1.27.1 and 1.27.2 above are at standard conditions which are:

Standard Temperature = 293.15^0 K
Standard Pressure = 101.325 KPa
Water Vapour zero unless otherwise state

1.27.3. The authorized works are fans, stack, baghouse and related appurtenances located approximately as shown on the attached Site Plan A.

1.27.4. The location of the facilities from which the emission originates is Lot 1, Plan 4926, Kootenay District.

1.27.5. The location of the point of discharge is Lot 1, Plan 4926, Kootenay District.

1.28. This subsection applies to the discharge of contaminants from **VENTILATION ASSOCIATED WITH THE COPPER SULPHATE/ARSENATE PLANT IDENTIFIED AS R-3A AND R-4A** as shown on the attached Site Plan I. The site reference numbers for this discharge are **E215813** and **E215814**.

1.28.1. The maximum authorized volumes which may be discharged are:

From the flash tank cross flow scrubber	100 m^3/min.
From the production ventilation scrubber	200 m^3/min.

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Regional Waste Manager

1.28.2. The characteristics of the discharges shall not exceed:

Arsenic	5 mg/m^3
Copper	2 mg/m^3

NOTE: All air and gaseous volumes specified in Subsections 1.28.1 and 1.28.2 above are at standard conditions which are:

Standard Temperature = 293.15^0 K
Standard Pressure = 101.325 KPa
Water Vapour zero unless otherwise stated

1.28.3. The authorized works are fans, ducts, two packed bed scrubbers and related appurtenances located approximately as shown on the attached Site Plan I.

1.28.4. The location of the facilities from which the emissions originate is Lot 4, Plan 4926, Kootenay District.

1.28.5. The location of the points of discharge is Lot 4, Plan 4926, Kootenay District.

1.29. This subsection applies to the discharge of contaminants from **VENTILATION ASSOCIATED WITH THE EFFLUENT TREATMENT PLANT IDENTIFIED AS NUMBERS 1 TO 4 INCLUSIVE** shown on the attached Site Plan H. The site reference number for this discharge is **E215815**.

1.29.1. The maximum authorized volume may be discharged is 50 m^3/min.

1.29.2. The characteristics of the discharge shall be air with traces of SO_2.

NOTE: All air and gaseous volumes specified in Subsections 1.29.1 and 1.29.2 above are at standard conditions which are:

Standard Temperature = 293.15^0 K
Standard Pressure = 101.325 KPa
Water Vapour zero unless otherwise stated

1.29.3. The authorized works are fans ducts, vents scrubber on surge tank vent, baghouse on lime silo, and related appurtenances located approximately as shown on the attached Site Plan H.

1.29.4. The location of the facilities from which the emissions originate is Lot 4, Plan 4926, Kootenay District.

1.29.5. The location of the points of discharge is Lot 4, Plan 4926, Kootenay District.

R. J. Crozier, R. P. Bio.
Regional Waste Manager

1.30. This subsection applies to the discharge of contaminants from **VENTILATION ASSOCIATED WITH THE NEW KIVCET SMELTER AREA IDENTIFIED AS NUMBER 68 TO NUMBER 72 INCLUSIVE** as shown on the attached Site Plan J. The site reference numbers for this discharge are No. 68 - **E215816**, No. 69 - **E215817**, No. 70 - **E215818**, No. 71 - **E215819** and No. 72 - **E215820**.

1.30.1. The maximum authorized volume may be discharged is undefined for emergency bypass stacks but from the Kivcet Slag Granulation Stack is 1,100 m^3/min, from the Kivcet Copper Matte Granulation Stack is 700 m^3/min and from the Smelter Feed Mix Plant Stack is 250 m^3/min.

1.30.2. The characteristics of the discharge shall not exceed:

Smelter Feed Mix Plant Stack (No. 72) - Particulate- 36 mg/m^3

NOTE: All air and gaseous volumes specified in Subsection 1.30.1 above are at standard conditions which are:

Standard Temperature = 293.15^0 K
Standard Pressure = 101.325 KPa
Water Vapour zero unless otherwise stated

1.30.3. The authorized works are fans, stacks, vents, scrubbers and related appurtenances located approximately as shown on the attached Site Plan J.

1.30.4. The location of the facilities from which the emission originates Lot 1, Plan 4926, Kootenay District.

1.30.5. The location of the point of discharge is Lot 1, Plan 4926, Kootenay District.

R. J. Crozier, R. P. Bio.
Regional Waste Manager

1.31. This subsection applies to the discharge of contaminants from the **TOTAL ANNUAL SULPHUR EMISSIONS MEASURED AS SULPHUR DIOXIDE** from the lead smelting operations of Cominco Ltd. in Trail, British Columbia. The site reference number for this discharge is **E217572.**

1.31.1. The maximum authorized rate of discharge shall not exceed 13,680 tonnes per year.

1.31.2. The total sulphur dioxide loading limit from the lead smelting operation is a summation of the following the following:

(i) **Sinter Plant S-1 Stack**

An annual summation of the daily average SO_2 concentration multiplied by the gas flow rate as estimated by daily average fan amperage correlated to actual gas flow rate measurements.

(ii) **Lead Furnaces Stack S-32**

An annual summation of the daily average SO_2 concentration multiplied by the gas flow rate as estimated by the daily single point pitot value correlated to actual gas flow measurements.

(iii) **Slag Furnace Stack S-40**

An annual summation of the daily average SO_2 concentration multiplied by the gas flow rate as estimated by averaging two pitot traverses per week.

2. GENERAL REQUIREMENT

2.1. Maintenance of Works and Emergency Procedures

The permittee shall inspect the pollution control works regularly and maintain them in good working order. In the event of an emergency or condition beyond the control of the permittee which prevents continuing operation of the approved method of pollution control, the permittee shall immediately notify the Regional Waste Manager and take appropriate remedial action.

The permittee shall submit to the Regional Waste Manager by June 30, 1996, contingency plans outlining emergency procedures to be undertaken in the event of foreseeable emergency incidents that may result in significant release of contaminants to the atmosphere.

R. J. Crozier, R. P. Bio.
Regional Waste Manager

2.2. Bypasses

The discharge of contaminants which has bypassed the designated treatment works is prohibited, except as provided for in Subsection 2.1 above, unless the approval of the Regional Waste Manager is obtained and confirmed in writing.

2.3. Process Modifications

The permittee shall notify the Regional Waste Manager prior to implementing changes to any process that may affect the quality and/or quantity of the discharge.

2.4. Phases of Smelter Operation

2.4.1. Phase I

This phase is defined as the period from December 31, 1995 to the startup of Kivcet furnace and allows the use of the existing sinter plant, blast furnaces, slag fuming furnaces and drossing plant and related appurtenances. During this time the Kivcet smelter and new slag fuming furnaces are under construction.

2.4.2. Phase II

This phase is defined as the period from the date of startup of the Kivcet furnace until it reaches approximately 60% of the normal feed rate of 1500 tonnes/day expressed as a 30 day average. Startup of the Kivcet furnace is considered to be 1 month after the first feed is fired in the furnace. This authorizes the emissions from one existing blast furnace and both old slag fuming furnaces, Kivcet furnace, new slag fuming furnace and related appurtenances and limited operation of the sinter plant if necessary.

2.4.3. Phase III

This phase is defined as the period from date of attainment of 60% of normal rate, as defined in PHASE II above, of the Kivcet furnace to the time when the Kivcet furnace reaches 90% of the normal feed rate to the Kivcet furnace of 1500 tonnes per day expressed as a 30 day average. During PHASE III only the operation of the Kivcet furnace, new slag fuming furnace and new CDF (continuous drossing furnace built for QSL project) are authorized to operate on a continuous basis. The old smelter (sinter plant, blast furnaces, old slag fuming furnaces and old CDF) is not normally in operation. Startup of the old smelter for limited operation during Kivcet repairs or modifications may occur following written notification of the Regional Waste Manager and the public.

R. J. Crozier, R. P. Bio.
Regional Waste Manager

2.4.4. Phase IV

This phase is defined as a one year performance period that commences when the Kivcet furnace reaches 90% of design rate as defined above. The old smelter may only be restarted in the event of major operational or design problems associated with the new smelter. Written notification from the company to the Regional Waste Manager and his written authorization is required prior to restarting the old smelter.

2.5. Ambient Sulphur Dioxide Control Regime

Sulphur Dioxide emissions from the entire operation are to be controlled at sites specified in Subsection 2.5.4 below:

2.5.1. The annual arithmetic mean at any one continuous ambient sensor shall not exceed .03 ppm (80 ug/m^3).

2.5.2. The maximum 24 hour (average) concentration at any continuous ambient sensor shall not exceed .14 ppm (375 ug/m^3).

2.5.3. The maximum 3 hour (average) concentration at any continuous ambient sensor shall not exceed .3 ppm (800 ug/m^3). The 3 hour average concentration is to be updated hourly for each ambient SO_2 sensor.

2.5.4. Ambient sulphur dioxide monitoring stations: Oasis (site reference number 0260022), W.K.P.L. (site reference number 0260010), Warfield (site reference number 0260011), and Butler Park (site reference number 0250009) must comply with the above limits.

2.6. Fugitive Dust Control

The permittee shall suppress fugitive dust created within the operation area as required by the Regional Waste Manager.

R. J. Crozier, R. P. Bio.
Regional Waste Manager

2.7. Materials Management Plan

The permittee shall submit to the Regional Waste Manager for his approval on or before September 1, 1996 an updated plan consisting of the following:

- current inventory of materials deemed to have the potential to create airborne contamination by the Regional Waste Manager;
- management proposals for containment and usage of these materials;
- the proposed final disposition location and estimated time frame for disposal or consumption these of materials within the process;
- details of facilities in place and planned to minimize fugitive emissions during transport of materials within the site;
- procedures to control the transport of materials off the site and into the populated areas of Trail, British Columbia.

2.8. Plans - New Works

Plans and specifications for the two new baghouses scheduled to be installed in the Silver Refinery shall be submitted to the Regional Waste Manager and his approval obtained before construction commences. The works shall be constructed in accordance with approved plans.

2.9. Environmental Performance Review

Eighteen (18) months following the commencement of PHASE IV as defined in Subsection 2.11, or no later than December 31st, 2000, the permittee shall submit a report, prepared using terms of reference approved by the Regional Waste Manager, that contains a comprehensive review of the permit operational requirements, ambient air quality and emission quality and quantities specified in the subsections to this permit by comparing data obtained from sampling of the emissions and ambient air by both the permittee and the Ministry of Environment, Lands and Parks.

The goal of the review is to assess the effectiveness of the new lead smelter and Refineries Abatement Upgrade in reducing emissions of particulate, metals and sulphur dioxide to the atmosphere from both stack and fugitive dust sources.

During Phase IV, and during the assessment period, the permittee shall endeavour to control sulphur dioxide emissions from the entire operation according to the following targets:

The annual arithmetic mean at any one continuous ambient sensor should not exceed 75 ug/m^3. The annual average concentration is to be updated hourly for each ambient SO_2 sensor.

The maximum 24 hour (average) concentration at any continuous ambient sensor should not exceed 260 ug/m^3. The 24 hour average concentration is to be updated hourly for each ambient SO_2 sensor.

The maximum 3 hour (average) concentration at any continuous ambient sensor should not exceed 665 ug/m^3. The 3 hour average concentration is to be updated hourly for each ambient SO_2 sensor.

The maximum 1 hour average concentration at any continuous ambient sensor should not exceed 900 ug/m^3.

Ambient sulphur dioxide data captured at all ambient sulphur dioxide monitoring stations is to be assessed according to the above averaging method. Oasis (Site Reference Number 0260022), W.K.P.L. (Site Reference Number 0260010), Warfield (Site Reference Number 0260011), Butler Park (Site Reference Number 0250009), Genelle (Site Reference Number E222140), Trail Hospital (Site Reference Number 0260023), West Trail (Site Reference Number E222141) Columbia Gardens (Site Reference Number 0260012), Glenmerry (Site Reference Number 0260026) and Robson (Site Reference Number E207879).

2.10. Suspension

The permittee shall ensure that no discharge occurs from or in respect of the works authorized by this permit during any period of suspension under the Waste Management Act.

R. J. Crozier, R. P. Bio.
Regional Waste Manager

3. MONITORING AND REPORTING REQUIREMENTS

3.1. Source Monitoring

The permittee shall carry out the Source Monitoring Program attached as Table 1. The permittee shall develop, within terms of reference developed in cooperation with and approved by the Regional Waste Manager, a program to evaluate potential arsenic emission sources. A report shall be submitted to the Regional Waste Manager by September 15, 1997 of the findings of this evaluation. The source monitoring program may be revised at the discretion of the Regional Waste Manager.

3.2. Ambient Monitoring

The permittee shall carry out the Ambient Air Program attached as Tables 2 and 2A. The permittee shall carry out a lichen monitoring program, as approved by the Regional Waste Manager, to assess impacts of sulphur and metals on sensitive vegetation in the Trail, BC - Northport, Washington area.

The permittee shall establish and fund a PM10 site in the Northport, Washington area at a site to be determined jointly by Washington State Department of Ecology, Cominco, and Ministry of Environment, Lands and Parks.

The ambient air monitoring program may be revised at the discretion of the Regional Waste Manager.

3.3. Source Testing Procedures - Particulate

Source testing procedures for the determination of particulate matter concentrations and the rate of discharge (flow rate) are to be carried out in accordance with those procedures described in the "Source Testing Code for the Measurement of Emissions of Particulates from Stationary Sources", 1982. Alternative test methods may be used provided that the alternative test methods are authorized by the Regional Waste Manager prior to performing the actual source testing.

Copies of the above mentioned manual are available from the Environmental Protection Division, Ministry of Environment, Lands and Parks, 777 Broughton Street, Victoria, British Columbia, V8V 1X5, at a cost of $5.00, and are also available for inspection at all Environmental Protection Program Offices.

R. J. Crozier, R. P. Bio.
Regional Waste Manager

3.4. Source Testing Procedure - Sulphur Dioxide

The source testing procedure for the measurement of sulphur dioxide is to be carried out in accordance with procedures described in the "Source Testing Code for the Measurement of Emissions of Sulphuric Acid Mist and Sulphur Dioxide form Stationary Sources, Ministry of Environment Manual 6 (1984)". Alternative test methods may be used proved that the alternative methods are authorized by the Regional Waste Manager prior to performing the actual source testing.

Copies of the above mentioned manual are available from the Environmental Protection Division, Ministry of Environment, Lands and Parks, 777 Broughton Street, Victoria, British Columbia, V8V 1X5, at a cost of $5.00, and are also available for inspection at all Environmental Protection Program Offices.

3.5. Sampling Facilities

Sampling ports shall be provided with nearby electrical outlets and, where required, approved access ladders and adequately sized platforms, for the discharges covered by Subsections 1.1, 1.2, 1.3, 1.4, 1.26, 1.28, 1.30 and 1.32 of the permit to enable Waste Management personnel to monitor these emissions.

3.6. Sampling Locations and Techniques

All sampling locations, techniques and equipment are to be approved by the Regional Waste Manager prior to use. Sampling and monitoring data, which also should include rate of discharge measurements, shall be accompanied by process data relevant to the operation of the source of the emissions and to the performance of the pollution abatement equipment involved in the testing.

3.7. Discharge Rate Measurement

Measure and record on the day of sampling of the above emissions, the average rate of discharge in m^3/min and the stack emission temperature from the stack based on normal operation of the plant in question for the period of sampling.

R. J. Crozier, R. P. Bio.
Regional Waste Manager

3.9. Quality Assurance/Quality Control

3.9.1. Permittee shall produce within 60 days of the request of the Regional Waste Manager, 'Laboratory Quality Protocols and Quality Assurance Criteria' acceptable to the Regional Waste Manager. The 'Laboratory Quality Protocols' shall include the procedures used to assess precision, accuracy and blank quality, including frequency of application of those procedures, the procedures for sampling handling (e.g. preservation, hold times) and corrective measures to be initiated when deficiencies are indicated. The 'Quality Assurance Criteria' shall include the acceptance criteria for accuracy (based on recoveries for reference samples/spikes), for precision (based on deviation in field and lab duplicates) and method blanks (designed to indicate false positives).

3.9.2. Permittee shall certify that all data required under Subsections 3.1 and 3.2 of this permit are produced in accordance with the 'Laboratory Quality Protocols' and met the 'Quality Assurance Criteria' as approved under Subsection 3.9.1. At the request of the Regional Waste Manager, the permittee is to provide the laboratory quality assurance data along with the submission of the data required under Subsections 3.1 and 3.2 of this permit, as well as all associated field blanks and duplicate analysis results along with the submission of data required under Subsections 3.2 (receiving environment monitoring).

3.9.3. The permittee shall ensure that all tests and other data required to be submitted under the permit are conducted by a laboratory acceptable to the Regional Waste Manager.

3.10. Special Evaluation of Ambient Air Quality

Four times during the calendar years 1996, 1997, 1998, and 1999 (once in each quarter), the permittee shall collect and analyze, using ICP scan techniques similar to those used in the previous survey in 1992, a 24 hour PM10 Total Suspended Particulate sample from each site equipped with a PM10 sampler. The date of sampling shall be co-ordinated with the Ministry of Environment, Lands and Parks in order to facilitate similar sampling at other sites in the Province as background data points. The results of this program are to be reported to the Regional Waste Manager as part of the monthly data submission.

R. J. Crozier, R. P. Bio.
Regional Waste Manager

3.11. Reporting

3.11.1. The permittee shall submit an annual report to the Regional Waste Manager which includes:

i) All source testing results.

ii) A summary of the ambient air monitoring results.

iii) Documentation of the remedial measures taken to improve those emissions, if any, shown to be in excess of permit limits.

iv) The report is to be written in a form suitable for public release.

v) The report is due by April 1 of the following year.

3.11.2. The permittee shall submit to the Regional Waste Manager monthly the available results of the previous month's ambient air quality and stack emission monitoring. This data is to be submitted in machine readable format as well as hard copy in a form suitable for subsequent release to the public.

R. J. Crozier, R. P. Bio.
Regional Waste Manager

TABLE 1 - Source Monitoring For PA-02691

Stack Description	Cominco No.	Volume	Particulate	Lead	Zinc	Cadmium	Mercury	Antimony	Total Arsenic	Gaseous Fluoride	Copper	Sulphur Dioxide
Sinter Stack	S-1	M	M	M	M	M	M	M	M	M		C
Lead Furnace	S-32	Q	Q	Q	Q	Q	Q	Q	Q	Q		C
Sinter Dryer	S-8	SA	SA	SA	SA	SA	SA	SA	SA	SA		SA
Slag Fuming	S-40	M	M	M	M	M	M	M	M	M		C
Refinery Scrubber	R-1A	M	M	M				M	M	M		
Short Rotary Fce.	R-2A	Q	Q	Q				Q	Q	Q		
Copper Arsenate 2 Stacks	R-3 & R-4	Q	Q	Q					Q		Q	
Arsenic Plant	R-14	SA	SA						SA			
Smelter Feed	72	Q	Q	Q					Q			
Mix Plant Stack												

FREQUENCY: C = Continuous, M = Monthly, Q = Quarterly, A = Annually, SA= Semi-Annually

Date Issued: September 9, 1975
Date Amended:
(most recent) DEC 22 1995

R.J. Crozier, R.P. Bio.
Regional Waste Manager

TABLE 2 - Ambient Air Quality Monitoring Program for PA-02691

Location	Site No.	Parameters To Be Measured And Frequency				Suspended Particulate					
		S02	Sulphation Plate	Fluoride Plate	Dust Fall	Total	Lead	Zinc	Cadmium	Arsenic	Total Fluoride
W.K.P.L. Building	260010	C	M	M	M	W	W	W	W	W	W-7
Oasis	260022	C	M	M	M	W	W	W	W	W	W-7
Warfield Substation	260011	C	M	M	M	W	W	W	W	W	W-7
Butler Park	250009	C				W	W	W	W	W	
Sunningdale	260025		M	M	M						
Glenmerry	260026		M	M	M						
Daniel Street	260009		M	M	M						
Columbia Gardens	260012		M	M	M						
Trail Hospital	260023		M	M	M						
Birchbank	26004		M	M	M						
FREQUENCY: C = Continuous, W = Weekly (Every 6 Days), W-7 = Weekly (Every 7 Days) M - Monthly (30 Days Duration											

Date Issued: September 9, 1975
Date Amended:
(most recent) DEC 22 1995

R.J. Croeier, R.P. Bio.
Regional Waste Manager

TABLE 2A - Ambient Air Quality Monitoring Program for PA-02691
Lead Modernization Assessment Sampling

Location	Site No.	Parameters To Be Measured And Frequency											
			PM 10 Suspended Particulate					Suspended Particulate					
		SO2	Total	Lead	Zinc	Cadmium	Arsenic	Total	Lead	Zinc	Cadmium	Arsenic	Met station
Genelle	E222140	C	W	W	W	W	W	W	W	W	W	W	C
West Trail	E222141	C						W	W	W	W	W	
Butler Park	250009		W	W	W	W	W						
Oasis	260022		W	W	W	W	W						
Glenmerry	260026	C						W	W	W	W	W	
Columbia Gardens	260012	C						W	W	W	W	W	
Trail Hospital	260023	C											
Northport, Washington	E222689	C	W	W	W	W	W	W	W	W	W	W	C
FREQUENCY: C = Continuous, W = Weekly (Every 6 Days),Met station means wind speed and direction, Temperature													

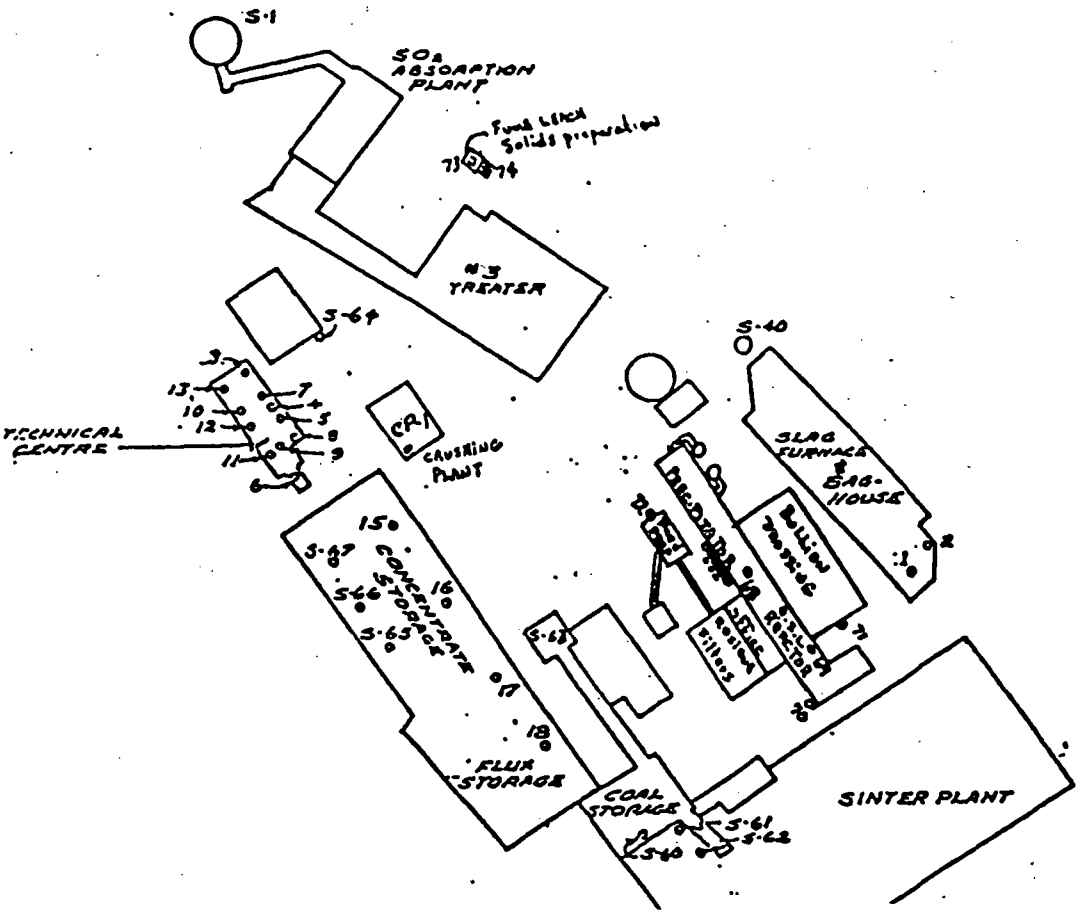
Date Issued: September 9, 1975
Date Amended:
(most recent) DEC 22 1995

R.J. Crozier, R.P. Bio.
Regional Waste Manager

PROVINCE OF
BRITISH COLUMBIA

Environmental Protection Program

Site Plan A



LEGAL DESCRIPTION: Lot 1, Plan 4926, Kootenay District

Permit: PA-02691

Date Issued: September 9, 1975

Date Amended: DEC 22 1995

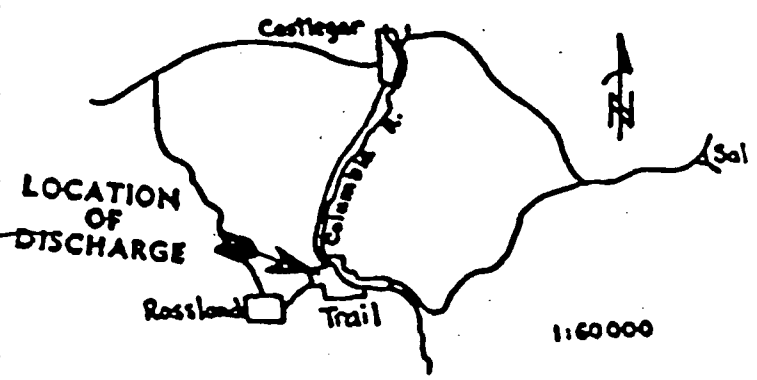
Regional Waste Manager:

R.J. Crozier, R.P. Bio.

Name of Applicant:

Cominco Ltd. - Cominco Ltee

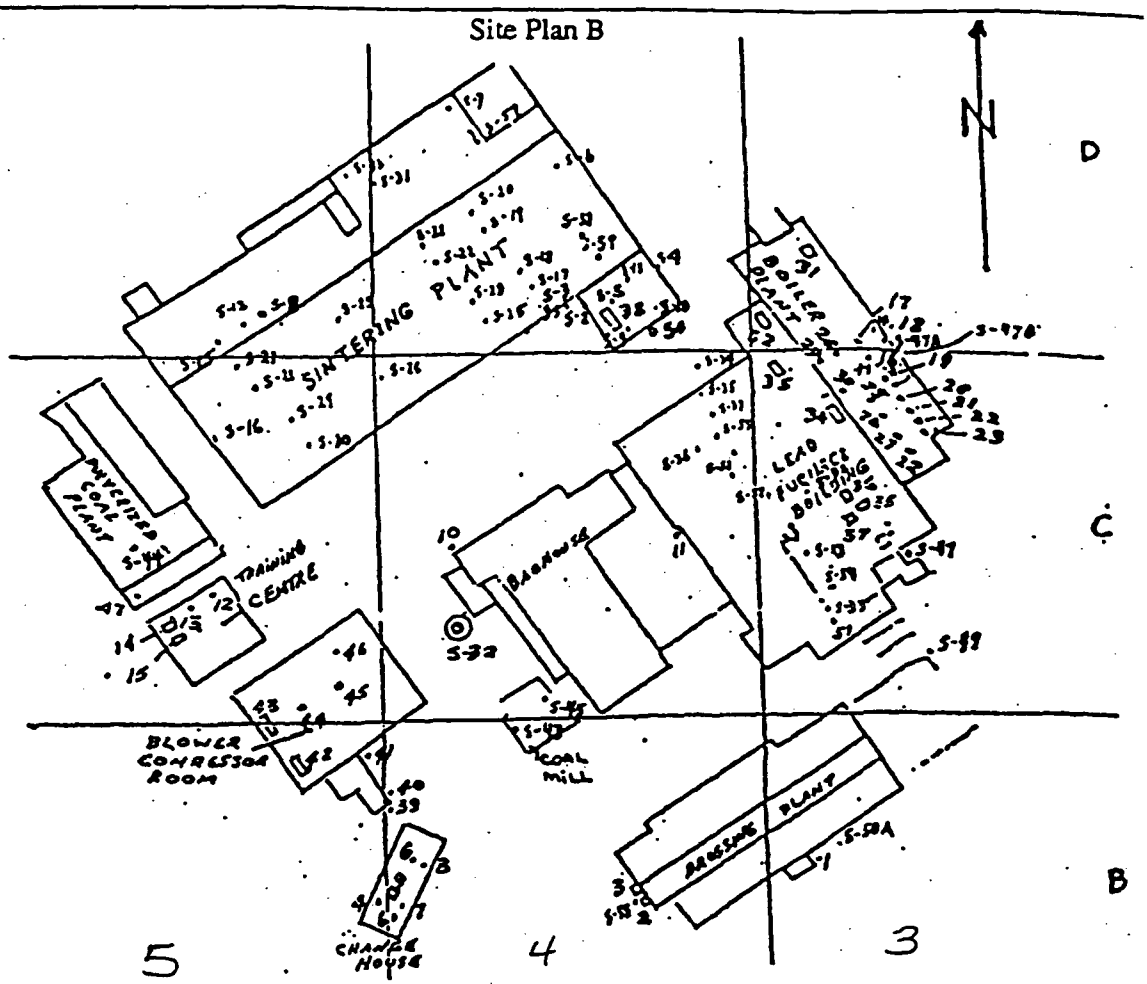
GENERAL DESCRIPTION



PROVINCE OF
BRITISH COLUMBIA

Environmental Protection Program

Site Plan B



LEGAL DESCRIPTION: Lot 1, Plan 4926, Kootenay District

Permit: PA-02691

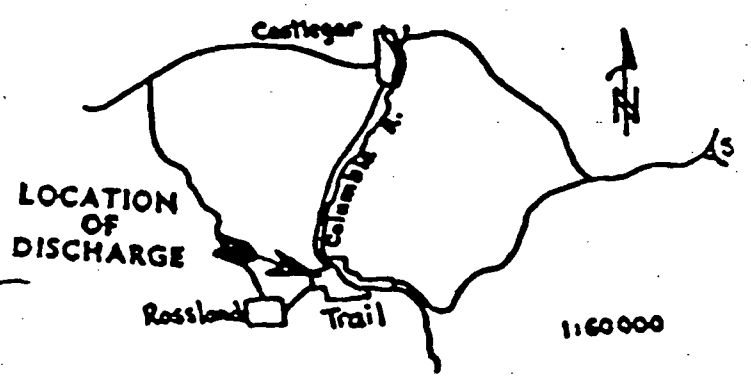
Date Issued: September 9, 1975

Date Amended: DEC 22 1995

Regional Waste Manager:

R.J. Crozier, R.P. Bio.

GENERAL DESCRIPTION



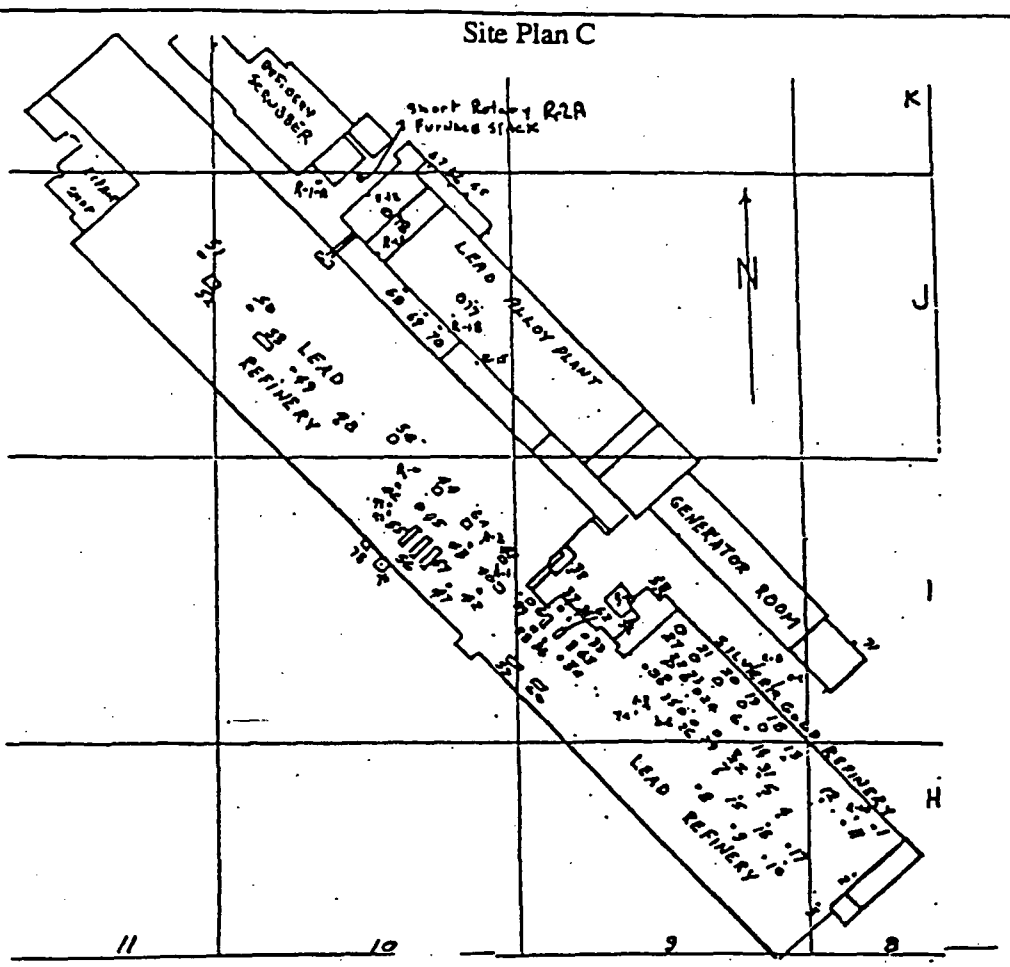
Name of Applicant:

Cominco Ltd. - Cominco Ltee

PROVINCE OF
BRITISH COLUMBIA

Environmental Protection Program

Site Plan C



LEGAL DESCRIPTION: Lot 4, Plan 4926, Kootenay District

Permit: PA-02691

Date Issued: September 9, 1975

Date Amended: DEC 22 1995

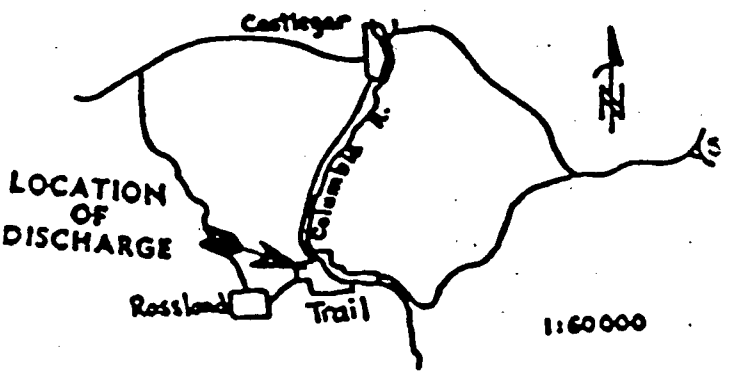
Regional Waste Manager:

R.J. Crozier, R.P. Bio.

Name of Applicant:

Cominco Ltd. - Cominco Ltee

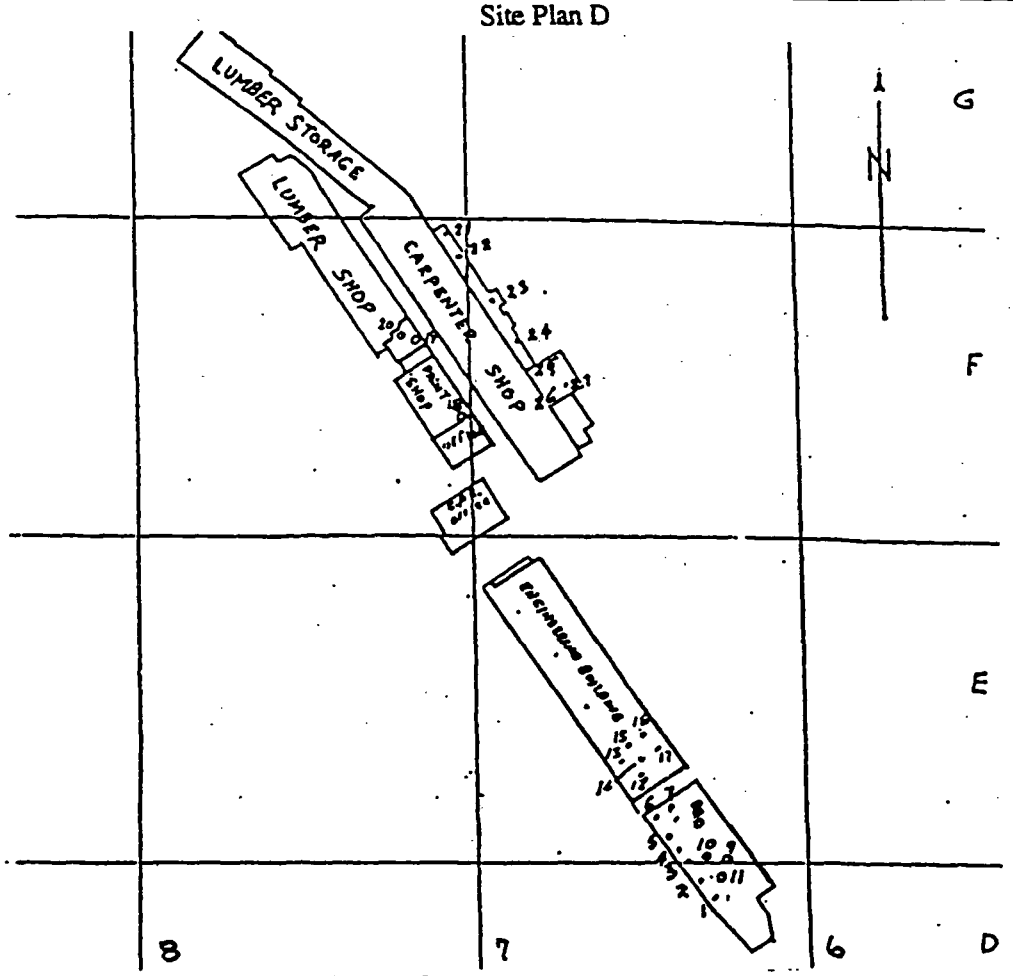
GENERAL DESCRIPTION



PROVINCE OF
BRITISH COLUMBIA

Environmental Protection Program

Site Plan D



LEGAL DESCRIPTION: Lot 1, Plan 4926, Kootenay District

GENERAL DESCRIPTION

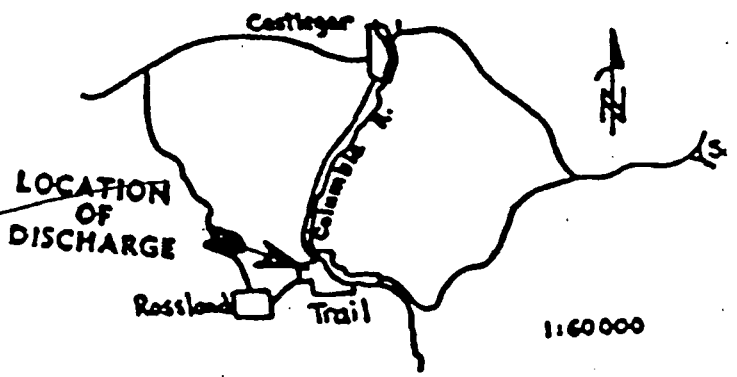
Permit: PA-02691

Date Issued: September 9, 1975

Date Amended: DEC 2 2 1995

Regional Waste Manager:

R.J. Crozier, R.P. Bio.



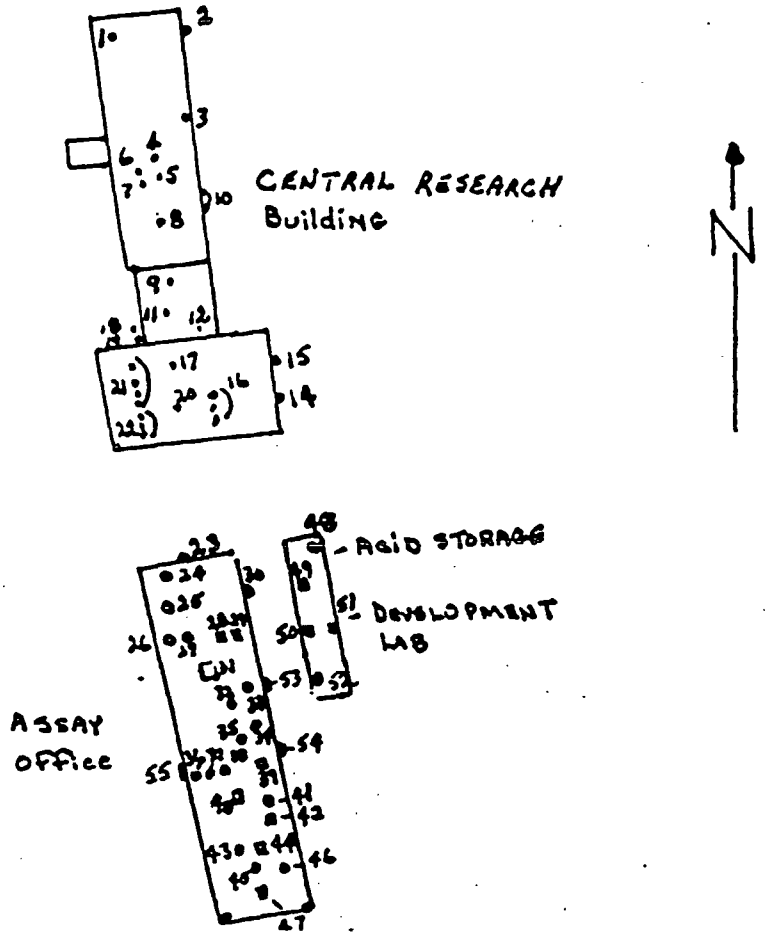
Name of Applicant:

Cominco Ltd. - Cominco Ltee

PROVINCE OF
BRITISH COLUMBIA

Environmental Protection Program

Site Plan E



LEGAL DESCRIPTION: Lots 1 and 4, Plan 4926, Kootenay District

Permit: PA-02691

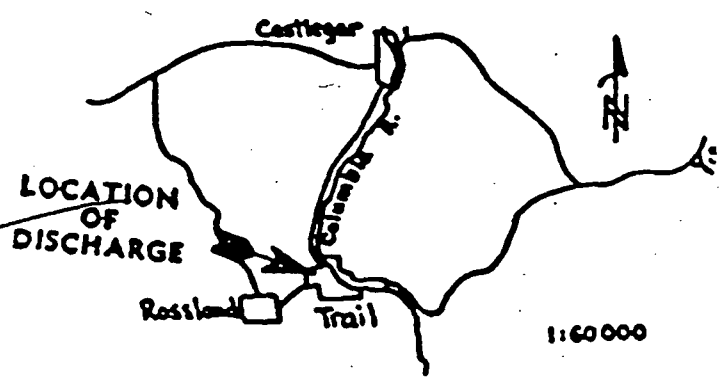
Date Issued: September 9, 1975

Date Amended: DEC 22 1995

Regional Waste Manager:

R.J. Crozier, R.P. Bio.

GENERAL DESCRIPTION

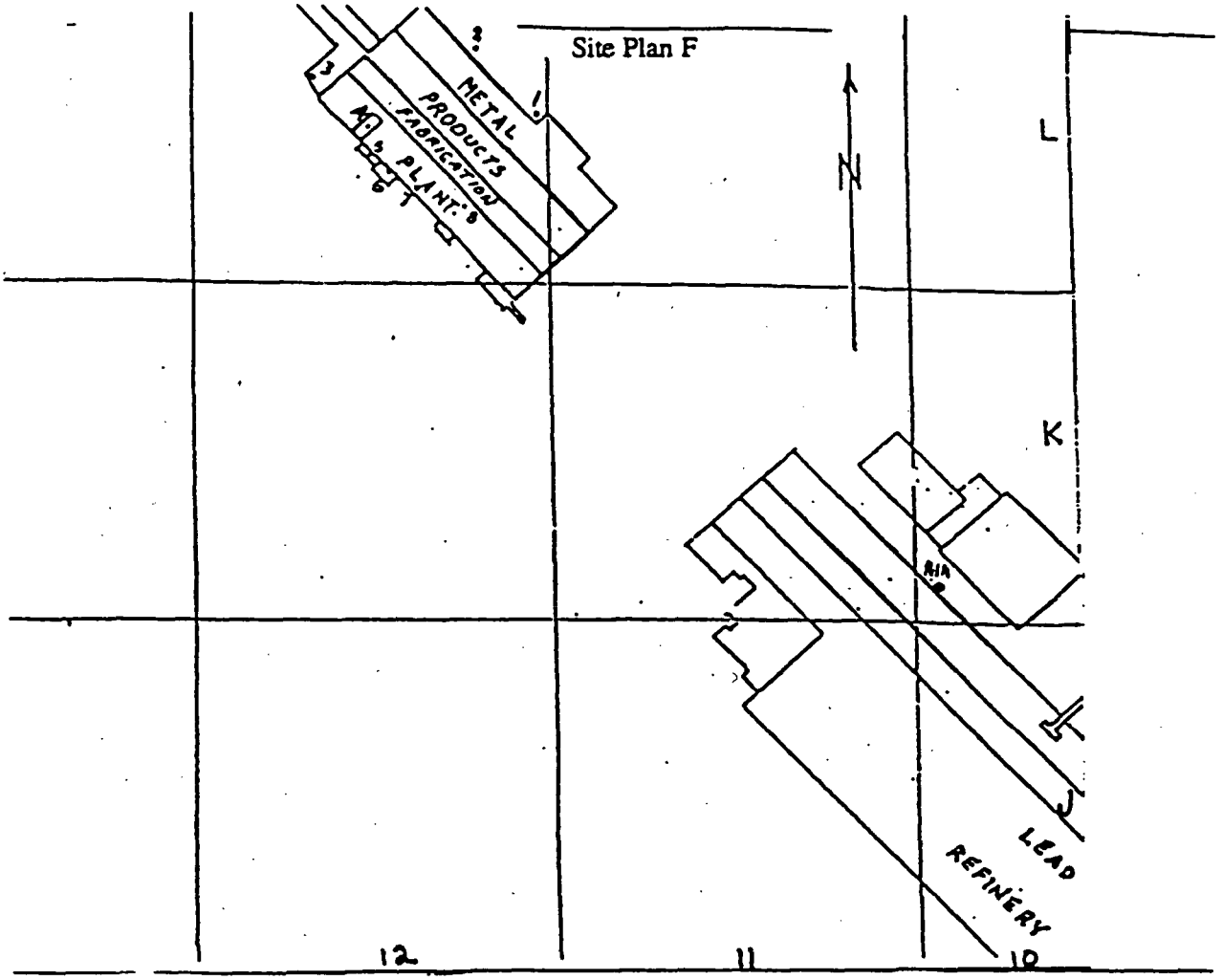


Name of Applicant:

Cominco Ltd. - Cominco Ltee

PROVINCE OF
BRITISH COLUMBIA

Environmental Protection Program



LEGAL DESCRIPTION: Lot 4, Plan 4926, Kootenay District

Permit: PA-02691

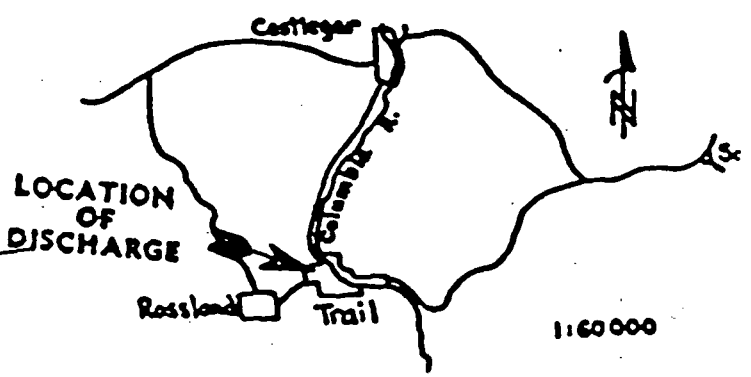
Date Issued: September 9, 1975

Date Amended: DEC 22 1995

Regional Waste Manager:

R.J. Crozier, R.P. Bio.

GENERAL DESCRIPTION



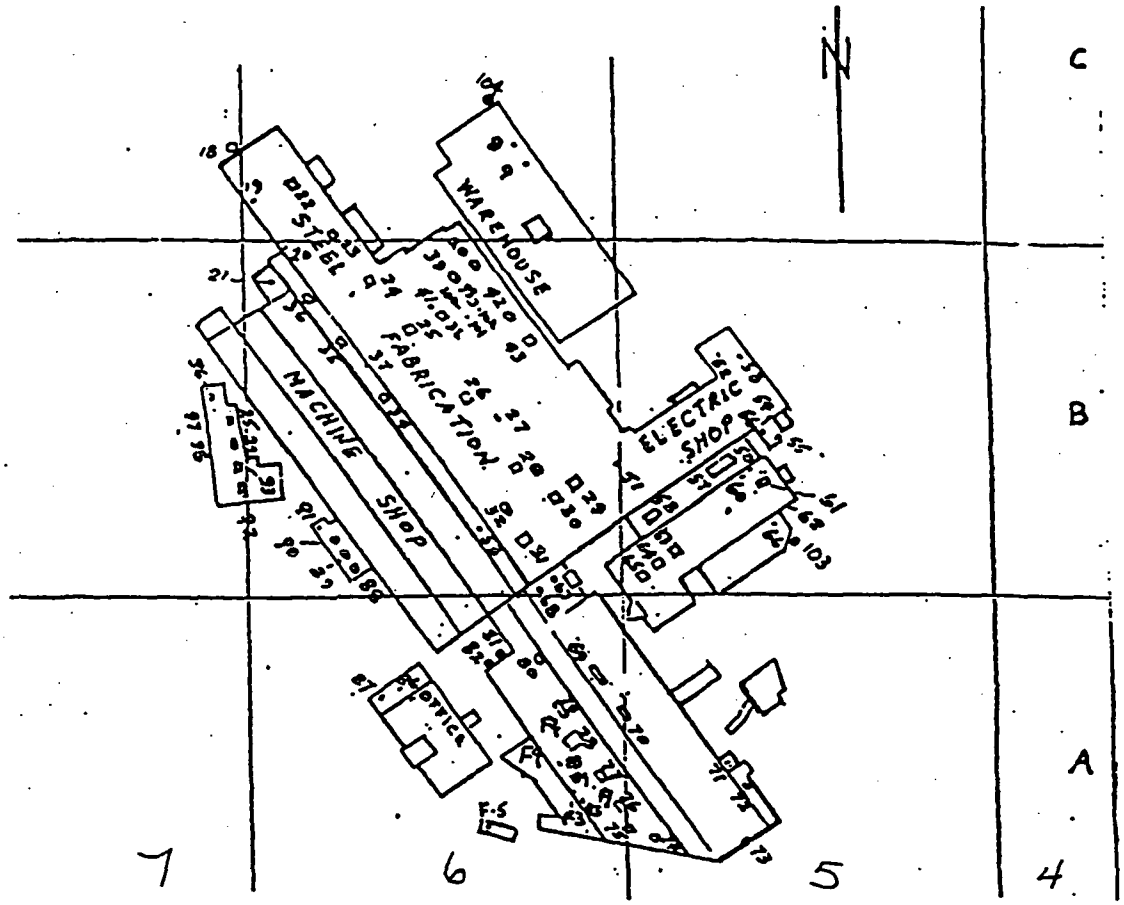
Name of Applicant:

Cominco Ltd. - Cominco Ltee

PROVINCE OF
BRITISH COLUMBIA

Environmental Protection Program

Site Plan G



LEGAL DESCRIPTION: Lot 1, Plan 4926, Kootenay District

Permit: PA-02691

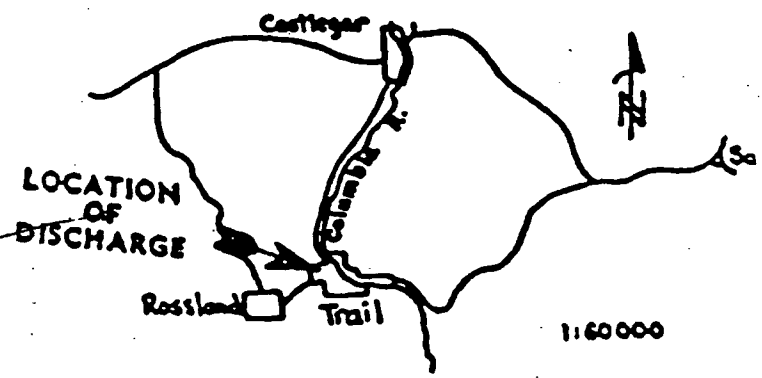
Date Issued: September 9, 1975

Date Amended: DEC 22 1995

Regional Waste Manager:

R.J. Crozier, R.P. Bio.

GENERAL DESCRIPTION.



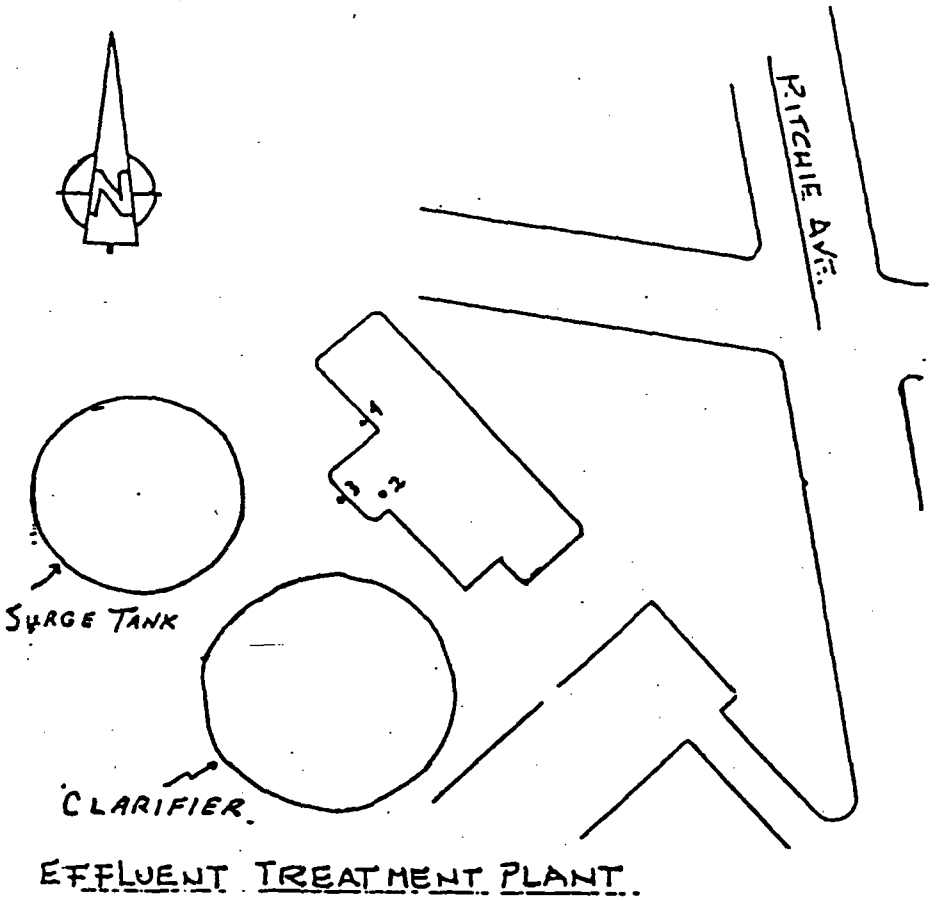
Name of Applicant:

Cominco Ltd. - Cominco Ltee

PROVINCE OF
BRITISH COLUMBIA

Environmental Protection Program

Site Plan H



LEGAL DESCRIPTION: Lot 4, Plan 4926, Kootenay District

Permit: PA-02691

Date Issued: September 9, 1975

Date Amended: DEC 22 1995

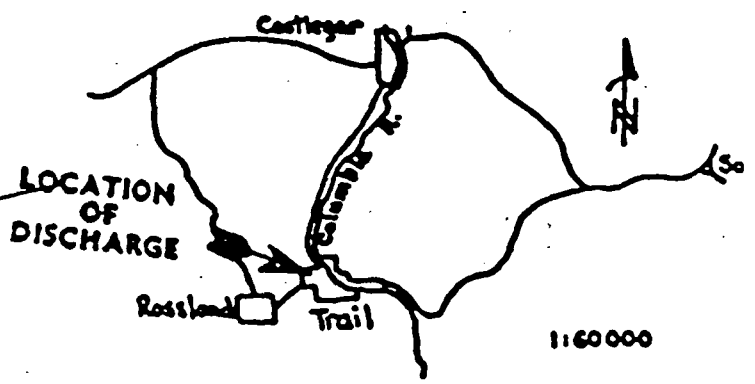
Regional Waste Manager:

R.J. Crozier, R.P. Bio.

Name of Applicant:

Cominco Ltd. - Cominco Ltee

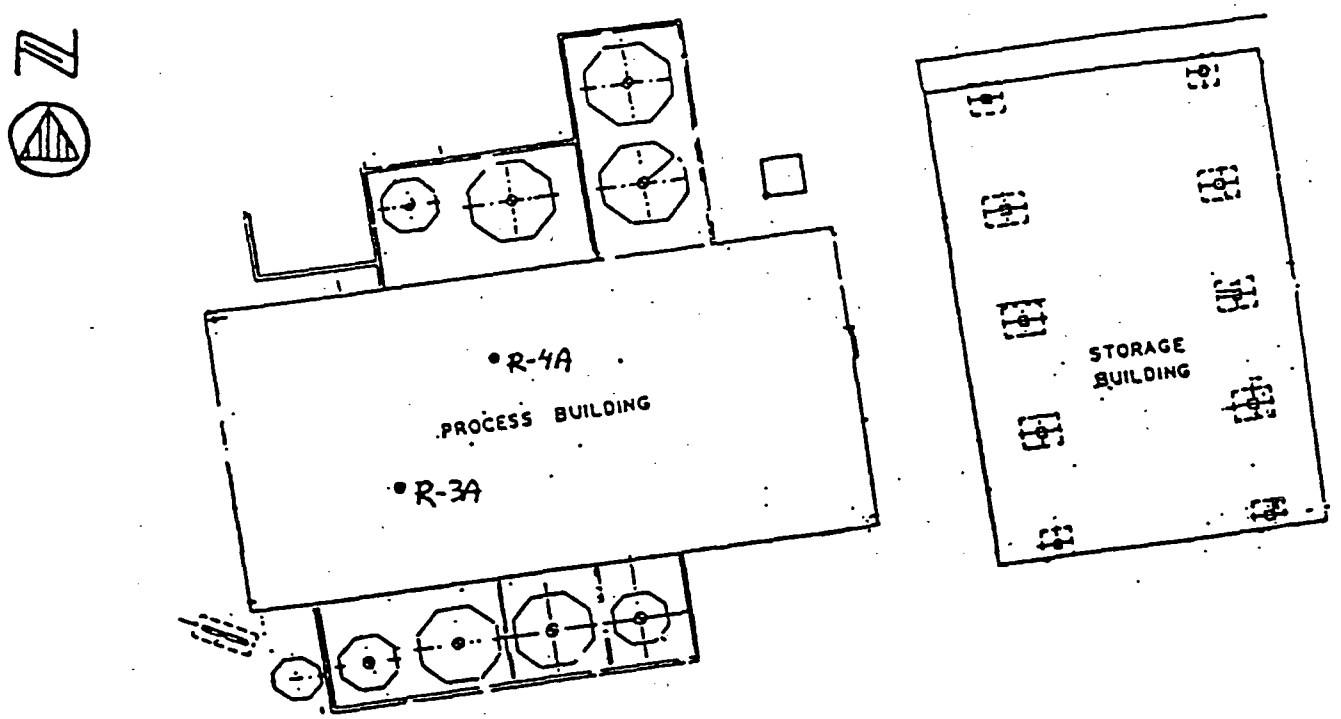
GENERAL DESCRIPTION



PROVINCE OF
BRITISH COLUMBIA

Environmental Protection Program

Site Plan I



COPPER ARSENATE PLANT

LEGAL DESCRIPTION: Lot 4, Plan 4926, Kootenay District

Permit: PA-02691

Date Issued: September 9, 1975

Date Amended: DEC 22 1995

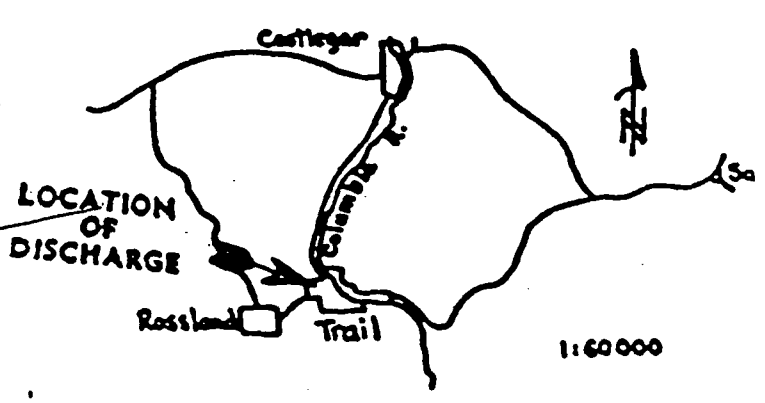
Regional Waste Manager:

R.J. Crozier, R.P. Bio.

Name of Applicant:

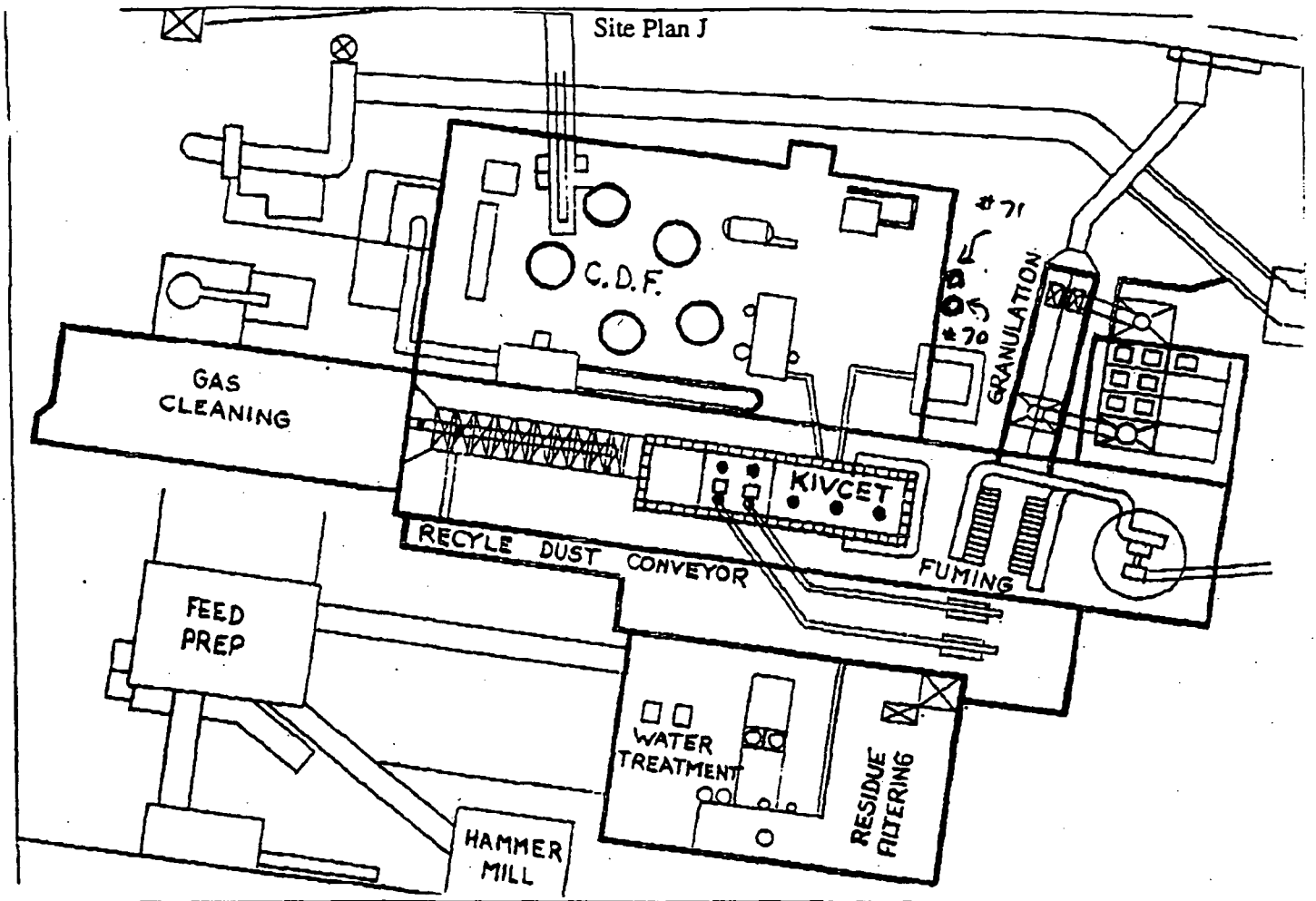
Cominco Ltd. - Cominco Ltee

GENERAL DESCRIPTION



PROVINCE OF
BRITISH COLUMBIA

Environmental Protection Program



LEGAL DESCRIPTION: Lot 1, Plan 4926, Kootenay District

Permit: PA-02691

Date Issued: September 9, 1975

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Regional Waste Manager:

R.J. Crozier, R.P. Bio.

Name of Applicant:

Cominco Ltd. - Cominco Ltee

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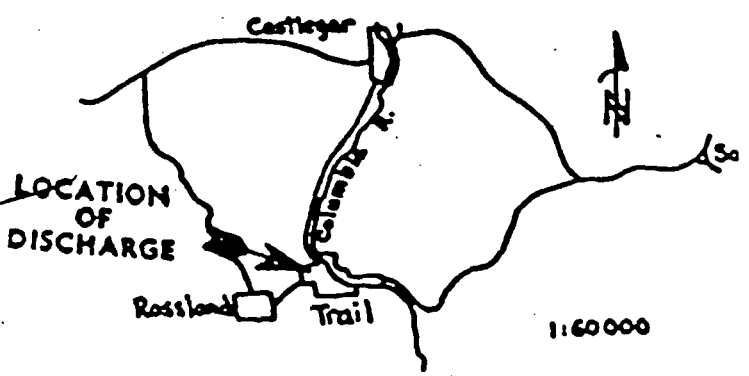
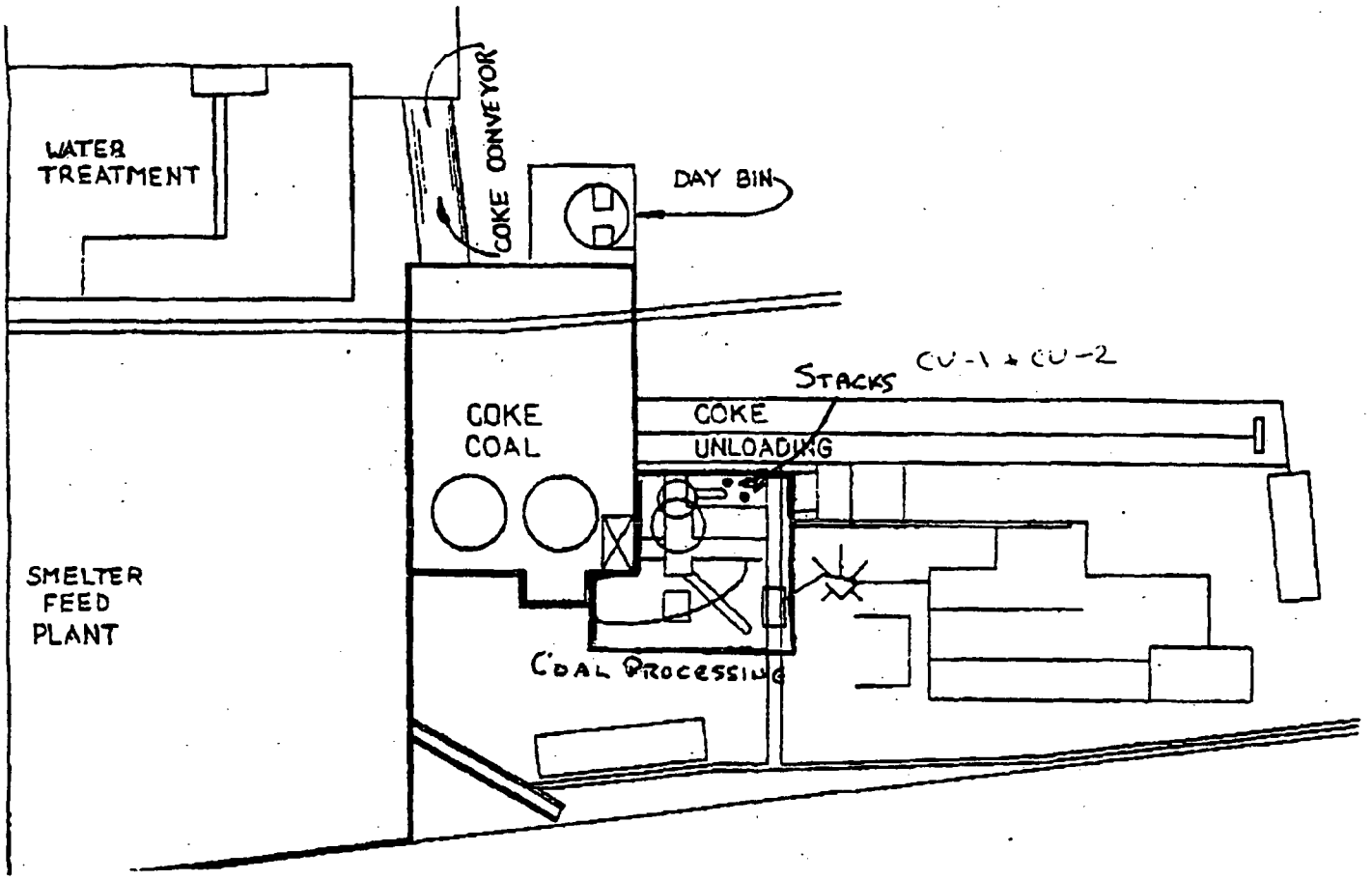


PROVINCE OF
BRITISH COLUMBIA

Environmental Protection Program

Site Plan K



LEGAL DESCRIPTION: Lot 1, Plan 4926, Kootenay District

Permit: PA-02691

Date Issued: September 9, 1975

Date Amended: DEC 22 1995

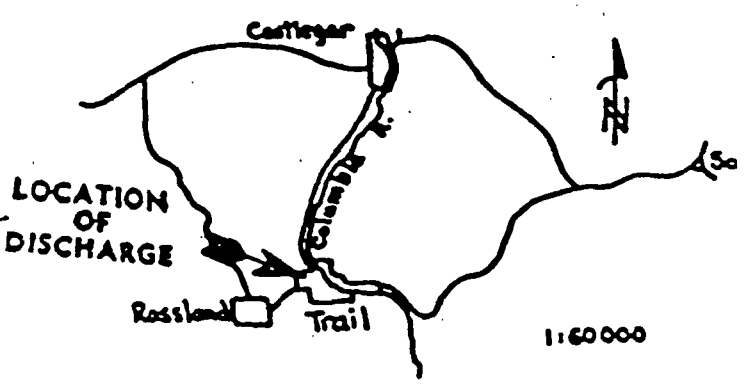
Regional Waste Manager:

R.J. Crozier, R.P. Bio.

Name of Applicant:

Cominco Ltd. - Cominco Ltee

GENERAL DESCRIPTION



Province of
British Columbia

MINISTRY OF ENVIRONMENT, LANDS AND PARKS
AND MINISTER RESPONSIBLE FOR
MULTICULTURALISM AND HUMAN RIGHTS

BC Environment

#401 - 333 Victoria Street
Nelson, British Columbia
V1L 4K3
Telephone: (604) 354-6333
Main Fax: (604) 354-6332
EP Fax: (604) 354-6367

File: PE-02753

December 28, 1994

REGISTERED MAIL

Cominco Ltd. - Cominco Ltee
500 - 200 Burrard Street
Vancouver, British Columbia
V6C 3L7

Dear Permittee:

**Notice of Correction to Permit No. PE-02753
Issued under the provisions of the
Waste Management Act
S.B.C. 1982 C.41, in the name of
Cominco Ltd. - Cominco Ltee**

This is to advise you that the following correction has been made to the subject Permit:

Appendix 01, Dissolved Arsenic, Column 3 should read .2 tonnes Annually not 2 tonnes Annually.

Please remove and destroy the original pages in your Permit package and replace them with the revised version enclosed.

Yours truly,

R.J. Crozier, R.P. Bio.
Regional Waste Manager

/sw
Enclosure

NOTICE OF A MINOR AMENDMENT TO PERMIT PE-02753 ISSUED UNDER THE PROVISIONS OF THE WASTE MANAGEMENT ACT, S.B.C. 1982, c.41, IN THE NAME OF COMINCO LTD. - COMINCO LTEE

Notice that a minor amendment to Permit PE-02753 issued to Cominco Ltd. - Cominco Ltee in Trail, British Columbia has been amended effective December 16, 1994 to reduce the permitted daily maximum discharge of various dissolved metals into the Columbia River as a result of process improvements and pollution control equipment installed by the company over the past two years.

The permit limits are now specified as maximum daily loadings expressed as kg/day instead of the previous maximum concentrations expressed as mg/l.

This amendment may be appealed by persons who consider themselves aggrieved by this decision in accordance with Part 5 of the Waste Management Act. Written notice of intent to appeal must be received by the Regional Waste Manager within twenty-one (21) days.

A copy of the amended permit may be viewed at Environmental Protection, B.C. Environment, #401 - 333 Victoria Street, Nelson, B.C., V1L 4K3 during normal business hours.

Dated at Nelson, British Columbia this 16th day of December, 1994.

R.J. Crozier, R.P. Bio.
Regional Waste Manager

/sw

Province of
British Columbia

MINISTRY OF ENVIRONMENT, LANDS AND PARKS
AND MINISTER RESPONSIBLE FOR
MULTICULTURALISM AND HUMAN RIGHTS

BC Environment

#401 - 333 Victoria Street
Nelson, British Columbia
V1L 4K3
Telephone: (604) 354-6333
Main Fax: (604) 354-6332
EP Fax: (604) 354-6367

File: PE-02753

November 30, 1994

Carol Jolly
Washington State Department of Ecology
PO Box 47600
Olympia Washington 98504-7600
USA

Dear Carol Jolly:

RE: AMENDMENT OF COMINCO PERMIT PE-2753, EFFLUENT FORM METALLURGICAL PLANTS TO COLUMBIA RIVER

It is my intention to amend the above noted permit in accordance with section 11(1)(a) of the Waste Management Act to reduce the daily loading of metals and slag to the Columbia River.

There are several important changes to note:

The permit limits for dissolved metals in each outfall are no longer expressed as a concentration ie. mg/l, but are now specified as a daily loading in kg/d that cannot be exceeded.

For the first time permit limits for dissolved copper have been included in the permit.

The allowable annual discharge of tail slag discharged to the river has been reduced from 140,000 tonnes/yr to 80,000 tonnes/yr to reflect the commitment by Cominco to eliminate this discharge in 1995.

The volume rate of discharge in outfalls 07 and III have been increased due to process changes (indirect heat exchanger at 07) and to reflect our recent experience with unusually high river water temperatures during the summer of 1994. The bulk of the water in these discharges is cooling water.

The following table shows the reduction in the maximum allowable dissolved metals in the proposed amendment of the permit as compared to the existing version dated December 1993.

Dissolved Lead	Reduction by 47.5 kg/d.
Dissolved Zinc	Reduction by 607 kg/d
Dissolved Cadmium	Reduction by 21.1 kg/d
Dissolved Arsenic	Reduction by 6.25 kg/d
Total Mercury	Reduction by 1.32 kg/d
Slag	Reduction by 60,000 tonnes /yr
other TSS	Reduction by 1555 kg/d

The proposed permit limits are as follows:

Outfall I

flow	70,000 m3/day
pH	6.5 - 8.5
Dissolved Lead	15 kg/day
Dissolved Zinc	20 kg/day
Dissolved Cadmium	2.0 kg/day
Dissolved Arsenic	1.0 kg/day
Dissolved Copper	3.5 kg/day .2 tonnes annually
Total Mercury	.05 kg/day

Total Suspended Solids 500 tonnes/day - annual maximum 80,000 tonnes/year

Outfall 07

flow	60,000 m3/day
pH	6.5 - 8.5
Dissolved Lead	3.0 kg/day
Dissolved Zinc	3.0 kg/day
Dissolved Cadmium	.5 kg/day
Dissolved Arsenic	.5 kg/day
Dissolved Copper	.5 kg/day .1 tonnes annually
Total Mercury	.05 kg/day

Total Suspended Solids 120 kg/day

Outfall II

flow	55,000 m3/day
pH	6.5 - 8.5
Dissolved Lead	20 kg/day
Dissolved Zinc	150 kg/day
Dissolved Cadmium	2.75 kg/day
Dissolved Arsenic	1.75 kg/day
Dissolved Copper	1.5 kg/day .25 tonnes annually
Total Mercury	.15 kg/day

Total Suspended Solids 1925 kg/day

Outfall III

flow	120,000 m3/day
pH	6.5 - 9.5
Dissolved Lead	27.5 kg/day
Dissolved Zinc	150 kg/day
Dissolved Cadmium	4.0 kg/day
Dissolved Arsenic	11 kg/day 2.0 tonnes annually
Dissolved Copper	5.5 kg/day 1.0 tonne annually
Total Mercury	.55 kg/day .1 tonnes annually

Total Suspended Solids 2000 kg/day

This amendment is considered to be an interim version that will remain in effect until the design information for the new lead smelter is available which will allow the development of another amendment that will further reduce metals discharges to the river. It is the goal of the Ministry to eventually reduce the discharges from the Cominco smelter to the point where the discharges are consistently non-acutely toxic to fish as tested by the 96 hour LC_{50} fish bioassay, and to control all metals discharges so that the water quality of the Columbia River is consistently better than that required by the most sensitive use (usually aquatic life).

It should be noted that the above proposed limits are maximums and on average the actual discharges are much less based on recent evaluation of effluent data. Attached are two tables that show the maximum allowable discharges for the existing and proposed permits.

We would appreciate any comments from your program by December 9, 1994 so that this permit may be issued without delay.

For additional information feel free to contact Carl Johnson, Industrial Section Head, Nelson phone 604-354-6355.

Yours truly,

Rick Crozier, R.P.Bio.
Regional Waste Manager
CAJ/mh

Attachments

cc: Claude Sappington
Martin Pomeroy

	A	B	C	D	E	F
1	Daily loadings based on permit Dec 2 1993					
2		Outfall I	Outfall 07	Outfall II	Outfall III	summation
3		kg/d	kg/d	kg/d	kg/d	kg/d
4						
5						
6	Diss Pb	17.5	35	27.5	33	113
7						
8	Diss Zn	70	35	275	550	930
9						
10	Diss Cd	3.5	17.5	3.85	5.5	30.35
11						
12	Diss As	3.5	8.75	2.75	5.5	20.5
13						
14	Diss Cu	n/a	n/a	n/a	n/a	n/a
15						
16	Tot Hg	0.07	1.225	0.275	0.55	2.12
17						
18	TSS	140,000 t/yr	875 kg/d	1975 kg/d	2750 kg/d	5600 +slag
19						
20	Flow	70,000	35,000	55,000	110,000	270,000
21						
22	pH	6.5-8.5	2.0 - 8.5	6.5-8.5	6.5-9.5	

table 2

cominco daily load new

	A	B	C	D	E	F
1	Daily loadings based on proposed Nov 94 permit					
2		Outfall I	Outfall 07	Outfall II	Outfall III	summation
3		kg/d	kg/d	kg/d	kg/d	kg/d
4						
5						
6	Diss Pb	15	3	20	27.5	65.5
7						
8	Diss Zn	20	3	150	150	323
9						
10	Diss Cd	2	0.5	2.75	4	9.25
11						
12	Diss As	1	0.5	1.75	11	14.25
13						
14	Diss Cu	3.5	0.5	1.5	5.5	11
15						
16	Tot Hg	0.05	0.05	0.15	0.55	0.8
17						
18	TSS	80000 t/yr	120	1925	2000	4045 + slag
19						
20	Flow	70,000	60,000	55,000	120,000	305,000
21						
22	pH	6.5-8.5	6.5-8.5	6.5-8.5	6.5-9.5	

Mr. C. Johnson
Head, Industrial Section
Kootenay Region
B.C.Environment
#401-333 Victoria St.
Nelson, B.C.
V1L 4K3

June 26, 1995

REFERENCE-PERMIT-;PE-2753-Appendix 04

Dear Mr. Johnson,

We have reviewed operating practices in the plant associated with 07 sewer and made improvements for both spill prevention and spill detection to reduce the risk of contamination of this cooling water flow.

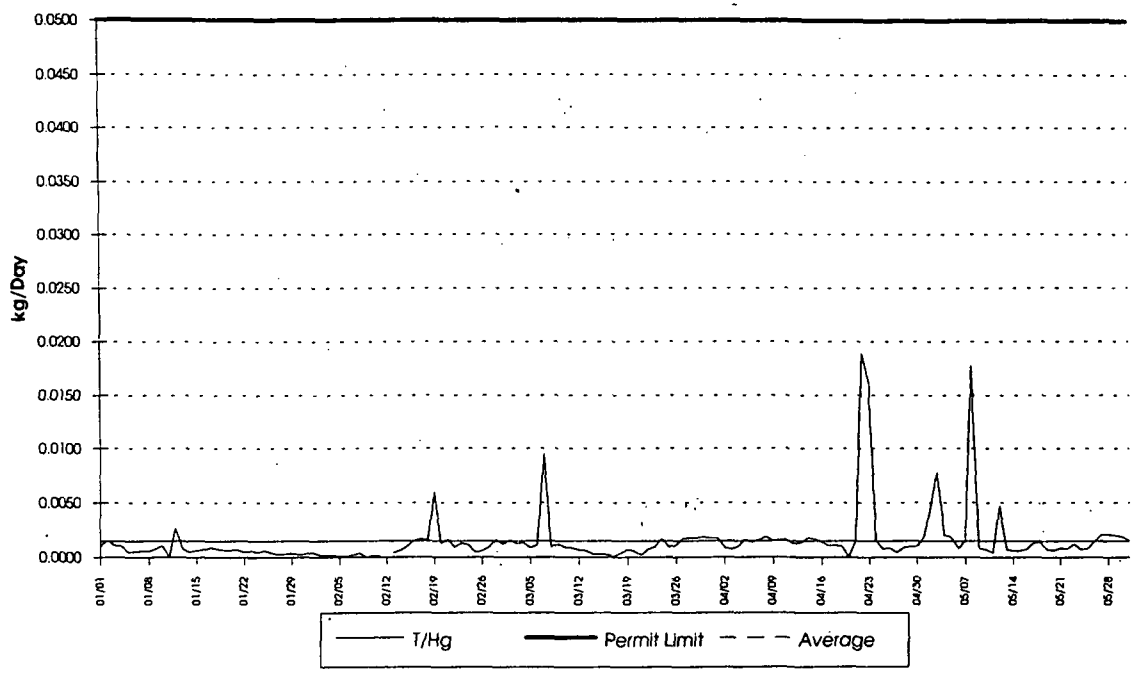
When these activities are complete we will assay this discharge for compliance only, e.g. mercury daily and other elements on the compliance schedule. We will continue sampling on a daily basis and holding the samples for seven days.

We have attached the daily results on this discharge for the year to date and would draw your attention to the mercury data. We believe this shows that at the levels experienced a six day schedule for mercury would be appropriate rather than the current daily regime. We request your review of this item for a possible permit amendment to the mercury schedule.

Yours Truly

R.W.ABBEY

Outfall 0-7
Total Mercury Discharge - 1995 to May 31



Outfall 0-7 Daily Analyses & Kilogram Loading

* Indicates Daily Kilogram Loading Permit Limit Exceeded

Where concentrations are indicated as less than (<) loadings are calculated at 50% of detection limit.

Compliance sample results are in bold and double outline

Jan	Flow		Suspended Solids		Total Lead		Dissolved Lead		Total Zinc		Dissolved Zinc		Total Cadmium		Dissolved Cadmium		Total Arsenic		Dissolved Arsenic		Total Copper		Dissolved Copper		Total Mercury	
1995	M³/Day	pH	mg/l	kg/day	mg/l	kg/day	mg/l	kg/day	mg/l	kg/day	mg/l	kg/day	mg/l	kg/day	mg/l	kg/day	mg/l	kg/day	mg/l	kg/day	mg/l	kg/day	mg/l	kg/day	mg/l	kg/day
P.L.	55000	6.5 -8.5		120				3.00				3.00				0.50				0.50				0.50		0.05
1	20200	8.0	2	40.4	0.01	0.20	0.01	0.20	0.03	0.61	0.03	0.61	< 0.01	0.10	< 0.01	0.10	< 0.01	0.10	< 0.01	0.10	< 0.01	0.10	< 0.01	0.10	< 0.0001	0.0010
2	30600	7.9	1	30.6	0.02	0.61	0.01	0.31	0.02	0.61	0.02	0.61	< 0.01	0.15	< 0.01	0.15	< 0.01	0.15	< 0.01	0.15	< 0.01	0.15	< 0.01	0.15	< 0.0001	0.0015
3	21700	7.8	1	21.7	0.03	0.65	0.01	0.22	0.30	6.51	0.05	1.09	< 0.01	0.11	< 0.01	0.11	0.03	0.65	0.01	0.22	0.01	0.22	< 0.01	0.11	< 0.0001	0.0011
4	20000	8.0	1	20.0	0.01	0.20	< 0.01	0.10	0.01	0.20	0.01	0.20	< 0.01	0.10	< 0.01	0.10	< 0.01	0.10	0.02	0.40	< 0.01	0.10	< 0.01	0.10	< 0.0001	0.0010
5	9300	8.1	1	9.3	< 0.01	0.05	< 0.01	0.05	0.01	0.09	0.01	0.09	< 0.01	0.05	< 0.01	0.05	< 0.01	0.05	< 0.01	0.05	< 0.01	0.05	< 0.01	0.05	< 0.0001	0.0005
6	9400	7.9	< 1	4.7	0.02	0.19	0.02	0.19	0.03	0.28	0.03	0.28	< 0.01	0.05	< 0.01	0.05	0.01	0.09	< 0.01	0.05	< 0.01	0.05	< 0.01	0.05	< 0.0001	0.0005
7	11200	8.0	< 1	5.6	0.02	0.22	0.01	0.11	0.03	0.34	0.03	0.34	< 0.01	0.06	< 0.01	0.06	< 0.01	0.06	< 0.01	0.06	< 0.01	0.06	< 0.01	0.06	< 0.0001	0.0006
8	5100	8.0	< 1	2.6	0.02	0.10	0.01	0.05	0.02	0.10	0.02	0.10	< 0.01	0.03	< 0.01	0.03	< 0.01	0.03	< 0.01	0.03	< 0.01	0.03	< 0.01	0.03	0.0001	0.0005
9	15700	8.0	1	15.7	< 0.01	0.08	< 0.01	0.08	0.02	0.31	0.02	0.31	< 0.01	0.08	< 0.01	0.08	< 0.01	0.08	< 0.01	0.08	< 0.01	0.08	< 0.01	0.08	< 0.0001	0.0008
10	21200	8.1	< 1	10.6	0.01	0.21	0.01	0.21	0.02	0.42	0.02	0.42	< 0.01	0.11	< 0.01	0.11	< 0.01	0.11	< 0.01	0.11	< 0.01	0.11	< 0.01	0.11	< 0.0001	0.0011
11																										
12	13200	8.0	< 1	6.6	0.03	0.40	0.03	0.40	0.02	0.26	0.02	0.26	< 0.01	0.07	< 0.01	0.07	< 0.01	0.07	< 0.01	0.07	< 0.01	0.07	< 0.01	0.07	0.0002	0.0026
13	14900	7.9	1	14.9	< 0.01	0.07	< 0.01	0.07	0.02	0.30	0.02	0.30	< 0.01	0.07	< 0.01	0.07	< 0.01	0.07	< 0.01	0.07	< 0.01	0.07	< 0.01	0.07	< 0.0001	0.0007
14	9500	8.0	< 1	4.8	0.02	0.19	0.02	0.19	0.02	0.19	0.02	0.19	< 0.01	0.05	< 0.01	0.05	< 0.01	0.05	< 0.01	0.05	< 0.01	0.05	< 0.01	0.05	< 0.0001	0.0005
15	12400	8.0	< 1	6.2	0.03	0.37	0.03	0.37	0.01	0.12	0.01	0.12	< 0.01	0.06	< 0.01	0.06	< 0.01	0.06	< 0.01	0.06	< 0.01	0.06	< 0.01	0.06	< 0.0001	0.0006
16	14200	7.3	1	14.2	0.02	0.28	< 0.01	0.07	0.02	0.28	0.02	0.28	< 0.01	0.07	< 0.01	0.07	< 0.01	0.07	< 0.01	0.07	< 0.01	0.07	< 0.01	0.07	< 0.0001	0.0007
17	17600	7.7	< 1	8.8	0.03	0.53	0.02	0.35	0.01	0.18	0.01	0.18	< 0.01	0.09	< 0.01	0.09	0.01	0.18	< 0.01	0.09	< 0.01	0.09	< 0.01	0.09	< 0.0001	0.0009
18	15100	8.0	1	15.1	< 0.01	0.08	< 0.01	0.08	< 0.01	0.08	< 0.01	0.08	< 0.01	0.08	< 0.01	0.08	< 0.01	0.08	< 0.01	0.08	< 0.01	0.08	< 0.01	0.08	< 0.0001	0.0008
19	13200	8.1	1	13.2	0.01	0.13	< 0.01	0.07	0.02	0.26	< 0.01	0.07	< 0.01	0.07	< 0.01	0.07	< 0.01	0.07	< 0.01	0.07	< 0.01	0.07	< 0.01	0.07	< 0.0001	0.0007
20	12600	8.1	< 1	6.3	0.01	0.13	< 0.01	0.06	0.02	0.25	0.02	0.25	< 0.01	0.06	< 0.01	0.06	< 0.01	0.06	< 0.01	0.06	< 0.01	0.06	< 0.01	0.06	< 0.0001	0.0006
21	14000	8.2	1	14.0	0.03	0.42	0.01	0.14	0.03	0.42	0.03	0.42	< 0.01	0.07	< 0.01	0.07	< 0.01	0.07	< 0.01	0.07	< 0.01	0.07	< 0.01	0.07	< 0.0001	0.0007
22	9100	8.1	< 1	4.6	0.05	0.46	0.02	0.18	0.03	0.27	0.03	0.27	< 0.01	0.05	< 0.01	0.05	< 0.01	0.05	< 0.01	0.05	< 0.01	0.05	< 0.01	0.05	< 0.0001	0.0005
23	12400	8.1	< 1	6.2	0.03	0.37	< 0.01	0.06	0.03	0.37	0.03	0.37	< 0.01	0.06	< 0.01	0.06	< 0.01	0.06	< 0.01	0.06	< 0.01	0.06	< 0.01	0.06	< 0.0001	0.0006
24	9300	7.9	< 1	4.7	0.03	0.28	0.02	0.19	0.02	0.19	0.02	0.19	< 0.01	0.05	< 0.01	0.05	0.01	0.09	< 0.01	0.05	< 0.01	0.05	< 0.01	0.05	< 0.0001	0.0005
25	12300	8.0	< 1	6.2	0.01	0.12	< 0.01	0.06	0.02	0.25	0.02	0.25	< 0.01	0.06	< 0.01	0.06	0.02	0.25	< 0.01	0.06	< 0.01	0.06	< 0.01	0.06	< 0.0001	0.0006
26	8000	8.0	< 1	4.0	0.01	0.08	< 0.01	0.04	0.01	0.08	0.01	0.08	< 0.01	0.04	< 0.01	0.04	0.01	0.08	< 0.01	0.04	< 0.01	0.04	< 0.01	0.04	< 0.0001	0.0004
27	4600	8.0	1	4.6	0.02	0.09	0.01	0.05	0.02	0.09	0.02	0.09	< 0.01	0.02	< 0.01	0.02	0.01	0.05	0.01	0.05	< 0.01	0.02	< 0.01	0.02	< 0.0001	0.0002
28	6000	8.2	2	12.0	0.01	0.06	0.01	0.06	0.06	0.36	0.02	0.12	< 0.01	0.03	< 0.01	0.03					< 0.01	0.03	< 0.01	0.03	< 0.0001	0.0003
29	7000	7.6	1	7.0	< 0.01	0.04	< 0.01	0.04	0.01	0.07	0.01	0.07	< 0.01	0.04	< 0.01	0.04					< 0.01	0.04	< 0.01	0.04	< 0.0001	0.0004
30	4800	8.2	< 1	2.4	0.03	0.14	0.02	0.10	0.03	0.14	0.03	0.14	< 0.01	0.02	< 0.01	0.02					< 0.01	0.02	< 0.01	0.02	< 0.0001	0.0002
31	6100	8.0	< 1	3.1	0.01	0.06	0.01	0.06	0.02	0.12	0.02	0.12	< 0.01	0.03	< 0.01	0.03	< 0.01	0.03	< 0.01	0.03	< 0.01	0.03	< 0.01	0.03	< 0.0001	0.0003
Max	30600	8.2	2	40.4	0.05	0.65	0.03	0.40	0.30	6.51	0.05	1.09	< 0.01	0.15	< 0.01	0.15	0.03	0.65	0.02	0.40	0.01	0.22	< 0.01	0.15	0.0002	0.0026
Min	4600	7.3	< 1	2.4	0.01	0.04	0.01	0.04	< 0.01	0.07	0.01	0.07	< 0.01	0.02	< 0.01	0.02	< 0.01	0.03	< 0.01	0.03	< 0.01	0.02	< 0.01	0.02	< 0.0001	0.0002
Avg	12690		< 1	10.7	0.02	0.23	0.01	0.14	0.03	0.46	0.02	0.26	< 0.01	0.06	< 0.01	0.06	< 0.01	0.10	< 0.01	0.08	< 0.01	0.07	< 0.01	0.06	< 0.0001	0.0007

Compliance tests

# >P.L.	0	0	0	0	0	0	0	0	0	0	0
% Compl.	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Daily tests

# >P.L.	0	0	0	0	0	0	0	0	0	0	
% Compl.	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	

Outfall 0-7 Daily Analyses & Kilogram Loading

* Indicates Daily Kilogram Loading Permit Limit Exceeded

Where concentrations are indicated as less than (<) loadings are calculated at 50% of detection limit.

Compliance sample results are in bold and double outline

Feb	Flow		Suspended Solids		Total Lead		Dissolved Lead		Total Zinc		Dissolved Zinc		Total Cadmium		Dissolved Cadmium		Total Arsenic		Dissolved Arsenic		Total Copper		Dissolved Copper		Total Mercury	
1995	M³/Day	pH	mg/l	kg/day	mg/l	kg/day	mg/l	kg/day	mg/l	kg/day	mg/l	kg/day	mg/l	kg/day	mg/l	kg/day	mg/l	kg/day	mg/l	kg/day	mg/l	kg/day	mg/l	kg/day	mg/l	kg/day
P.L.	55000	6.5 -8.5		120				3.00				3.00				0.50				0.50				0.50		0.05
1	8800	8.1	1	8.8	0.02	0.18	0.02	0.18	0.02	0.18	0.02	0.18	< 0.01	0.04	< 0.01	0.04	< 0.01	0.04	< 0.01	0.04	< 0.01	0.04	< 0.01	0.04	< 0.0001	0.0004
2	3800	8.0	1	3.8	0.03	0.11	0.02	0.08	0.02	0.08	0.02	0.08	< 0.01	0.02	< 0.01	0.02	< 0.01	0.02	< 0.01	0.02	< 0.01	0.02	< 0.01	0.02	< 0.0001	0.0002
3	3500	8.2	1	3.5	0.02	0.07	0.01	0.04	0.01	0.04	0.01	0.04	< 0.01	0.02	< 0.01	0.02	< 0.01	0.02	< 0.01	0.02	< 0.01	0.02	< 0.01	0.02	< 0.0001	0.0002
4	3500	8.1	1	3.5	0.01	0.04	< 0.01	0.02	0.02	0.07	0.02	0.07	< 0.01	0.02	< 0.01	0.02	< 0.01	0.02	< 0.01	0.02	< 0.01	0.02	< 0.01	0.02	< 0.0001	0.0002
5	2300	8.0	< 1	1.2	0.03	0.07	0.02	0.05	0.01	0.02	0.01	0.02	< 0.01	0.01	< 0.01	0.01	< 0.01	0.01	< 0.01	0.01	< 0.01	0.01	< 0.01	0.01	< 0.0001	0.0001
6	2000	8.2	1	2.0	< 0.01	0.01	< 0.01	0.01	0.03	0.06	< 0.01	0.01	< 0.01	0.01	< 0.01	0.01	< 0.01	0.01	< 0.01	0.01	< 0.01	0.01	< 0.01	0.01	< 0.0001	0.0001
7	4400	8.2	< 1	2.2	0.02	0.09	0.01	0.04	0.02	0.09	0.01	0.04	< 0.01	0.02	< 0.01	0.02	< 0.01	0.02	< 0.01	0.02	< 0.01	0.02	< 0.01	0.02	< 0.0001	0.0002
8	7200	8.0	1	7.2	0.02	0.14	0.01	0.07	0.01	0.07	0.01	0.07	< 0.01	0.04	< 0.01	0.04	< 0.01	0.04	< 0.01	0.04	< 0.01	0.04	< 0.01	0.04	< 0.0001	0.0004
9	8100																									
10	3200	7.8	1	3.2	0.06	0.19	0.01	0.03	0.07	0.22	0.06	0.19	< 0.01	0.02	< 0.01	0.02	< 0.01	0.02	< 0.01	0.02	< 0.01	0.02	< 0.01	0.02	< 0.0001	0.0002
11	1900	8.0	3	5.7	0.03	0.06	< 0.01	0.01	0.06	0.11	0.02	0.04	< 0.01	0.01	< 0.01	0.01	< 0.01	0.01	< 0.01	0.01	< 0.01	0.01	< 0.01	0.01	< 0.0001	0.0001
12	200	7.9																								
13	7900	7.9	2	15.8	0.02	0.16	0.02	0.16	0.04	0.32	0.04	0.32	< 0.01	0.04	< 0.01	0.04	< 0.01	0.04	< 0.01	0.04	< 0.01	0.04	< 0.01	0.04	< 0.0001	0.0004
14	11800	8.1	1	11.8	0.03	0.35	0.03	0.35	0.02	0.24	0.02	0.24	< 0.01	0.06	< 0.01	0.06	< 0.01	0.06	< 0.01	0.06	< 0.01	0.06	< 0.01	0.06	< 0.0001	0.0006
15	19400	8.1	< 1	9.7	0.02	0.39	0.01	0.19	0.01	0.19	0.01	0.19	< 0.01	0.10	< 0.01	0.10	0.02	0.39	< 0.01	0.10	< 0.01	0.10	< 0.01	0.10	< 0.0001	0.0010
16	29100	8.0	< 1	14.6	0.02	0.58	< 0.01	0.15	0.01	0.29	< 0.01	0.15	< 0.01	0.15	< 0.01	0.15	< 0.01	0.15	< 0.01	0.15	< 0.01	0.15	< 0.01	0.15	< 0.0001	0.0015
17	33200	8.0	1	33.2	0.04	1.33	0.02	0.66	0.01	0.33	0.01	0.33	< 0.01	0.17	< 0.01	0.17	< 0.01	0.17	< 0.01	0.17	< 0.01	0.17	< 0.01	0.17	< 0.0001	0.0017
18	30100	8.1	1	30.1	0.02	0.60	< 0.01	0.15	0.04	1.20	0.04	1.20	< 0.01	0.15	< 0.01	0.15	< 0.01	0.15	< 0.01	0.15	< 0.01	0.15	< 0.01	0.15	< 0.0001	0.0015
19	29700	8.0	2	59.4	0.02	0.59	0.02	0.59	0.03	0.89	0.03	0.89	< 0.01	0.15	< 0.01	0.15	< 0.01	0.15	< 0.01	0.15	< 0.01	0.15	< 0.01	0.15	0.0002	0.0059
20	24400	8.0	1	24.4	0.02	0.49	0.02	0.49	0.01	0.24	0.01	0.24	< 0.01	0.12	< 0.01	0.12	0.01	0.24	< 0.01	0.12	< 0.01	0.12	< 0.01	0.12	< 0.0001	0.0012
21	31300	8.1	1	31.3	0.05	1.57	0.03	0.94	0.02	0.63	0.02	0.63	< 0.01	0.16	< 0.01	0.16	< 0.01	0.16	< 0.01	0.16	< 0.01	0.16	< 0.01	0.16	< 0.0001	0.0016
22	18300	8.0	< 1	9.2	0.05	0.92	0.03	0.55	0.02	0.37	0.02	0.37	< 0.01	0.09	< 0.01	0.09	< 0.01	0.09	< 0.01	0.09	< 0.01	0.09	< 0.01	0.09	< 0.0001	0.0009
23	24900	8.0	1	24.9	0.01	0.25	0.01	0.25	0.05	1.25	0.04	1.00	< 0.01	0.12	< 0.01	0.12	< 0.01	0.12	< 0.01	0.12	< 0.01	0.12	< 0.01	0.12	< 0.0001	0.0012
24	21800	8.0	1	21.8	< 0.01	0.11	< 0.01	0.11	0.01	0.22	0.01	0.22	< 0.01	0.11	< 0.01	0.11	< 0.01	0.11	< 0.01	0.11	< 0.01	0.11	< 0.01	0.11	< 0.0001	0.0011
25	9100	8.0	< 1	4.6	0.03	0.27	0.01	0.09	0.02	0.18	< 0.01	0.05	< 0.01	0.05	< 0.01	0.05	< 0.01	0.05	< 0.01	0.05	< 0.01	0.05	< 0.01	0.05	< 0.0001	0.0005
26	11700	8.0	< 1	5.9	0.03	0.35	0.02	0.23	0.03	0.35	0.03	0.35	< 0.01	0.06	< 0.01	0.06	< 0.01	0.06	< 0.01	0.06	< 0.01	0.06	< 0.01	0.06	< 0.0001	0.0006
27	18300	8.1	1	18.3	0.03	0.55	0.01	0.18	< 0.01	0.09	< 0.01	0.09	< 0.01	0.09	< 0.01	0.09	< 0.01	0.09	< 0.01	0.09	< 0.01	0.09	< 0.01	0.09	< 0.0001	0.0009
28	31300	8.0	< 1	15.7	0.02	0.63	< 0.01	0.16	0.02	0.63	0.02	0.63	< 0.01	0.16	< 0.01	0.16	< 0.01	0.16	< 0.01	0.16	< 0.01	0.16	< 0.01	0.16	< 0.0001	0.0016
Max	33200	8.2	3	59.4	0.06	1.57	0.03	0.94	0.07	1.25	0.06	1.20	< 0.01	0.17	< 0.01	0.17	0.02	0.39	< 0.01	0.17	< 0.01	0.17	< 0.01	0.17	0.0002	0.0059
Min	200	7.8	< 1	1.2	0.01	0.01	0.01	0.01	< 0.01	0.02	0.01	0.01	< 0.01	0.01	< 0.01	0.01	< 0.01	0.01	< 0.01	0.01	< 0.01	0.01	< 0.01	0.01	< 0.0001	0.0001
Avg	14329		1	14.3	0.03	0.39	0.01	0.22	0.02	0.32	0.02	0.29	< 0.01	0.08	< 0.01	0.08	< 0.01	0.09	< 0.01	0.08	< 0.01	0.08	< 0.01	0.08	< 0.0001	0.0009

Compliance tests

# >P.L.	0	0	0		0		0		0		0		0		0		0		0		0		0		0	
% Compl.	100%	100%	100%		100%		100%		100%		100%		100%		100%		100%		100%		100%		100%		100%	

Daily tests

# >P.L.	0	0	0		0		0		0		0		0		0		0		0		0		0		0	
% Compl.	100%	100%	100%		100%		100%		100%		100%		100%		100%		100%		100%		100%		100%		100%	

Outfall 0-7 Daily Analyses & Kilogram Loading

* Indicates Daily Kilogram Loading Permit Limit Exceeded

Where concentrations are indicated as less than (<) loadings are calculated at 50% of detection limit.

Compliance sample results are in bold and double outline

Mar 1995	Flow M³/Day	pH	Suspended Solids mg/l	Suspended Solids kg/day	Total Lead mg/l	Total Lead kg/day	Dissolved Lead mg/l	Dissolved Lead kg/day	Total Zinc mg/l	Total Zinc kg/day	Dissolved Zinc mg/l	Dissolved Zinc kg/day	Total Cadmium mg/l	Total Cadmium kg/day	Dissolved Cadmium mg/l	Dissolved Cadmium kg/day	Total Arsenic mg/l	Total Arsenic kg/day	Dissolved Arsenic mg/l	Dissolved Arsenic kg/day	Total Copper mg/l	Total Copper kg/day	Dissolved Copper mg/l	Dissolved Copper kg/day	Total Mercury mg/l	Total Mercury kg/day
P.L.	55000	6.5 -8.5		120				3.00				3.00				0.50				0.50				0.50		0.05
1	23800	8.0	1	23.8	0.02	0.48	0.01	0.24	0.03	0.71	0.03	0.71	< 0.01	0.12	< 0.01	0.12	< 0.01	0.12	< 0.01	0.12	< 0.01	0.12	< 0.01	0.12	< 0.0001	0.0012
2	30300	7.9	< 1	15.2	0.01	0.30	0.01	0.30	0.03	0.91	0.03	0.91	< 0.01	0.15	< 0.01	0.15	< 0.01	0.15	< 0.01	0.15	< 0.01	0.15	< 0.01	0.15	< 0.0001	0.0015
3	24300	8.0	1	24.3	0.03	0.73	< 0.01	0.12	0.03	0.73	0.03	0.73	< 0.01	0.12	< 0.01	0.12	< 0.01	0.12	< 0.01	0.12	< 0.01	0.12	< 0.01	0.12	< 0.0001	0.0012
4	25900	8.0	3	77.7	0.02	0.52	< 0.01	0.13	0.05	1.30	0.04	1.04	< 0.01	0.13	< 0.01	0.13	< 0.01	0.13	< 0.01	0.13	< 0.01	0.13	< 0.01	0.13	< 0.0001	0.0013
5	17400	8.0	< 1	8.7	0.03	0.52	< 0.01	0.09	0.02	0.35	0.02	0.35	< 0.01	0.09	< 0.01	0.09	< 0.01	0.09	< 0.01	0.09	< 0.01	0.09	< 0.01	0.09	< 0.0001	0.0009
6	22400	8.0	< 1	11.2	0.01	0.22	< 0.01	0.11	0.02	0.45	0.02	0.45	< 0.01	0.11	< 0.01	0.11	< 0.01	0.11	< 0.01	0.11	< 0.01	0.11	< 0.01	0.11	< 0.0001	0.0011
7	19000	8.1	< 1	9.5	0.03	0.57	0.01	0.19	0.04	0.76	0.04	0.76	0.01	0.19	0.01	0.19	< 0.01	0.10	< 0.01	0.10	< 0.01	0.10	< 0.01	0.10	0.0005	0.0095
8	18800	8.2	1	18.8	< 0.01	0.09	< 0.01	0.09	< 0.01	0.09	< 0.01	0.09	< 0.01	0.09	< 0.01	0.09	< 0.01	0.09	< 0.01	0.09	< 0.01	0.09	< 0.01	0.09	< 0.0001	0.0009
9	11600	8.0	1	11.6	0.02	0.23	0.02	0.23	0.02	0.23	0.02	0.23	< 0.01	0.06	< 0.01	0.06	< 0.01	0.06	< 0.01	0.06	< 0.01	0.06	< 0.01	0.06	0.0001	0.0012
[illegible]	17900	8.1	2	35.8	0.02	0.36	0.02	0.36	0.01	0.18	0.01	0.18	< 0.01	0.09	< 0.01	0.09	< 0.01	0.09	< 0.01	0.09	< 0.01	0.09	< 0.01	0.09	< 0.0001	0.0009
11	16900	7.9	2	33.8	0.03	0.51	0.03	0.51	0.04	0.68	0.04	0.68	< 0.01	0.08	< 0.01	0.08	< 0.01	0.08	< 0.01	0.08	< 0.01	0.08	< 0.01	0.08	< 0.0001	0.0008
12	13100	8.1	< 1	6.6	0.03	0.39	< 0.01	0.07	0.02	0.26	0.02	0.26	< 0.01	0.07	< 0.01	0.07	< 0.01	0.07	< 0.01	0.07	< 0.01	0.07	< 0.01	0.07	< 0.0001	0.0007
13	12400	8.2	< 1	6.2	0.01	0.12	0.01	0.12	0.03	0.37	0.03	0.37	< 0.01	0.06	< 0.01	0.06	< 0.01	0.06	< 0.01	0.06	< 0.01	0.06	< 0.01	0.06	< 0.0001	0.0006
14	2900	8.2	1	2.9	0.04	0.12	0.02	0.06	0.04	0.12	0.04	0.12	< 0.01	0.01	< 0.01	0.01	0.02	0.06	< 0.01	0.01	< 0.01	0.01	< 0.01	0.01	0.0001	0.0003
15	5900	8.0	1	5.9	< 0.01	0.03	< 0.01	0.03	0.01	0.06	0.01	0.06	< 0.01	0.03	< 0.01	0.03	< 0.01	0.03	< 0.01	0.03	< 0.01	0.03	< 0.01	0.03	< 0.0001	0.0003
16	4900	8.1	< 1	2.5	0.03	0.15	< 0.01	0.02	< 0.01	0.02	< 0.01	0.02	< 0.01	0.02	< 0.01	0.02	< 0.01	0.02	< 0.01	0.02	< 0.01	0.02	< 0.01	0.02	< 0.0001	0.0002
17	1800	8.0	< 1	0.9	0.02	0.04	0.02	0.04	0.02	0.04	0.02	0.04	< 0.01	0.01	< 0.01	0.01	< 0.01	0.01	0.01	0.01	0.01	0.02	< 0.01	0.01	< 0.0001	0.0001
18	7600	8.1	1	7.6	< 0.01	0.04	< 0.01	0.04	0.01	0.08	0.01	0.08	< 0.01	0.04	< 0.01	0.04	< 0.01	0.04	< 0.01	0.04	< 0.01	0.04	< 0.01	0.04	< 0.0001	0.0004
19	14000	8.2	< 1	7.0	< 0.01	0.07	< 0.01	0.07	0.02	0.28	< 0.01	0.07	< 0.01	0.07	< 0.01	0.07	< 0.01	0.07	< 0.01	0.07	< 0.01	0.07	< 0.01	0.07	< 0.0001	0.0007
20	10300	8.2	1	10.3	0.02	0.21	0.01	0.10	0.02	0.21	0.02	0.21	< 0.01	0.05	< 0.01	0.05	< 0.01	0.05	< 0.01	0.05	< 0.01	0.05	< 0.01	0.05	< 0.0001	0.0005
21	3700	8.1	< 1	1.9	0.01	0.04	< 0.01	0.02	0.03	0.11	0.03	0.11	< 0.01	0.02	< 0.01	0.02	< 0.01	0.02	< 0.01	0.02	< 0.01	0.02	< 0.01	0.02	< 0.0001	0.0002
22	14600	7.9	< 1	7.3	0.01	0.15	0.01	0.15	0.01	0.15	0.01	0.15	< 0.01	0.07	< 0.01	0.07	< 0.01	0.07	< 0.01	0.07	< 0.01	0.07	< 0.01	0.07	< 0.0001	0.0007
23	17700	8.2	< 1	8.9	< 0.01	0.09	< 0.01	0.09	0.01	0.18	< 0.01	0.09	< 0.01	0.09	< 0.01	0.09	0.01	0.18	0.01	0.18	< 0.01	0.09	< 0.01	0.09	< 0.0001	0.0009
24	33300	8.2	2	66.6	0.02	0.67	< 0.01	0.17	0.01	0.33	0.01	0.33	< 0.01	0.17	< 0.01	0.17	< 0.01	0.17	< 0.01	0.17	< 0.01	0.17	< 0.01	0.17	< 0.0001	0.0017
25	18100	8.0	< 1	9.1	0.03	0.54	0.01	0.18	0.02	0.36	0.02	0.36	< 0.01	0.09	< 0.01	0.09	< 0.01	0.09	< 0.01	0.09	< 0.01	0.09	< 0.01	0.09	< 0.0001	0.0009
[illegible]	20900	7.8	< 1	10.5	0.02	0.42	0.01	0.21	0.04	0.84	0.04	0.84	< 0.01	0.10	< 0.01	0.10	< 0.01	0.10	< 0.01	0.10	< 0.01	0.10	< 0.01	0.10	< 0.0001	0.0010
[illegible]	34000	8.2	1	34.0	< 0.01	0.17	< 0.01	0.17	0.01	0.34	< 0.01	0.17	< 0.01	0.17	< 0.01	0.17	< 0.01	0.17	< 0.01	0.17	< 0.01	0.17	< 0.01	0.17	< 0.0001	0.0017
28	34100	8.3	1	34.1	< 0.01	0.17	< 0.01	0.17	< 0.01	0.17	< 0.01	0.17	< 0.01	0.17	< 0.01	0.17	< 0.01	0.17	< 0.01	0.17	< 0.01	0.17	< 0.01	0.17	< 0.0001	0.0017
29	34600	8.2	1	34.6	0.01	0.35	< 0.01	0.17	0.01	0.35	0.01	0.35	< 0.01	0.17	< 0.01	0.17	< 0.01	0.17	< 0.01	0.17	< 0.01	0.17	< 0.01	0.17	< 0.0001	0.0017
30	36200	8.3	1	36.2	0.02	0.72	< 0.01	0.18	0.03	1.09	0.03	1.09	< 0.01	0.18	< 0.01	0.18	< 0.01	0.18	< 0.01	0.18	< 0.01	0.18	< 0.01	0.18	< 0.0001	0.0018
31	34500	8.4	< 1	17.3	0.02	0.69	< 0.01	0.17	0.09	3.11	0.02	0.69	< 0.01	0.17	< 0.01	0.17	< 0.01	0.17	< 0.01	0.17	< 0.01	0.17	< 0.01	0.17	< 0.0001	0.0017
Max	36200	8.4	3	77.7	0.04	0.73	0.03	0.51	0.09	3.11	0.04	1.09	0.01	0.19	0.01	0.19	0.02	0.18	0.01	0.18	0.01	0.18	< 0.01	0.18	0.0005	0.0095
Min	1800	7.8	< 1	0.9	0.01	0.03	0.01	0.02	< 0.01	0.02	0.01	0.02	< 0.01	0.01	< 0.01	0.01	< 0.01	0.01	< 0.01	0.01	< 0.01	0.01	< 0.01	0.01	< 0.0001	0.0001
Avg	18803		< 1	18.7	0.02	0.31	< 0.01	0.15	0.02	0.48	0.02	0.38	< 0.01	0.10	< 0.01	0.10	< 0.01	0.10	< 0.01	0.10	< 0.01	0.09	< 0.01	0.09	< 0.0001	0.0012

Compliance tests

# >P.L	0	0		.0				0				0				0				0				0		0
% Com	100%	100%		100%				100%				100%				100%				100%				100%		100%

Daily tests

# >P.L	0	0		0				0				0				0				0				0		
% Com	100%	100%		100%				100%				100%				100%				100%				100%		

Outfall 0-7 Daily Analyses & Kilogram Loading

* Indicates Daily Kilogram Loading Permit Limit Exceeded

Where concentrations are indicated as less than (<) loadings are calculated at 50% of detection limit.

Compliance sample results are in bold and double outline

Apr 1995	Flow M³/Day	pH	Suspended Solids mg/l	Suspended Solids kg/day	Total Lead mg/l	Total Lead kg/day	Dissolved Lead mg/l	Dissolved Lead kg/day	Total Zinc mg/l	Total Zinc kg/day	Dissolved Zinc mg/l	Dissolved Zinc kg/day	Total Cadmium mg/l	Total Cadmium kg/day	Dissolved Cadmium mg/l	Dissolved Cadmium kg/day	Total Arsenic mg/l	Total Arsenic kg/day	Dissolved Arsenic mg/l	Dissolved Arsenic kg/day	Total Copper mg/l	Total Copper kg/day	Dissolved Copper mg/l	Dissolved Copper kg/day	Total Mercury mg/l	Total Mercury kg/day
P.L.	55000	6.5 -8.5		120				3.00				3.00				0.50				0.50				0.50		0.05
1	34600	8.1	< 1	17.3	< 0.01	0.17	< 0.01	0.17	< 0.01	0.17	< 0.01	0.17	< 0.01	0.17	< 0.01	0.17	< 0.01	0.17	< 0.01	0.17	< 0.01	0.17	< 0.01	0.17	**< 0.0001**	**0.0017**
2	17100	8.0	1	17.1	< 0.01	0.09	< 0.01	0.09	0.03	0.51	0.03	0.51	< 0.01	0.09	< 0.01	0.09	< 0.01	0.09	< 0.01	0.09	< 0.01	0.09	< 0.01	0.09	**< 0.0001**	**0.0009**
3	13500	8.1	< 1	6.8	< 0.01	0.07	< 0.01	0.07	0.02	0.27	0.02	0.27	< 0.01	0.07	< 0.01	0.07	< 0.01	0.07	< 0.01	0.07	< 0.01	0.07	< 0.01	0.07	**< 0.0001**	**0.0007**
4	19200	8.0	< 1	9.6	< 0.01	0.10	< 0.01	0.10	0.07	1.34	0.07	1.34	< 0.01	0.10	< 0.01	0.10	< 0.01	0.10	< 0.01	0.10	0.06	1.15	0.02	0.38	**< 0.0001**	**0.0010**
* 5	31500	8.0	< 1	15.8	< 0.01	0.16	< 0.01	0.16	0.07	2.21	0.07	2.21	< 0.01	0.16	< 0.01	0.16	< 0.01	0.16	< 0.01	0.16	0.06	1.89	0.02	0.63 *	**< 0.0001**	**0.0016**
6	26900	7.8	< 1	13.5	0.03	0.81	0.01	0.27	0.03	0.81	0.03	0.81	< 0.01	0.13	< 0.01	0.13	< 0.01	0.13	< 0.01	0.13	< 0.01	0.13	< 0.01	0.13	**< 0.0001**	**0.0013**
7	30600	8.2	1	30.6	< 0.01	0.15	< 0.01	0.15	0.05	1.53	0.05	1.53	< 0.01	0.15	< 0.01	0.15	< 0.01	0.15	< 0.01	0.15	< 0.01	0.15	< 0.01	0.15	**< 0.0001**	**0.0015**
8	36400	8.2	< 1	18.2	0.01	0.36	< 0.01	0.18	0.02	0.73	0.01	0.36	< 0.01	0.18	< 0.01	0.18	< 0.01	0.18	< 0.01	0.18	< 0.01	0.18	< 0.01	0.18	**< 0.0001**	**0.0018**
9	29600	8.0	1	29.6	< 0.01	0.15	< 0.01	0.15	0.01	0.30	0.01	0.30	< 0.01	0.15	< 0.01	0.15	< 0.01	0.15	< 0.01	0.15	< 0.01	0.15	< 0.01	0.15	**< 0.0001**	**0.0015**
10	31100	8.1	< 1	15.6	0.02	0.62	0.02	0.62	0.01	0.31	0.01	0.31	< 0.01	0.16	< 0.01	0.16	< 0.01	0.16	< 0.01	0.16	< 0.01	0.16	< 0.01	0.16	**< 0.0001**	**0.0016**
11	31600	7.8	1	31.6	0.02	0.63	0.02	0.63	0.02	0.63	0.02	0.63	< 0.01	0.16	< 0.01	0.16	< 0.01	0.16	< 0.01	0.16	< 0.01	0.16	< 0.01	0.16	**< 0.0001**	**0.0016**
12	23300	8.2	< 1	11.7	0.01	0.23	< 0.01	0.12	0.02	0.47	0.02	0.47	< 0.01	0.12	< 0.01	0.12	< 0.01	0.12	< 0.01	0.12	< 0.01	0.12	< 0.01	0.12	**< 0.0001**	**0.0012**
13	26100	8.1	1	26.1	0.01	0.26	0.01	0.26	0.02	0.52	0.02	0.52	< 0.01	0.13	< 0.01	0.13	< 0.01	0.13	< 0.01	0.13	< 0.01	0.13	< 0.01	0.13	**< 0.0001**	**0.0013**
14	35300	8.2	1	35.3	0.01	0.35	0.01	0.35	0.02	0.71	0.02	0.71	< 0.01	0.18	< 0.01	0.18	< 0.01	0.18	< 0.01	0.18	< 0.01	0.18	< 0.01	0.18	**< 0.0001**	**0.0018**
15	32300	8.0	1	32.3	0.03	0.97	< 0.01	0.16	0.07	2.26	0.07	2.26	< 0.01	0.16	< 0.01	0.16	< 0.01	0.16	< 0.01	0.16	< 0.01	0.16	< 0.01	0.16	**< 0.0001**	**0.0016**
16	27800	7.9	< 1	13.9	< 0.01	0.14	< 0.01	0.14	0.03	0.83	0.03	0.83	< 0.01	0.14	< 0.01	0.14	< 0.01	0.14	< 0.01	0.14	< 0.01	0.14	< 0.01	0.14	**< 0.0001**	**0.0014**
17	20600	7.9	< 1	10.3	< 0.01	0.10	< 0.01	0.10	0.02	0.41	0.02	0.41	< 0.01	0.10	< 0.01	0.10	< 0.01	0.10	< 0.01	0.10	< 0.01	0.10	< 0.01	0.10	**< 0.0001**	**0.0010**
18	20900	8.1	1	20.9	< 0.01	0.10	< 0.01	0.10	< 0.01	0.10	< 0.01	0.10	< 0.01	0.10	< 0.01	0.10	< 0.01	0.10	< 0.01	0.10	< 0.01	0.10	< 0.01	0.10	**< 0.0001**	**0.0010**
19	19500	7.9	1	19.5	0.02	0.39	0.01	0.20	0.01	0.20	0.01	0.20	< 0.01	0.10	< 0.01	0.10	< 0.01	0.10	< 0.01	0.10	< 0.01	0.10	< 0.01	0.10	**< 0.0001**	**0.0010**
20																										
21	14200	8.0	< 1	7.1	0.06	0.85	0.02	0.28	0.05	0.71	0.04	0.57	< 0.01	0.07	< 0.01	0.07	< 0.01	0.07	< 0.01	0.07	< 0.01	0.07	< 0.01	0.07	**0.0001**	**0.0014**
22	31500	8.1	1	31.5	0.16	5.04	0.01	0.32	0.07	2.21	0.06	1.89	0.01	0.32	< 0.01	0.16	< 0.01	0.16	< 0.01	0.16	< 0.01	0.16	< 0.01	0.16	**0.0006**	**0.0189**
23	26800	8.1	1	26.8	0.03	0.80	< 0.01	0.13	0.04	1.07	0.04	1.07	< 0.01	0.13	< 0.01	0.13	< 0.01	0.13	< 0.01	0.13	< 0.01	0.13	< 0.01	0.13	**0.0006**	**0.0161**
24	29900	7.7	< 1	15.0	0.02	0.60	< 0.01	0.15	0.02	0.60	0.02	0.60	< 0.01	0.15	< 0.01	0.15	< 0.01	0.15	< 0.01	0.15	< 0.01	0.15	< 0.01	0.15	**< 0.0001**	**0.0015**
25	14900	8.0	1	14.9	< 0.01	0.07	< 0.01	0.07	0.02	0.30	0.02	0.30	< 0.01	0.07	< 0.01	0.07	< 0.01	0.07	< 0.01	0.07	< 0.01	0.07	< 0.01	0.07	**< 0.0001**	**0.0007**
26	16400	8.2	< 1	8.2	0.02	0.33	< 0.01	0.08	0.02	0.33	0.02	0.33	< 0.01	0.08	< 0.01	0.08	0.02	0.33	< 0.01	0.08	< 0.01	0.08	< 0.01	0.08	**< 0.0001**	**0.0008**
27	8300	8.0	2	16.6	< 0.01	0.04	< 0.01	0.04	< 0.01	0.04	< 0.01	0.04	< 0.01	0.04	< 0.01	0.04	< 0.01	0.04	< 0.01	0.04	< 0.01	0.04	< 0.01	0.04	**< 0.0001**	**0.0004**
28	16800	7.8	< 1	8.4	0.01	0.17	< 0.01	0.08	0.01	0.17	0.01	0.17	< 0.01	0.08	< 0.01	0.08	< 0.01	0.08	< 0.01	0.08	< 0.01	0.08	< 0.01	0.08	**< 0.0001**	**0.0008**
29	18800	8.1	< 1	9.4	0.02	0.38	< 0.01	0.09	0.03	0.56	0.03	0.56	< 0.01	0.09	< 0.01	0.09	< 0.01	0.09	< 0.01	0.09	< 0.01	0.09	< 0.01	0.09	**< 0.0001**	**0.0009**
30	19200	7.6	1	19.2	0.02	0.38	< 0.01	0.10	0.03	0.58	0.03	0.58	< 0.01	0.10	< 0.01	0.10	< 0.01	0.10	< 0.01	0.10	< 0.01	0.10	< 0.01	0.10	**< 0.0001**	**0.0010**
Max	36400	8.2	2	35.3	0.16	5.04	0.02	0.63	0.07	2.26	0.07	2.26	0.01	0.32	< 0.01	0.18	0.02	0.33	< 0.01	0.18	0.06	1.89	0.02	0.63 *	0.0006	0.0189
Min	8300	7.6	< 1	6.8	0.01	0.04	0.01	0.04	< 0.01	0.04	0.01	0.04	< 0.01	0.04	< 0.01	0.04	< 0.01	0.04	< 0.01	0.04	< 0.01	0.04	< 0.01	0.04	< 0.0001	0.0004
Avg	24300		< 1	18.4	0.02	0.50	< 0.01	0.19	0.03	0.72	0.03	0.69	< 0.01	0.13	< 0.01	0.12	< 0.01	0.13	< 0.01	0.12	< 0.01	0.22	< 0.01	0.15	< 0.0001	0.0023

Compliance tests

# >P.L.	0	0	0		0		0		0		0		0		0		0		0		0		0		0	
% Compl.	100%	100%	100%		100%		100%		100%		100%		100%		100%		100%		100%		100%		100%		100%	

Daily tests

# >P.L.	0	0	0		0		0		0		0		0		0		0		0		1					
% Compl.	100%	100%	100%		100%		100%		100%		100%		100%		100%		100%		100%		97%					

Outfall 0-7 Daily Analyses & Kilogram Loading

* Indicates Daily Kilogram Loading Permit Limit Exceeded

Where concentrations are indicated as less than (<) loadings are calculated at 50% of detection limit.

Compliance sample results are in bold and double outline

May	Flow		Suspended Solids		Total Lead		Dissolved Lead		Total Zinc		Dissolved Zinc		Total Cadmium		Dissolved Cadmium		Total Arsenic		Dissolved Arsenic		Total Copper		Dissolved Copper		Total Mercury	
1995	M³/Day	pH	mg/l	kg/day	mg/l	kg/day	mg/l	kg/day	mg/l	kg/day	mg/l	kg/day	mg/l	kg/day	mg/l	kg/day	mg/l	kg/day	mg/l	kg/day	mg/l	kg/day	mg/l	kg/day	mg/l	kg/day
P.L.	55000	6.5 -8.5		120				3.00				3.00				0.50				0.50				0.50		0.05
1	36600	7.8	< 1	18.3	< 0.01	0.18	< 0.01	0.18	0.02	0.73	0.02	0.73	< 0.01	0.18	< 0.01	0.18	< 0.01	0.18	< 0.01	0.18	< 0.01	0.18	< 0.01	0.18	< 0.0001	0.0018
2	23100	7.8	1	23.1	< 0.01	0.12	< 0.01	0.12	0.04	0.92	0.01	0.23	< 0.01	0.12	< 0.01	0.12	< 0.01	0.12	< 0.01	0.12	< 0.01	0.12	< 0.01	0.12	0.0002	0.0046
3	38800	7.9	< 1	19.4	< 0.01	0.19	< 0.01	0.19	< 0.01	0.19	< 0.01	0.19	< 0.01	0.19	< 0.01	0.19	< 0.01	0.19	< 0.01	0.19	< 0.01	0.19	< 0.01	0.19	0.0002	0.0078
4	40100	8.1	1	40.1	0.01	0.40	0.01	0.40	< 0.01	0.20	< 0.01	0.20	< 0.01	0.20	< 0.01	0.20	< 0.01	0.20	< 0.01	0.20	< 0.01	0.20	< 0.01	0.20	< 0.0001	0.0020
5	36400	8.0	1	36.4	0.01	0.36	< 0.01	0.18	0.01	0.36	0.01	0.36	< 0.01	0.18	< 0.01	0.18	< 0.01	0.18	< 0.01	0.18	< 0.01	0.18	< 0.01	0.18	< 0.0001	0.0018
6	15100	8.2	2	30.2	0.02	0.30	< 0.01	0.08	0.07	1.06	0.03	0.45	< 0.01	0.08	< 0.01	0.08	0.02	0.30	< 0.01	0.08	< 0.01	0.08	< 0.01	0.08	< 0.0001	0.0008
7	29200	8.0	< 1	14.6	0.03	0.88	< 0.01	0.15	0.01	0.29	0.04	1.17	< 0.01	0.15	< 0.01	0.15	< 0.01	0.15	< 0.01	0.15	< 0.01	0.15	< 0.01	0.15	< 0.0001	0.0015
8	29600	7.8	2	59.2	0.07	2.07	0.04	1.18	0.05	1.48	0.04	1.18	0.02	0.59	0.01	0.30	0.01	0.30	< 0.01	0.15	< 0.01	0.15	< 0.01	0.15	0.0006	0.0178
9	16000	7.9	< 1	8.0	0.02	0.32	< 0.01	0.08	0.02	0.32	0.02	0.32	< 0.01	0.08	< 0.01	0.08	< 0.01	0.08	< 0.01	0.08	< 0.01	0.08	< 0.01	0.08	< 0.0001	0.0008
10	13700	8.0	< 1	6.9	< 0.01	0.07	< 0.01	0.07	0.01	0.14	0.01	0.14	< 0.01	0.07	< 0.01	0.07	< 0.01	0.07	< 0.01	0.07	< 0.01	0.07	< 0.01	0.07	< 0.0001	0.0007
11	8000	8.0	1	8.0	< 0.01	0.04	< 0.01	0.04	0.01	0.08	0.01	0.08	< 0.01	0.04	< 0.01	0.04	0.01	0.08	0.01	0.08	< 0.01	0.04	< 0.01	0.04	< 0.0001	0.0004
12	15700	8.1	2	31.4	0.03	0.47	0.02	0.31	0.02	0.31	0.02	0.31	< 0.01	0.08	< 0.01	0.08	0.02	0.31	< 0.01	0.08	< 0.01	0.08	< 0.01	0.08	0.0003	0.0047
13	14000	8.0	< 1	7.0	0.02	0.28	< 0.01	0.07	0.03	0.42	0.03	0.42	< 0.01	0.07	< 0.01	0.07	< 0.01	0.07	< 0.01	0.07	< 0.01	0.07	< 0.01	0.07	< 0.0001	0.0007
14	11700	8.0	2	23.4	0.02	0.23	< 0.01	0.06	0.04	0.47	0.02	0.23	< 0.01	0.06	< 0.01	0.06	< 0.01	0.06	< 0.01	0.06	< 0.01	0.06	< 0.01	0.06	< 0.0001	0.0006
15	11100	8.4	4	44.4	< 0.01	0.06	< 0.01	0.06	0.02	0.22	0.02	0.22	< 0.01	0.06	< 0.01	0.06	< 0.01	0.06	< 0.01	0.06	< 0.01	0.06	< 0.01	0.06	< 0.0001	0.0006
16	13500	8.0	3	40.5	0.01	0.14	0.01	0.14	0.01	0.14	0.01	0.14	< 0.01	0.07	< 0.01	0.07	< 0.01	0.07	< 0.01	0.07	< 0.01	0.07	< 0.01	0.07	< 0.0001	0.0007
17	25500	8.0	3	76.5	< 0.01	0.13	< 0.01	0.13	0.02	0.51	0.02	0.51	< 0.01	0.13	< 0.01	0.13	< 0.01	0.13	< 0.01	0.13	< 0.01	0.13	< 0.01	0.13	< 0.0001	0.0013
18	26600	8.1	1	26.6	0.01	0.27	0.01	0.27	0.03	0.80	0.01	0.27	< 0.01	0.13	< 0.01	0.13	< 0.01	0.13	< 0.01	0.13	< 0.01	0.13	< 0.01	0.13	< 0.0001	0.0013
19	14000	8.1	2	28.0	< 0.01	0.07	< 0.01	0.07	0.02	0.28	0.02	0.28	< 0.01	0.07	< 0.01	0.07	< 0.01	0.07	< 0.01	0.07	< 0.01	0.07	< 0.01	0.07	< 0.0001	0.0007
20	11400	8.1	1	11.4	0.03	0.34	< 0.01	0.06	0.06	0.68	0.03	0.34	< 0.01	0.06	< 0.01	0.06	< 0.01	0.06	< 0.01	0.06	< 0.01	0.06	< 0.01	0.06	< 0.0001	0.0006
21	16400	8.1	1	16.4	0.02	0.33	0.01	0.16	0.01	0.16	0.01	0.16	< 0.01	0.08	< 0.01	0.08	< 0.01	0.08	< 0.01	0.08	< 0.01	0.08	< 0.01	0.08	< 0.0001	0.0008
22	14800	8.2	3	44.4	0.01	0.15	0.01	0.15	0.02	0.30	0.02	0.30	< 0.01	0.07	< 0.01	0.07	< 0.01	0.07	< 0.01	0.07	< 0.01	0.07	< 0.01	0.07	< 0.0001	0.0007
23	23300	8.1	2	46.6	< 0.01	0.12	< 0.01	0.12	0.01	0.23	0.01	0.23	< 0.01	0.12	< 0.01	0.12	< 0.01	0.12	< 0.01	0.12	< 0.01	0.12	< 0.01	0.12	< 0.0001	0.0012
24	13300	8.2	2	26.6	0.01	0.13	0.01	0.13	0.02	0.27	0.02	0.27	< 0.01	0.07	< 0.01	0.07	< 0.01	0.07	< 0.01	0.07	< 0.01	0.07	< 0.01	0.07	< 0.0001	0.0007
25	15300	8.1	3	45.9	< 0.01	0.08	< 0.01	0.08	0.01	0.15	0.01	0.15	< 0.01	0.08	< 0.01	0.08	< 0.01	0.08	< 0.01	0.08	< 0.01	0.08	< 0.01	0.08	< 0.0001	0.0008
26	28800	8.1	2	57.6	0.02	0.58	0.01	0.29	0.02	0.58	0.01	0.29	< 0.01	0.14	< 0.01	0.14	0.01	0.29	< 0.01	0.14	< 0.01	0.14	< 0.01	0.14	< 0.0001	0.0014
27	40600	8.1	1	40.6	< 0.01	0.20	< 0.01	0.20	0.02	0.81	0.02	0.81	< 0.01	0.20	< 0.01	0.20	< 0.01	0.20	< 0.01	0.20	< 0.01	0.20	< 0.01	0.20	< 0.0001	0.0020
28	41900	8.1	2	83.8	< 0.01	0.21	< 0.01	0.21	0.01	0.42	0.01	0.42	< 0.01	0.21	< 0.01	0.21	< 0.01	0.21	< 0.01	0.21	< 0.01	0.21	< 0.01	0.21	< 0.0001	0.0021
29	39000	8.1	2	78.0	< 0.01	0.20	< 0.01	0.20	0.02	0.78	0.02	0.78	< 0.01	0.20	< 0.01	0.20	< 0.01	0.20	< 0.01	0.20	< 0.01	0.20	< 0.01	0.20	< 0.0001	0.0020
30	37000	8.0	4	148.0 *	0.01	0.37	0.01	0.37	0.03	1.11	0.02	0.74	< 0.01	0.19	< 0.01	0.19	< 0.01	0.19	< 0.01	0.19	< 0.01	0.19	< 0.01	0.19	< 0.0001	0.0019
31	30400	8.0	5	152.0 *	0.01	0.30	< 0.01	0.15	0.03	0.91	0.03	0.91	< 0.01	0.15	< 0.01	0.15	< 0.01	0.15	< 0.01	0.15	< 0.01	0.15	< 0.01	0.15	< 0.0001	0.0015
Max	41900	8.4	5	152.0 *	0.07	2.07	0.04	1.18	0.07	1.48	0.04	1.18	0.02	0.59	0.01	0.30	0.02	0.31	0.01	0.21	< 0.01	0.21	< 0.01	0.21	0.0006	0.0178
Min	8000	7.8	< 1	6.9	0.01	0.04	0.01	0.04	< 0.01	0.08	0.01	0.08	< 0.01	0.04	< 0.01	0.04	< 0.01	0.06	< 0.01	0.06	< 0.01	0.04	< 0.01	0.04	< 0.0001	0.0004
Avg	23577		2	41.7	0.01	0.31	< 0.01	0.19	0.02	0.49	0.02	0.41	< 0.01	0.13	< 0.01	0.12	< 0.01	0.14	< 0.01	0.12	< 0.01	0.12	< 0.01	0.12	< 0.0001	0.0021

Compliance tests

# >P.L.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Compl.	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Daily tests

# >P.L.	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Compl.	100%	100%	94%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Daily Mercury Loadings - July 1995

	Permit PE-02753				Permit PE-05309
	Combined Outfall I	Combined Outfall II	Combined Outfall III	Outfall 0-7	Combined Outfall IV
	<---------- kg/day ---------->				
95/07/01	0.0015	0.0188	0.2058		0.0147
95/07/02	0.0015	0.0605	0.2148	0.0042	0.0223
95/07/03	0.0044	0.0126	0.1058	0.0044	0.0110
95/07/04	0.0015	0.0128	0.0868	0.0035	0.0117
95/07/05	0.0015	0.0044	0.0885	0.0018	0.0037
95/07/06	0.0007	0.0083	0.0768	0.0021	0.0020
95/07/07	0.0015	0.0087	0.1235	0.0021	0.0041
95/07/08	0.0007	0.0349	0.1875	0.0023	0.0077
95/07/09	0.0015	0.0134	0.2352	0.0023	0.0115
95/07/10	0.0015	0.0130	0.1491	0.0023	0.0132
95/07/11	0.0015	0.0043	0.1011	0.0041	0.0126
95/07/12	0.0015	0.0216	0.1649	0.0022	0.0118
95/07/13	0.0007	0.0175	0.0572	0.0021	0.0039
95/07/14	0.0015	0.0086	0.1190	0.0019	0.0192
95/07/15	0.0007	0.0045	0.0595	0.0022	0.0036
95/07/16	0.0030	0.0086	0.0593	0.0018	0.0712
95/07/17	0.0015	0.0128	0.0583	0.0020	0.0112
95/07/18	0.0015	0.0044	0.0561	0.0019	0.0042
95/07/19	0.0015	0.0042	0.1333	0.0022	0.0039
95/07/20	0.0015	0.0043	0.1425	0.0020	0.0179
95/07/21	0.0015	0.0043	0.0907	0.0021	0.0036
95/07/22	0.0007	0.0022	0.0458	0.0021	0.0034
95/07/23	0.0015	0.0046	0.0416	0.0022	0.0034
95/07/24	0.0007	0.0045	0.0784	0.0010	0.0036
95/07/25	0.0015	0.0177	0.0842	0.0004	0.0039
95/07/26	0.0007	0.0468	0.2146	0.0004	0.0239
95/07/27	0.0015	0.0048	0.0920		0.0112
95/07/28	0.0015	0.0136	0.0583	0.0010	0.0037
95/07/29		0.0046	0.0447	0.0010	0.0038
95/07/30	0.0007	0.0047	0.0615	0.0012	0.0038
95/07/31	0.0007	0.0045	0.0512	0.0010	0.0038
Permit Limits	**0.05**	**0.15**	**0.55**	**0.05**	**0.097**
July Averages	**0.0014**	**0.0126**	**0.1061**	**0.0019**	**0.0106**

Daily Mercury Loadings - June 1995

	Permit PE-02753				Permit PE-05309
	Combined Outfall I	Combined Outfall II	Combined Outfall III	Outfall 0-7	Combined Outfall IV
	<---------- kg/day ---------->				
95/06/01	0.0014	0.0237	0.3033	0.0015	0.0086
95/06/02	0.0014	0.0348	0.4284	0.0022	0.0143
95/06/03	0.0007	0.0128	0.1051	0.0022	0.0088
95/06/04	0.0007	0.0130	0.1355	0.0021	0.0029
95/06/05	0.0007	0.0279	0.2811	0.0021	0.0060
95/06/06	0.0007	0.0246	0.3683	0.0043	0.0060
95/06/07	0.0014	0.0233	0.2164	0.0022	0.0028
95/06/08	0.0014	0.0262	0.1069	0.0020	0.0032
95/06/09	0.0014	0.0362	0.8784 *	0.0011	0.0101
95/06/10	0.0014	0.0226	0.3381	0.0020	0.0153
95/06/11	0.0007	0.0086	0.3990	0.0014	0.0121
95/06/12	0.0027	0.0288	0.2205	0.0007	0.0062
95/06/13	0.0007	0.1021	0.1541	0.0009	0.0015
95/06/14	0.0007	0.0180	0.1000	0.0017	0.0181
95/06/15	0.0014	0.0179	0.1415	0.0023	0.0254
95/06/16	0.0014	0.0187	0.2122	0.0022	0.0145
95/06/17	0.0007	0.0294	0.1336	0.0011	0.0134
95/06/18	0.0014	0.0400	0.1382	0.0030	0.0131
95/06/19	0.0007	0.0113	0.0951	0.0021	0.0085
95/06/20	0.0014	0.0871	0.0743	0.0020	0.0086
95/06/21	0.0007	0.0290	0.3198	0.0007	0.0089
95/06/22	0.0007	0.0437	0.3326	0.0020	0.0090
95/06/23	0.0007	0.0362	0.2653	0.0019	0.0089
95/06/24	0.0014	0.0271	0.3111	0.0017	0.0085
95/06/25	0.0014	0.0261	0.4180	0.0020	0.0082
95/06/26	0.0014	0.0239	0.1964	0.0011	0.0146
95/06/27	0.0007	0.0123	0.1209		0.0108
95/06/28	0.0007	0.0184	0.1340	0.0015	0.0048
95/06/29	0.0007	0.1585 *	0.0957	0.0022	0.0091
95/06/30	0.0007	0.0311	0.1125	0.0021	0.0112
Permit Limits	**0.05**	**0.15**	**0.55**	**0.05**	**0.097**
June Averages	**0.0010**	**0.0338**	**0.2379**	**0.0019**	**0.0098**
# Results YTD	**179**	**180**	**181**	**177**	**181**
Averages YTD	**0.0017**	**0.0331**	**0.1697**	**0.0015**	**0.0083**
Total kgs YTD	**0.2972**	**5.9603**	**30.7089**	**0.2719**	**1.4942**
kgs/Yr. Limits	**2**	**30**	**100**	**10**	**10**

this is where effort is required

Province of
British Columbia

MINISTRY OF ENVIRONMENT, LANDS AND PARKS
AND MINISTER RESPONSIBLE FOR
MULTICULTURALISM AND HUMAN RIGHTS

BC Environment

#401 - 333 Victoria Street
Nelson, British Columbia
V1L 4K3
Telephone: (604) 354-6333
Main Fax: (604) 354-6332
EP Fax: (604) 354-6367

File: PE-02753

November 30, 1994

Carol Jolly
Washington State Department of Ecology
PO Box 47600
Olympia Washington 98504-7600
USA

Dear Carol Jolly:

RE: AMENDMENT OF COMINCO PERMIT PE-2753, EFFLUENT FORM METALLURGICAL PLANTS TO COLUMBIA RIVER

It is my intention to amend the above noted permit in accordance with section 11(1)(a) of the Waste Management Act to reduce the daily loading of metals and slag to the Columbia River.

There are several important changes to note:

The permit limits for dissolved metals in each outfall are no longer expressed as a concentration ie. mg/l, but are now specified as a daily loading in kg/d that cannot be exceeded.

For the first time permit limits for dissolved copper have been included in the permit.

The allowable annual discharge of tail slag discharged to the river has been reduced from 140,000 tonnes/yr to 80,000 tonnes/yr to reflect the commitment by Cominco to eliminate this discharge in 1995.

The volume rate of discharge in outfalls 07 and III have been increased due to process changes (indirect heat exchanger at 07) and to reflect our recent experience with unusually high river water temperatures during the summer of 1994. The bulk of the water in these discharges is cooling water.

The following table shows the reduction in the maximum allowable dissolved metals in the proposed amendment of the permit as compared to the existing version dated December 1993.

Dissolved Lead	Reduction by 47.5 kg/d.
Dissolved Zinc	Reduction by 607 kg/d
Dissolved Cadmium	Reduction by 21.1 kg/d
Dissolved Arsenic	Reduction by 6.25 kg/d
Total Mercury	Reduction by 1.32 kg/d
Slag	Reduction by 60,000 tonnes /yr
other TSS	Reduction by 1555 kg/d

The proposed permit limits are as follows:

Outfall I

flow	70,000 m3/day
pH	6.5 - 8.5
Dissolved Lead	15 kg/day
Dissolved Zinc	20 kg/day
Dissolved Cadmium	2.0 kg/day
Dissolved Arsenic	1.0 kg/day
Dissolved Copper	3.5 kg/day .2 tonnes annually
Total Mercury	.05 kg/day

Total Suspended Solids 500 tonnes/day - annual maximum 80,000 tonnes/year

Outfall 07

flow	60,000 m3/day
pH	6.5 - 8.5
Dissolved Lead	3.0 kg/day
Dissolved Zinc	3.0 kg/day
Dissolved Cadmium	.5 kg/day
Dissolved Arsenic	.5 kg/day
Dissolved Copper	.5 kg/day .1 tonnes annually
Total Mercury	.05 kg/day

Total Suspended Solids 120 kg/day

Outfall II

flow	55,000 m3/day
pH	6.5 - 8.5
Dissolved Lead	20 kg/day
Dissolved Zinc	150 kg/day
Dissolved Cadmium	2.75 kg/day
Dissolved Arsenic	1.75 kg/day
Dissolved Copper	1.5 kg/day .25 tonnes annually
Total Mercury	.15 kg/day

Total Suspended Solids 1925 kg/day

Outfall III

flow	120,000 m3/day
pH	6.5 - 9.5
Dissolved Lead	27.5 kg/day
Dissolved Zinc	150 kg/day
Dissolved Cadmium	4.0 kg/day
Dissolved Arsenic	11 kg/day 2.0 tonnes annually
Dissolved Copper	5.5 kg/day 1.0 tonne annually
Total Mercury	.55 kg/day .1 tonnes annually

Total Suspended Solids 2000 kg/day

This amendment is considered to be an interim version that will remain in effect until the design information for the new lead smelter is available which will allow the development of another amendment that will further reduce metals discharges to the river. It is the goal of the Ministry to eventually reduce the discharges from the Cominco smelter to the point where the discharges are consistently non-acutely toxic to fish as tested by the 96 hour LC_{50} fish bioassay, and to control all metals discharges so that the water quality of the Columbia River is consistently better than that required by the most sensitive use (usually aquatic life).
It should be noted that the above proposed limits are maximums and on average the actual discharges are much less based on recent evaluation of effluent data. Attached are two tables that show the maximum allowable discharges for the existing and proposed permits.

We would appreciate any comments from your program by December 9, 1994 so that this permit may be issued without delay.

For additional information feel free to contact Carl Johnson, Industrial Section Head, Nelson phone 604-354-6355.

Yours truly,

Rick Crozier, R.P.Bio.
Regional Waste Manager
CAJ/mh

Attachments

cc: Claude Sappington
Martin Pomeroy

cominco daily load old

	A	B	C	D	E	F
1	Daily loadings based on permit Dec 2 1993					
2		Outfall I	Outfall 07	Outfall II	Outfall III	summation
3		kg/d	kg/d	kg/d	kg/d	kg/d
4						
5						
6	Diss Pb	17.5	35	27.5	33	113
7						
8	Diss Zn	70	35	275	550	930
9						
10	Diss Cd	3.5	17.5	3.85	5.5	30.35
11						
12	Diss As	3.5	8.75	2.75	5.5	20.5
13						
14	Diss Cu	n/a	n/a	n/a	n/a	n/a
15						
16	Tot Hg	0.07	1.225	0.275	0.55	2.12
17						
18	TSS	140,000 t/yr	875 kg/d	1975 kg/d	2750 kg/d	5600 +slag
19						
20	Flow	70,000	35,000	55,000	110,000	270,000
21						
22	pH	6.5-8.5	2.0 - 8.5	6.5-8.5	6.5-9.5	

table 2

cominco daily load new

	A	B	C	D	E	F
1	Daily loadings based on proposed Nov 94 permit					
2		Outfall I	Outfall 07	Outfall II	Outfall III	summation
3		kg/d	kg/d	kg/d	kg/d	kg/d
4						
5						
6	Diss Pb	15	3	20	27.5	65.5
7						
8	Diss Zn	20	3	150	150	323
9						
10	Diss Cd	2	0.5	2.75	4	9.25
11						
12	Diss As	1	0.5	1.75	11	14.25
13						
14	Diss Cu	3.5	0.5	1.5	5.5	11
15						
16	Tot Hg	0.05	0.05	0.15	0.55	0.8
17						
18	TSS	80000 t/yr	120	1925	2000	4045 + slag
19						
20	Flow	70,000	60,000	55,000	120,000	305,000
21						
22	pH	6.5-8.5	6.5-8.5	6.5-8.5	6.5-9.5	

Graham F. Kenyon
Manager,
Environment & Health
Tel. (604) 364-4239
Fax (604) 364-4144

Cominco

Regional Waste Manager
Ministry of Environment
3rd Floor, 333 Victoria Street
Nelson, B. C.
V1L 4K3

Attention: Mr. C. Johnson
Head, Industrial Section

November 28, 1994

Dear Mr. Johnson:

Re: **PE - 02753 AMENDMENTS**

We are enclosing completed copies of the draft amended appendices for PE-02753, with our requested annual tonnage limits included.

We are requesting deletion of arsenic, cadmium and copper and mercury limits from Appendix 04 applicable to Outfall 07. Several hundred analyses have been carried out since the heat exchanger project was installed, with almost all of the analyses reported below the detection limits for those elements. Permit limits for these elements are no longer relevant.

Through these amendments to PE-02753 there have been substantial reductions in permitted discharge loadings to the river, reflecting the progress we have made in our effluents management program. We believe the loadings basis represents a rational approach to establishing limits that will protect the integrity of the river. As we have discussed, it is important in setting internal priorities for effluents management, that our permit limits reflect the relative impact of the various elements on the river. Simply driving limits downward from their historical levels can, as we have discussed, result in priorities being inappropriately driven by legal risk considerations rather than real environmental considerations. To some extent this has been recognized in the adjustments to the arsenic limits, however, we believe it is important to keep this principle in the forefront when considering future adjustments. Combining the outfall loadings also would represent a more rational basis for determining impact on the river system. As we plan towards our mutual goal of minimizing the impact of contaminant discharges to the point of insignificance, we need to focus our resources where they will do most good with respect to the river.

Thank you for your consideration of our submissions with regard to these amendments.

Yours truly,

Graham F. Kenyon

APPENDIX 01
PERMIT NUMBER PE-02753

(a) The discharge of effluent to which Appendix 01 is applicable is from Metallurgical Plant Sewer I which replaces Sewer T-2 and the Blast Furnace Pond Overflow to the Columbia River as shown on the attached Appendix A-1.

(b) The maximum rate at which effluent may be discharged is 70,000 m³/day.

(c) The characteristics of a 24 hour composite sample of effluent shall be:

Total Suspended Solids	500 tonnes/d	~~50,000~~ tonnes 90,000	Annually*
Dissolved Zinc	20 kg/d	3.0 tonnes	Annually*
Dissolved Arsenic	1.0 kg/d	.2 tonnes	Annually*
Dissolved Lead	15 kg/d	3.0 tonnes	Annually*
Dissolved Cadmium	2.0 kg/d	.2 tonnes	Annually*
Dissolved Copper	3.5 kg/d	0.2 tonnes	Annually
Total Mercury	.05 kg/d	.002 tonnes	Annually*
pH Range	6.5 - 8.5		

* Annual discharges shall be based on the summation of the weekly flow and concentration measurement as specified in Sub-Section 2.1, Sewer Monitoring.

(d) The works authorized are a combined sewer, outfall and related appurtenances, approximately located as shown on the attached Appendix A-1.

(e) The location of the facilities from which the effluent originates and to which Appendix 01 is appurtenant is Lots 1 and 2, Plan 4926, Kootenay District.

(f) The location of the point of discharge and to which Appendix 01 is appurtenant is Lots 1 and 2, Plan 4926, Kootenay District.

(g) The authority to discharge effluent of the quality specified in (c) above expires on December 31, 1995.

DRAFT

Date issued: November 29, 1978

R.J. Crozier, R.P. Bio.
Regional Waste Manager

Amendment date:
(most recent)

APPENDIX 02
PERMIT NUMBER PE-02783

(a) The discharge of effluent to which Appendix 02 is applicable is from Metallurgical Plant Sewer II which replaces Sewers T-1, T-3, T-4, T-5 and T-6 (effluents from the lead fuming furnaces, sinter plant and zinc plant) to the Columbia River as shown on the attached Appendix A-1.

(b) The maximum rate at which effluent may be discharged is 55,000 m^3/day.

(c) The characteristics of a 24 hour flow proportional composite sample of the effluent shall be:

Total Suspended Solids	120 kg/d	600 tonnes	Annually*
Dissolved Zinc	150 kg/d	25 tonnes	Annually*
Dissolved Arsenic	1.75 kg/d	.5 tonnes	Annually*
Dissolved Lead	20 kg/d	5 tonnes	Annually*
Dissolved Cadmium	2.75 kg/d	.8 tonnes	Annually*
Dissolved Copper	1.5 kg/d	0.25 tonnes	Annually
Total Mercury	.15 kg/d	.03 tonnes	Annually*
pH Range	6.5 - 8.5		

* Annual discharges shall be based on the summation of the weekly flow and concentration measurement as specified in Sub-Section 2.1, Sewer Monitoring.

(d) The works authorized are a combined sewer, outfall and related appurtenances, approximately located as shown on the attached Appendix A-1.

(e) The location of the facilities from which the effluent originates and to which Appendix 02 is appurtenant is Lots 1, 2, 3 and 4, Plan 4926, Kootenay District.

(f) The location of the point of discharge and to which Appendix 02 is appurtenant is Lots 1, 2, 3 and 4, Plan 4926, Kootenay District.

(g) The authority to discharge effluent of the quality specified in (c) above expires on December 31, 1995.

DRAFT

Date issued: November 29, 1978

R.J. Crozier, R.P. Bio.
Regional Waste Manager

Amendment date:
(most recent)

APPENDIX 03

PERMIT NUMBER PE-02753

(a) The discharge of effluent to which Appendix 03 is applicable is from Metallurgical Plant Sewer III which replaces Sewers T-8, T-9, T-10 and T-13 (effluents from the lead and silver refinery, acid plants, zinc plant, assay office and effluent treatment plant) to the Columbia River as shown on the attached Appendix A-1.

(b) The maximum rate at which effluent may be discharged is 120,000 m^3/day.

(c) The characteristics of a 24 hour flow proportional composite sample of the effluent shall be:

Total Suspended Solids	2000 kg/d	300 tonnes	Annually*
Dissolved Zinc	150 kg/d	25 tonnes	Annually*
Dissolved Arsenic	11 kg/d	2.0	Tonnes Annually
Dissolved Lead	27.5 kg/d	6 tonnes	Annually*
Dissolved Cadmium	4.0 kg/d	1 tonne	Annually*
Dissolved Copper	5.5 kg/d	1.0	Tonnes Annually
Total Mercury	.55 kg/d	0.1	Tonnes Annually
pH Range	6.5 - 9.5		

* Annual discharges shall be based on the summation of the weekly flow and concentration measurement as specified in Sub-Section 2.1, Sewer Monitoring.

(d) The works authorized are a combined sewer, outfall, lime water treatment plant, No. 12 Lagoon, No. 13 Lagoon and related appurtenances approximately located as shown on the attached Appendix A-1.

(e) The location of the facilities from which the effluent originates and to which Appendix 03 is appurtenant is Lots 1, 2, 3 and 4, Plan 4928, Kootenay District.

(f) The location of the point of discharge and to which Appendix 03 is appurtenant is Lots 1, 2, 3 and 4, Plan 4928, Kootenay District.

(g) The authority to discharge effluent of the quality specified in (c) above expires on December 31, 1995.

DRAFT

Date issued: November 29, 1978

R.J. Crozier, R.P. Bio.
Regional Waste Manager

Amendment date:
(most recent)

APPENDIX 04
PERMIT NUMBER PE-02759

(a) The discharge of effluent to which Appendix 04 is applicable is from Metallurgical Plant Sewer T-7 (effluent from the lead smelter absorption plant) to the Columbia River as shown on the attached Appendix A-1.

(b) The maximum rate at which effluent may be discharged is 60,000 m³/day.

(c) The characteristics of a 24 hour composite sample of the effluent shall be:

Total Suspended Solids	120 kg/d	30 tonnes	Annually*
Dissolved Zinc	3.0 kg/d	1 tonne	Annually*
Dissolved Arsenic	.5 kg/d	.1 tonnes	Annually*
Dissolved Lead	3.0 kg/d	1 tonne	Annually*
Dissolved Cadmium	.5 kg/d	.1 tonnes	Annually*
Dissolved Copper	.5 kg/d	0.1	Tonnes Annually
Total Mercury	.035 mg/l	.01 tonnes	Annually*
pH Range	6.5 - 8.5		

* Annual discharges shall be based on the summation of the weekly flow and concentration measurement as specified in Sub-Section 2.1, Sewer Monitoring.

(d) The works authorized are a submerged outfall, air return line and related appurtenances, approximately located as shown on the attached Appendix A-1.

(e) The location of the facilities from which the effluent originates and to which Appendix 04 is appurtenant is Lots 1, 2, 3 and 4, Plan 4926, Kootenay District.

(f) The location of the point of discharge and to which Appendix 04 is appurtenant is Lots 1, 2, 3 and 4, Plan 4926, Kootenay District.

(g) The authority to discharge effluent via this outfall expires on December 31, 1995.

DRAFT

Date issued: November 29, 1978

Amendment date:
(most recent)

R.J. Crozier, R.P. Bio.
Regional Waste Manager

table 1

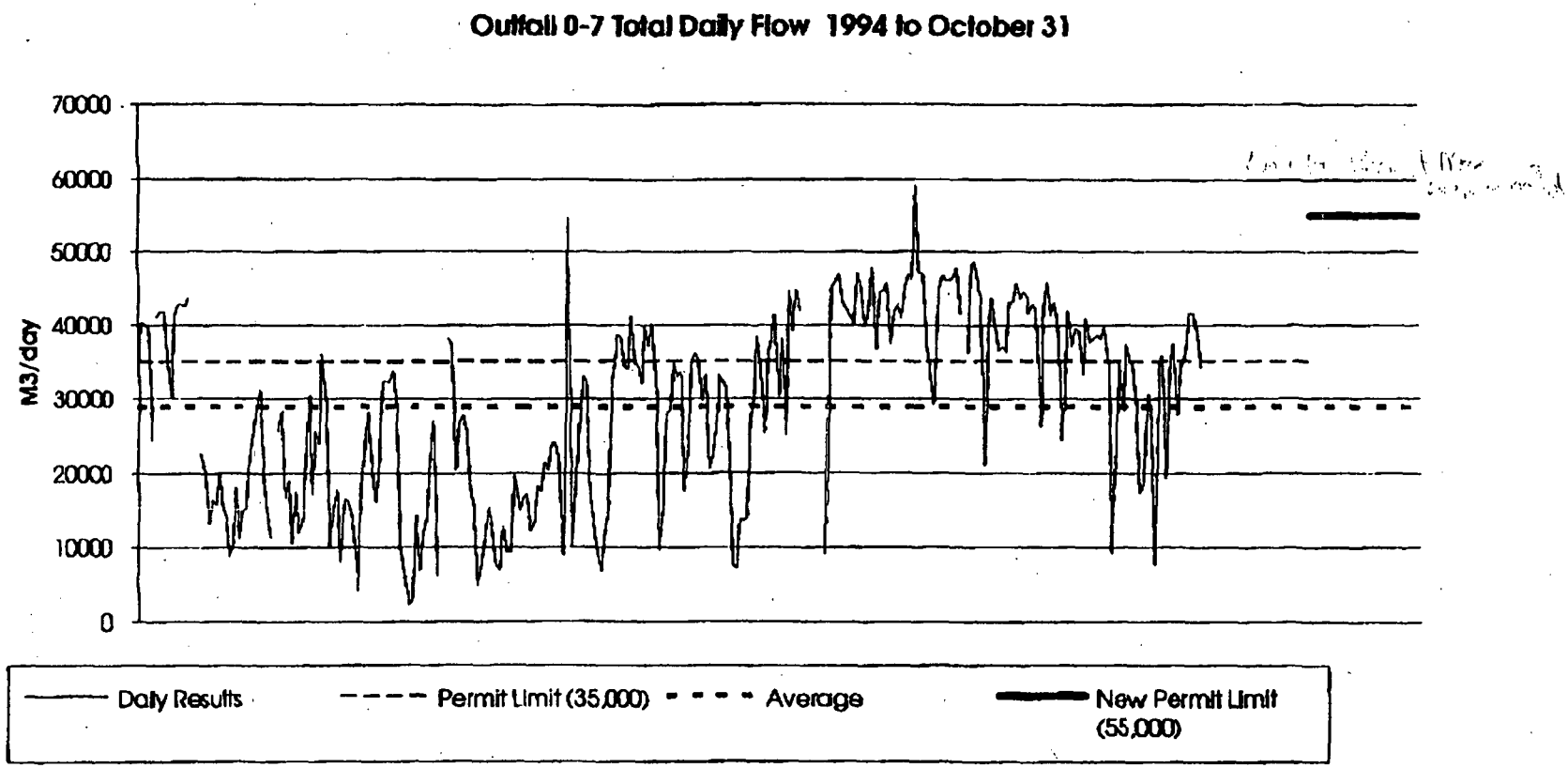
cominco daily load old

	A	B	C	D	E	F
1	Daily loadings based on permit Dec 2 1993					
2		Outfall I	Outfall 07	Outfall II	Outfall III	summation
3		kg/d	kg/d	kg/d	kg/d	kg/d
4						
5						
6	Diss Pb	17.5	35	27.5	33	113
7						
8	Diss Zn	70	35	275	550	930
9						
10	Diss Cd	3.5	17.5	3.85	5.5	30.35
11						
12	Diss As	3.5	8.75	2.75	5.5	20.5
13						
14	Diss Cu	n/a	n/a	n/a	n/a	n/a
15						
16	Tot Hg	0.07	1.225	0.275	0.55	2.12
17						
18	TSS	140,000 t/yr	875 kg/d	1975 kg/d	2750 kg/d	5600 +slag
19						
20	Flow	70,000	35,000	55,000	110,000	270,000
21						
22	pH	6.5-8.5	2.0 - 8.5	6.5-8.5	6.5-9.5	

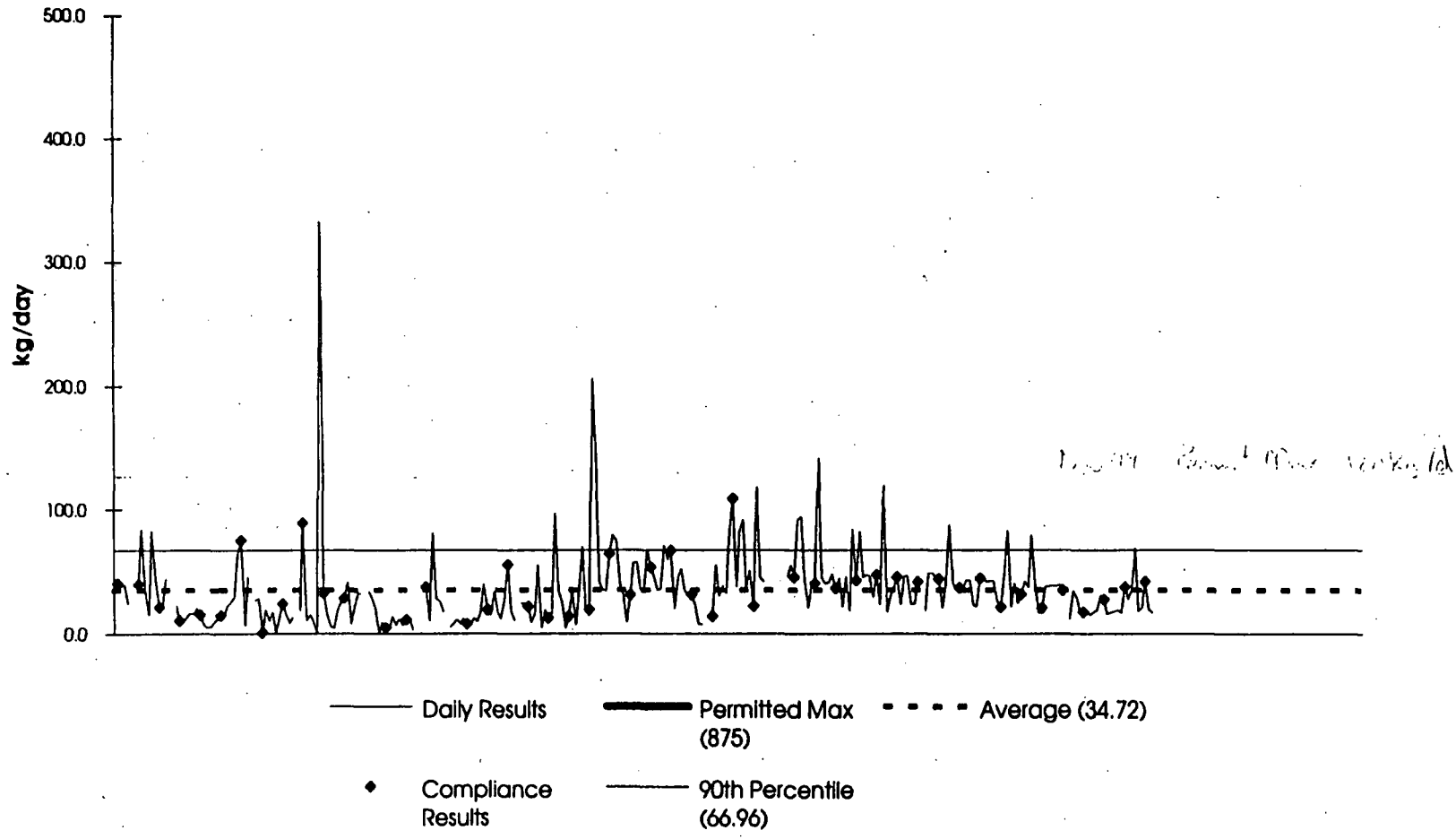
table 2

cominco daily load new

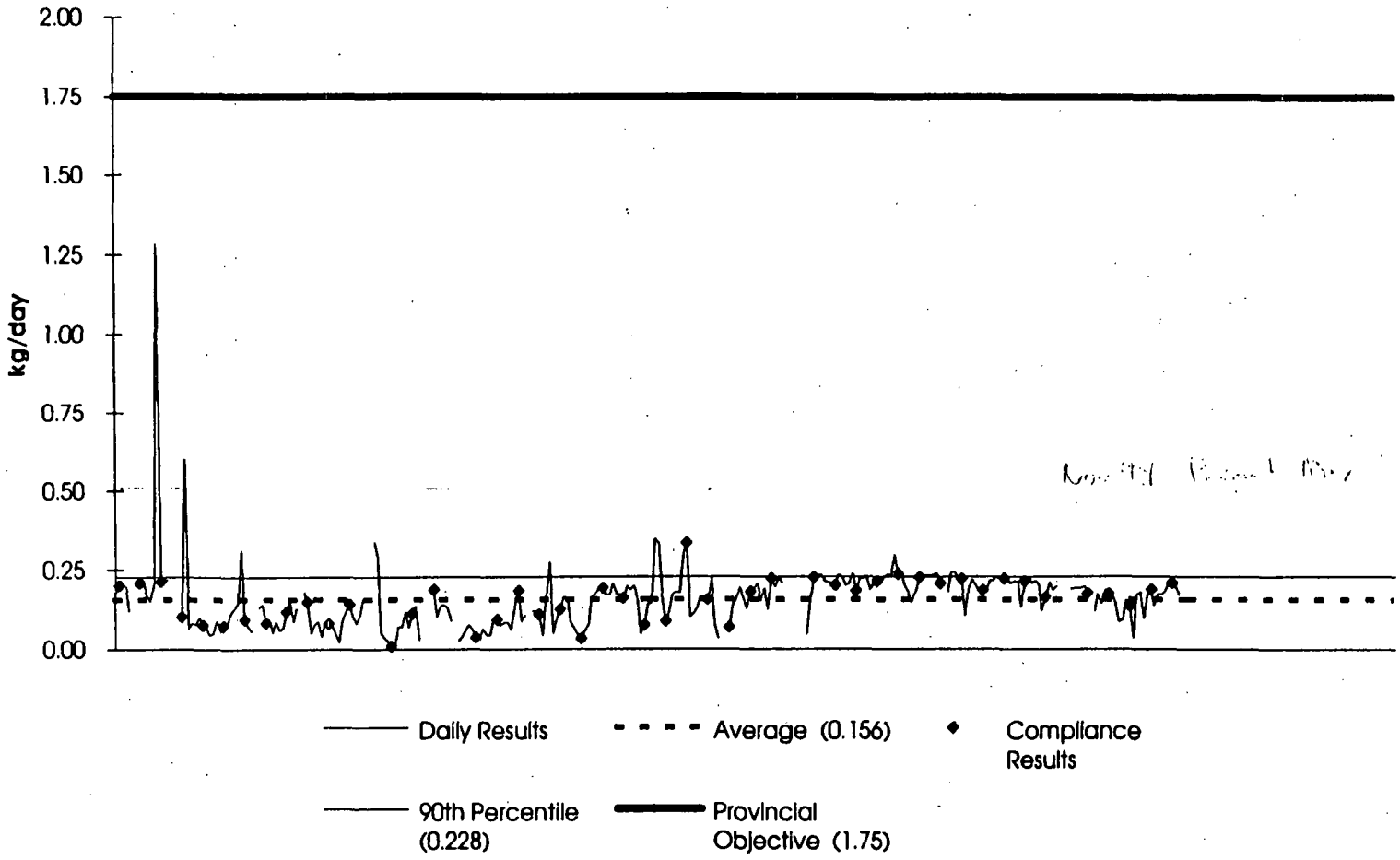
	A	B	C	D	E	F
1	Daily loadings based on proposed Nov 94 permit					
2		Outfall I	Outfall 07	Outfall II	Outfall III	summation
3		kg/d	kg/d	kg/d	kg/d	kg/d
4						
5						
6	Diss Pb	15	3	20	27.5	65.5
7						
8	Diss Zn	20	3	150	150	323
9						
10	Diss Cd	2	0.5	2.75	4	9.25
11						
12	Diss As	1	0.5	1.75	11	14.25
13						
14	Diss Cu	3.5	0.5	1.5	5.5	11
15						
16	Tot Hg	0.05	0.05	0.15	0.55	0.8
17						
18	TSS	80000 t/yr	120	1925	2000	4045 + slag
19						
20	Flow	70,000	60,000	55,000	120,000	305,000
21						
22	pH	6.5-8.5	6.5-8.5	6.5-8.5	6.5-9.5	


Outfall 0-7 Total Daily Flow 1994 to October 31
70000
60000
50000
40000
30000
20000
10000
0
M3/day
Daily Results
Permit Limit (35,000)
Average
New Permit Limit (55,000)

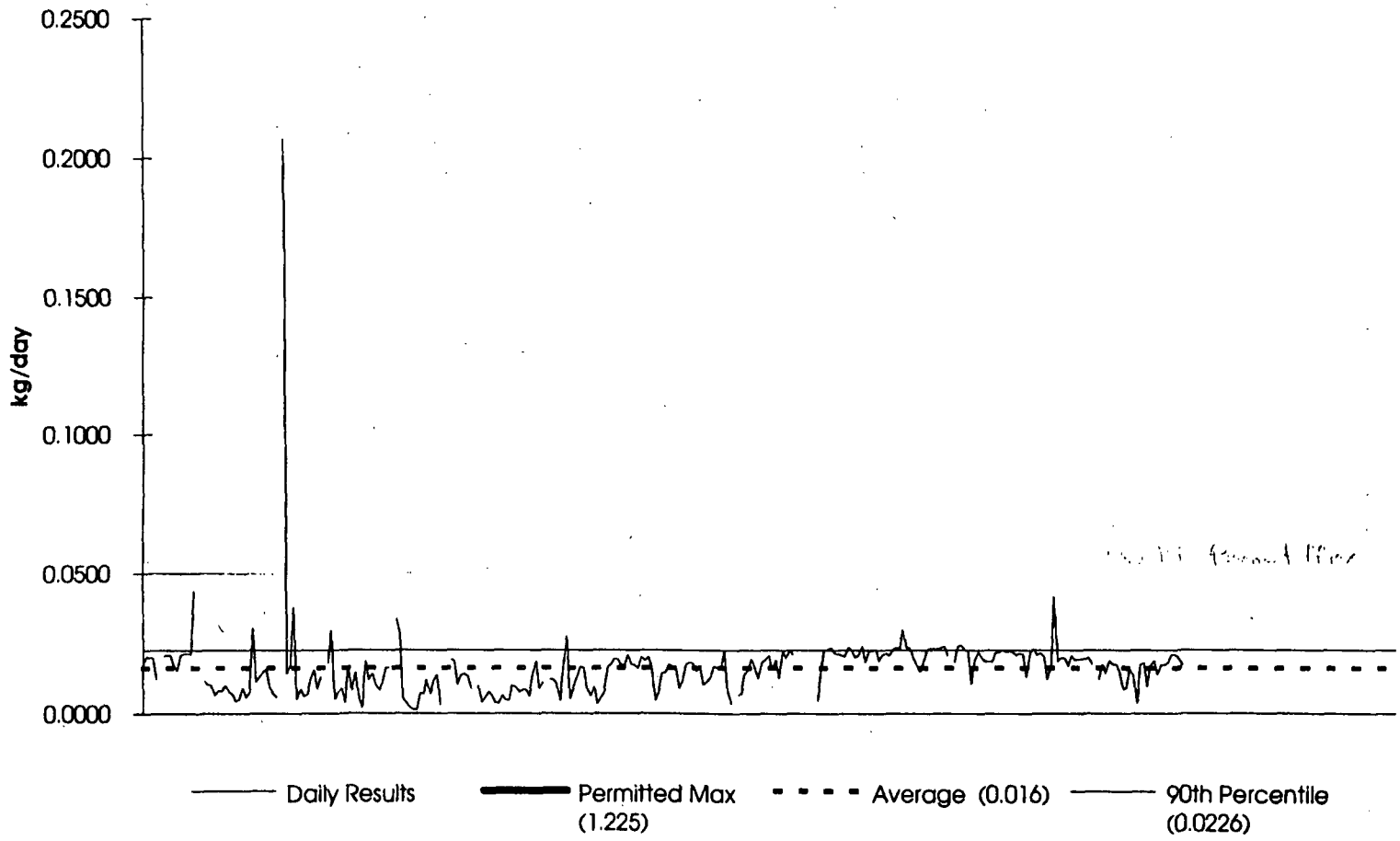
Outfall 0-7 Suspended Solids Discharge 1994 to October 31



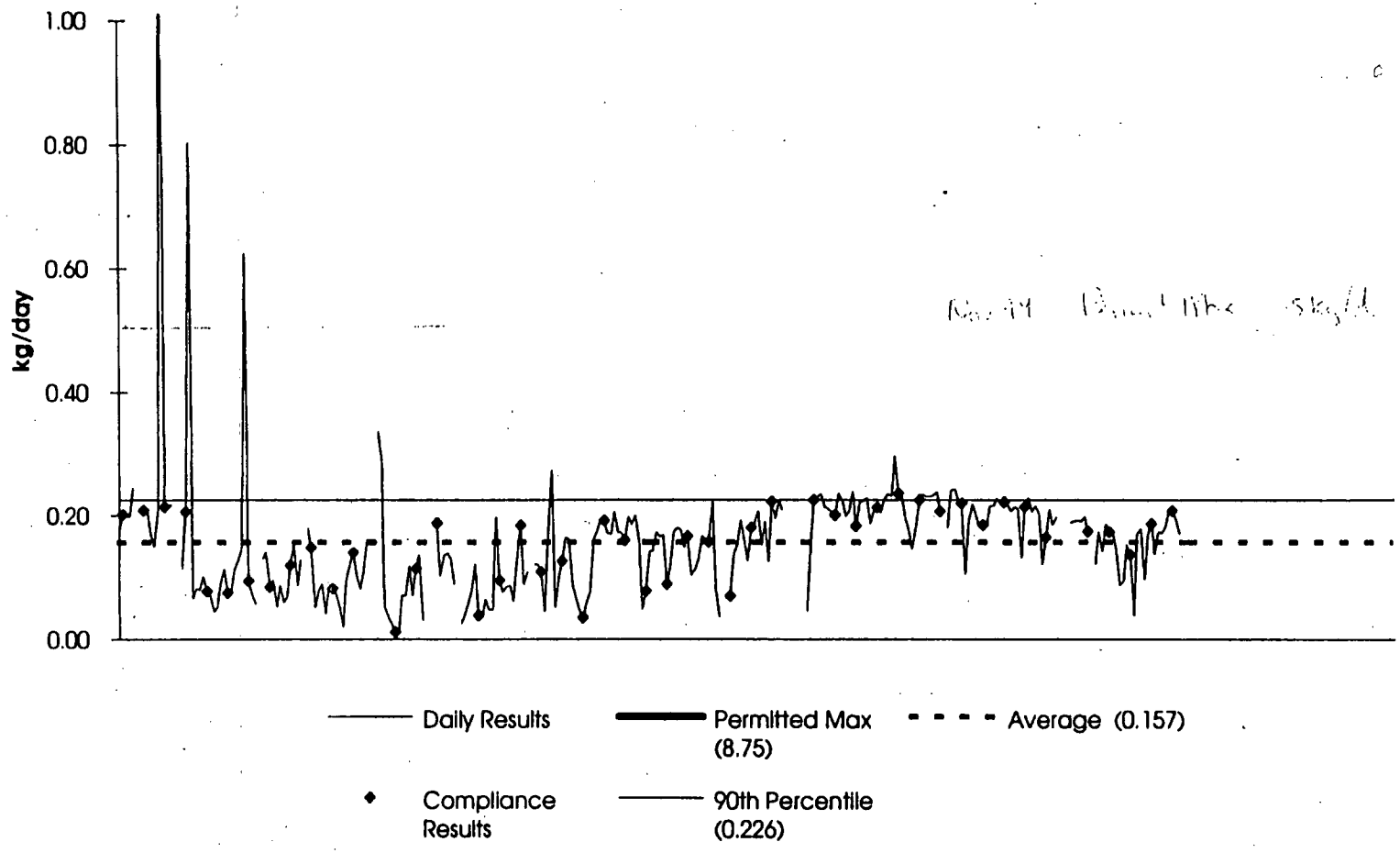
Outfall 0-7 Dissolved Copper Discharge 1994 to October 31



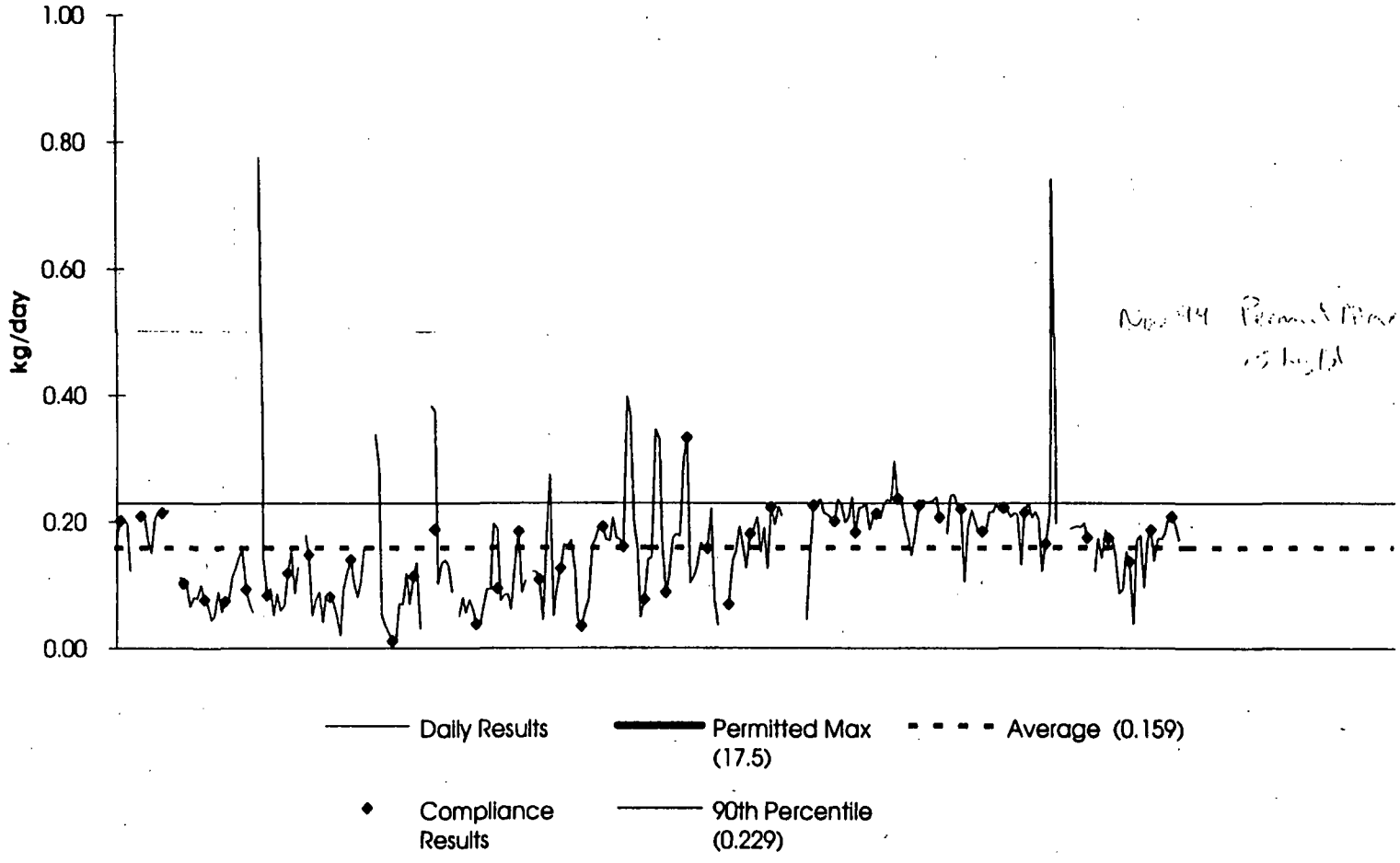
Outfall 0-7 Total Mercury Discharge 1994 to October 31



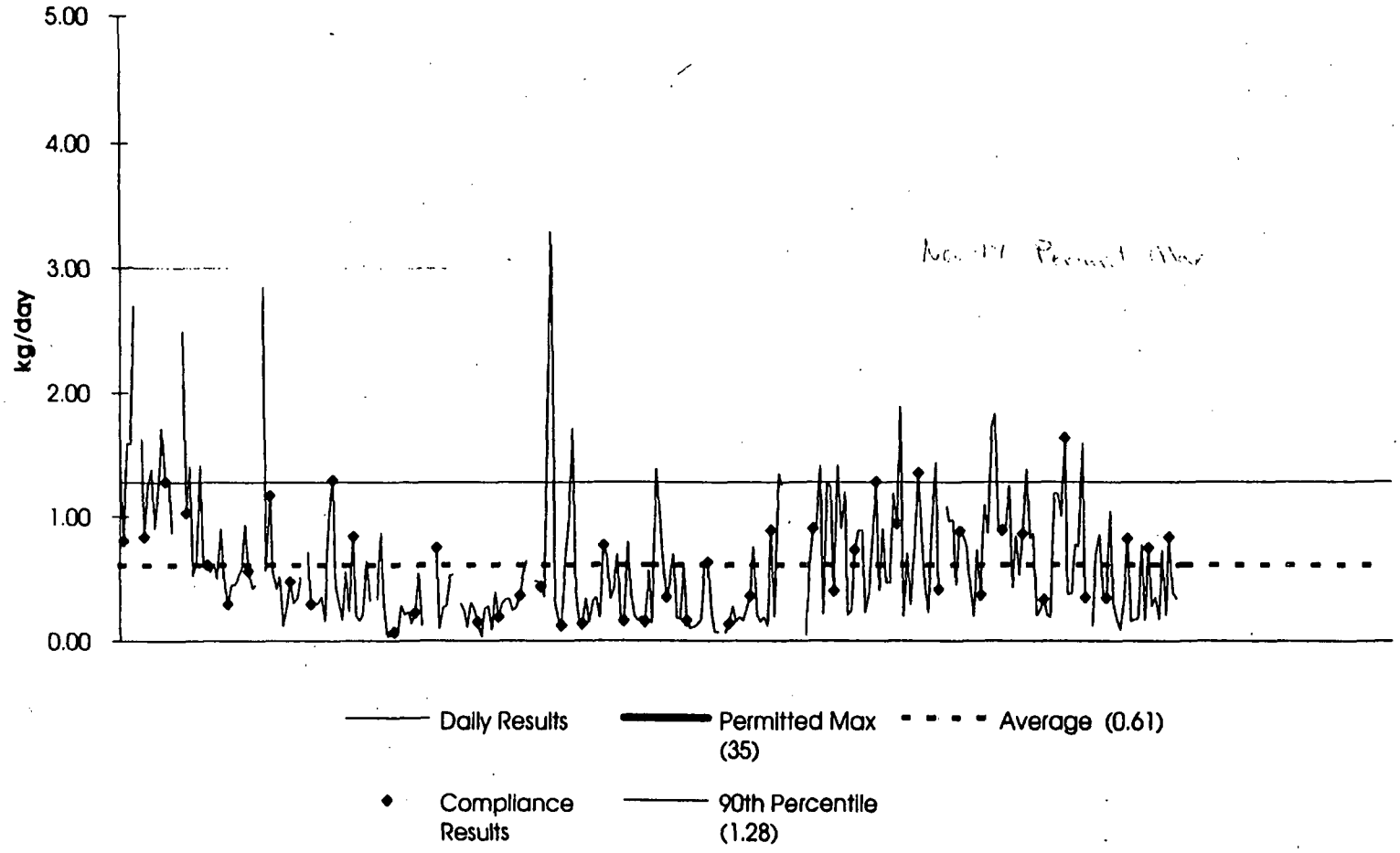
Outfall 0-7 Dissolved Arsenic Discharge 1994 to October 31



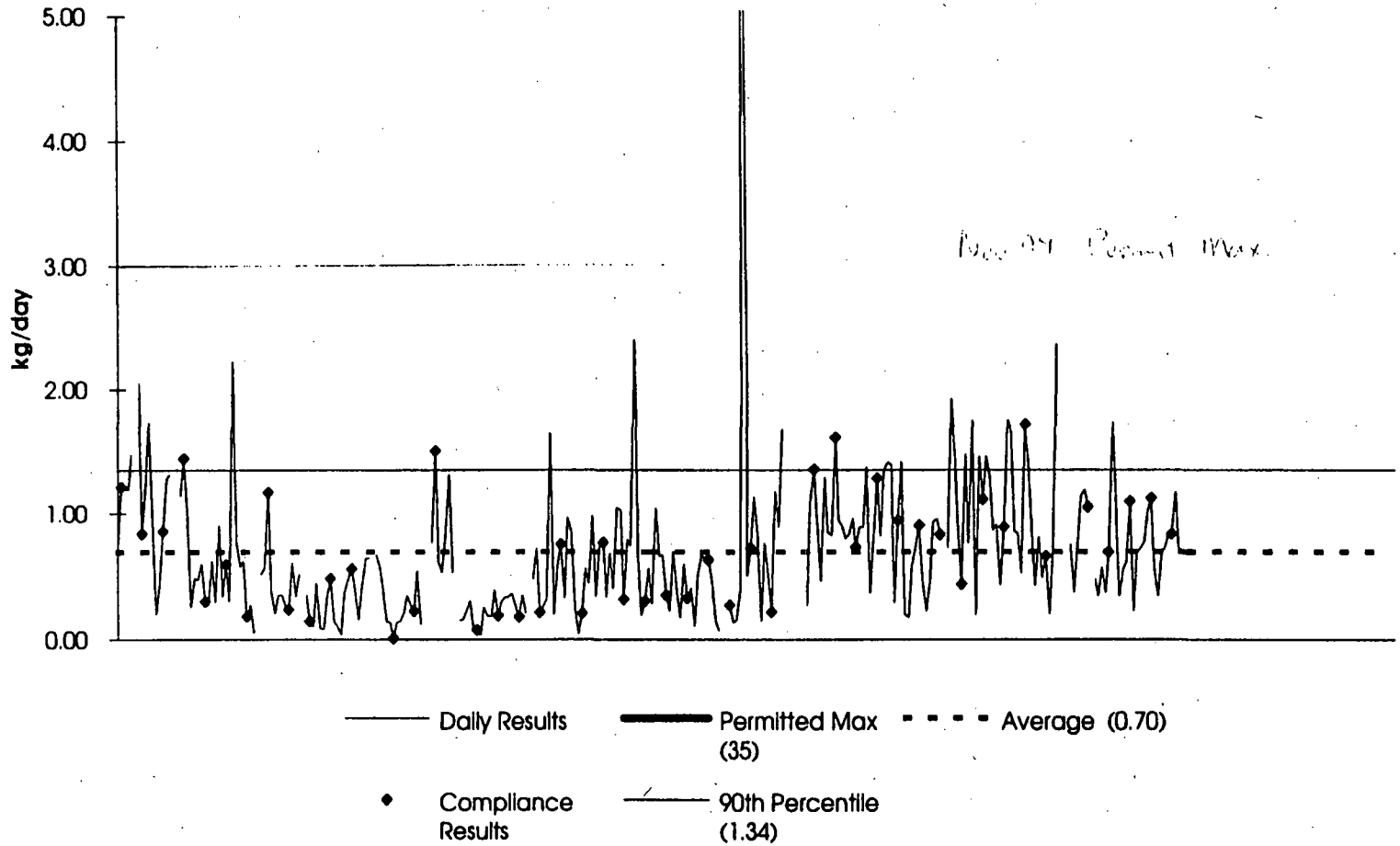
Outfall 0-7 Dissolved Cadmium Discharge 1994 to October 31



Outfall 0-7 Dissolved Lead Discharge 1994 to October 31



Outfall 0-7 Dissolved Zinc Discharge 1994 to October 31



To

WAYNE BELZER

DATA STANDARDS GROUP

FAX No. 660-1174

Here is updated Monitoring Requirement for Cominco

PE 2753

PA 2690

T. KINKADE

NELSON

MINISTRY OF ENVIRONMENT

WASTE MANAGEMENT BRANCH

APPENDIX No. C-5

to Permit No. PE-2753

E. ANALYTICAL PROCEDURES

Analyses are to be carried out in accordance with procedures described in the second edition (February 1976) of "A Laboratory Manual for the Chemical Analysis of Waters, Wastewaters, Sediments and Biological Materials", or by suitable alternative procedures as approved by the Regional Waste Manager.

Copies of the above mentioned manual are available from the Environmental Laboratory, 3650 Wesbrook Crescent, Vancouver, British Columbia, V6S 2L2, at a cost of $10.00, and are also available for inspection at all Waste Management Branch offices.

F. REPORTING

1. All results obtained from effluent and receiving water monitoring specified above are to be tabulated and submitted to the Regional Waste Manager quarterly. In conjunction with this report, the Permittee shall submit those records obtained for any process upset or use of existing sewers. Monitoring results obtained from the analysis of the effluents from Sewers II and III are to be submitted individually in conjunction with the calculated weighted average of these results.

2. Sulphuric Acid Discharge

   A report detailing the cause of each incident, the pH monitoring data collected and the actions taken to prevent a reoccurrence of a similar incident is to be submitted to the Regional Waste Manager within 10 days after the release of acid has stopped.

In addition within 60 days of completion of the first acid discharge a report shall be submitted to the Regional Waste Manager. This report shall assess the relationship between pH and the total to dissolved zinc ratio at those stations requiring replicate sampling. In addition the report should assess the potential impact of the acid discharge to river water quality within the dilution zone as established by dye tests carried out on May 20, 1982.

MINISTRY OF ENVIRONMENT

WASTE MANAGEMENT BRANCH

APPENDIX No. C-4

to Permit No. PE-2753

The daily flowrate of the Columbia River at Birchbank shall be recorded for the 3 consecutive days of sampling.

During the 3 consecutive sampling days, the other discharges authorized by Appendix 01, 02, 03, and 04 of PE-2753 and Appendix 01 of PE-5309 shall be sampled, (using a composite sampler) and analyzed for total and dissolved Zn and total Hg.

The actual sampling locations may be varied depending on the flow conditions of the Columbia at the time of discharge and the limitations of sampling equipment available.

At a minimum, during subsequent discharges of acid the following monitoring program will be carried out:

1. Upon commencement of the acid release, Cominco will record the pH of the 24 hour composite sample of III sewer on a daily basis.
2. Upon commencement of the acid release , Cominco will monitor the pH of the Columbia River at the old Trail bridge 6 m from the west shore and at the centre of the river at a frequency of once per hour.
3. Upon commencement of the acid release, Cominco will monitor the pH of the Columbia River immediately upstream of its confluence with Stoney Creek at a frequency of twice per day.
4. Upon commencement of the acid release, Cominco will monitor the pH of the Columbia River at Waneta continuously and shall report the daily average to this office.
5. Cominco will determine the daily flow of the Columbia River during the acid release.

D. MODIFICATIONS TO THE MONITORING PROGRAM

The above effluent and receiving water monitoring program may be modified to increase or decrease the frequency of sampling or the number of parameter analyses required. These modifications shall be at the discretion of the Regional Waste Manager and are dependent upon the results obtained from Permittee and Waste Management Branch monitoring.

Monitoring for total metals in effluent and receiving water samples shall be required for a minimum of one year commencing January 1, 1984. Further total metals monitoring may be required at the discretion of the Regional Waste Manager.

MINISTRY OF ENVIRONMENT

WASTE MANAGEMENT BRANCH

APPENDIX No. C-3

to Permit No. PE-2753

(continued)

Location	Parameter	Frequency
Columbia River between Sewer II and new bridge	pH total & Dissolved Zn Total Hg	twice per day for 3 consecutive days during discharge
New Bridge (2 locations within west span at least 5 m. from shore)	pH total & dissolved Zn total Hg	twice per day for 3 consecutive days during discharge 6 replicates for sample at mid station west span
Columbia River between Trail Creek and Old Bridge approximately 20 m from west bank	pH total & dissolved Zn total Hg	twice per day for 3 consecutive days during discharge
Old Bridge 2 locations - approx. 7 meters from west bank, and center of bridge.	pH total & dissolved Zn total Hg	every two hours during discharge twice per day for 3 consecutive days during discharge. 6 replicate samples per sample
Columbia River near Rock Island mid stream of river	pH total & dissolved Zn total Hg	twice per day for 3 consecutive days during discharge

MINISTRY OF ENVIRONMENT

WASTE MANAGEMENT BRANCH

APPENDIX No. C-2

to Permit No. PE-2753

Each sample is to be analysed for:

1) total suspended solids
2) pH
3) dissolved zinc
4) dissolved arsenic
5) dissolved cadmium
6) dissolved lead
7) phosphorus, total phosphate (as P)
8) phosphorus, ortho phosphate (as P)
9) dissolved fluoride
10) dissolved NH_3 (as N)
11) total mercury
12) dissolved sulphate

C. MONITORING IN CONJUNCTION WITH EMERGENCY DISCHARGE OF 93% SULPHURIC ACID

The following program is designed to determine the impact of a discharge of up to 200 T of 93% sulphuric acid (H_2SO_4) per day to the Columbia River via Sewer III.

This monitoring program will be carried out during the first such incident after the issuance of the amended Permit. The need for further detailed monitoring in subsequent discharges will depend on the information obtained during the first incident.

Location	Parameter	Frequency
Cominco Pumphouse	pH	twice per day during discharge
	total & dissolved Zn total Hg	twice per day for 3 consecutive days during discharge 6 replicates per sample
Columbia River just above Sewer II outfall	pH total & dissolved Zn total Hg	twice per day for 3 consecutive days during discharge

MINISTRY OF ENVIRONMENT

WASTE MANAGEMENT BRANCH

APPENDIX No. C-1

to Permit No. PE-2753

SAMPLING & MONITORING REQUIREMENTS

A. EFFLUENT MONITORING

a) All sewers in continuous use shall be sampled (a 24 hour flow proportional composite sample) once per month. These samples are to be analyzed for:

1) total suspended solids
2) pH
3) dissolved zinc
4) dissolved lead
5) dissolved arsenic
6) dissolved cadmium
7) total mercury

b) Flow Measurement

The effluent discharge rate from all sewers shall be measured as follows:

Sewer I - quarterly
Sewer II - weekly
Sewer III - weekly
Sewer 07 - quarterly

c) Measure and record the total quantity of slag discharged to the Columbia River each month. This quantity may be determined from metallurgical records.

B. RECEIVING WATER MONITORING

Once per month (on the date of effluent sampling when possible), 24 hour composite water samples are to be collected in the Columbia River, at the following locations:

1) Columbia River upstream of Topping (Stoney) Creek.
2) East side, Columbia River, just upstream of confluence of Columbia River with Pend D'Oreille River (Waneta).

MINISTRY OF ENVIRONMENT

WASTE MANAGEMENT BRANCH

APPENDIX No. C-2

to Permit No. PA-2690

2. Discharge Rate Measurement

The Permittee shall measure and record on the day of sampling, the rate of discharge in m^3/minute for the stack emissions identified above.

B. AMBIENT MONITORING

Ambient monitoring stations specified below are to be maintained and operated by the Permittee with respect to Permits PA-2690, PA-2691 and PA-2692.

STATION LOCATION	PARAMETERS TO BE MEASURED AND FREQUENCY									
	SO_2	Sulphation Plate	Fluoride Plate	Dust fall	Suspended Particulate total	Suspended Particulate Pb	Suspended Particulate Zn	Suspended Particulate Cd	Gaseous Fluoride	Total Arsenic
1 W.K. P & L Building	C	M	M	M	W	W	W	W	W	W
2 Oasis	C	M	M	M	W	W	W	W	W	W
3 Warfield Substation	C	M	M	M	W	W	W	W	W	W
4 Sunningdale		M	M	M						
5 Glenmerry		M	M	M						
6 Daniel St.		M	M	M						
7 Columbia Gardens		M	M	M						
8 Trail Hospital		M	M	M						
9 Birchbank		M	M	M						

C = continuous
W = weekly (every six days)
M = monthly (30 day duration)

Note: SO_2 monitoring data is to be submitted as 1 hour average readings, 3 hour average readings which have been updated hourly, and 24 hour averages.

MINISTRY OF ENVIRONMENT

WASTE MANAGEMENT BRANCH

APPENDIX No. C-1

to Permit No. PA-2690

MONITORING PROGRAM

Cominco Ltd. - Cominco Ltee.

A. SOURCE MONITORING

1. Sample Location, Frequency, and Parameters for Analysis

Sample all emissions tabulated below at the indicated frequency; the sampling period shall be of sufficient duration to be representative of the operation. Analyse the collected sample for the specified parameters.

		Parameter and Sampling Frequency				
Appendix	Identification	Total Particulate	Fluoride	Ammonia	Lead	Arsenic
01	W-1	A				
02	W-2	A				
03	W-3, W-4	SA				
04	W-7, W-8	A				
05	W-10	A				
06	W-12	A				
07	W-28	SA				
08	W-30	A				
09	W-34, W-35, W-36		A			
11	W-39, W-40, W-41		A			
13	W-43, W-44	A	A	A		
14	W-45, W-46, W-47	A	A	A		
16	W-54		A			
17	W-55, W-56, W-57		A			

SA = Semi Annually (once every 6 months)
A = Annually

File: PE 2753

July 6, 1994

Environmental Protection Branch
Pacific and Yukon Region
224 West Esplanade
North Vancouver, B.C.
V7M 3H7

Attention: Martin Pomeroy

Dear Mr Pomeroy:

I have your letter of June 20th concerning our proposed unilateral amendment of the Cominco effluent permit PE 2753.

After considering Environment Canada's concerns and subsequent discussions with Crown Counsel I have decided not to proceed with the bubble loading concept for Cominco's permit PE 2753.

If we continue with an interim permit amendment it is unlikely it will be completed until the end of summer due to staff vacations. I will have a hard look at your recommendation for individual outfall loading limits and will discuss any resulting proposals with Environment Canada. The option of a "cut-off" letter is also being actively considered at this point.

I was concerned that your letter suggested that this office was not consulting with the federal government on this issue. I notified you of the enforcement problem soon after it came to my attention and asked for your feedback on our ideas on mechanisms to deal with it. I believe we have to take the lead on negotiating with the permittee, but our intent is to continue on going consultation with the federal government as negotiations proceed.

RJC

Environnement Canada Conservation et Protection
Environment Canada Conservation and Protection

FAX: 354-6367

Environmental Protection Branch
Pacific and Yukon Region
224 West Esplanade
North Vancouver, B.C.
V7M 3H7

LE PLAN VERT DU CANADA
CANADA'S GREEN PLAN

Carl / file

PE 2753

4487-37/C685

June 20, 1994

Mr. R. Crozier
Regional Manager, Environmental Protection
Ministry of Environment, Lands and Parks
401-333 Victoria Street
Nelson, B.C.
V1K 4K3

Dear Mr. Crozier:

RE: EMERGENCY REWRITE OF COMINCO-TRAIL SMELTER PERMIT

I am writing to reiterate our concerns regarding your proposed approach for the emergency rewrite of the subject permit, as discussed at the June 6, 1994 meeting in Nelson. Although we support a permit rewrite to ensure enforceability, we have serious reservations about the "bubble concept", whereby a 24 hour maximum loading value is set for each parameter based on the sum loading from all outfalls. This concept may appear to be more stringent than the existing permit from a total loading point of view, but it allows variability among outfalls and does not control maximum concentrations at any one outfall. This bubble approach is unacceptable as written, and accordingly we have provided additional conditions to ensure that the amended permit moves towards meeting our long-term federal requirements. Our concerns regarding the proposed emergency permit rewrite and our recommendations for modifying this approach to meet federal requirements are summarized below.

One of the problems associated with the bubble loading approach is that the incentive for better process control on an individual outfall will be lost. Peak concentrations can vary widely, and thereby pose a threat to the biological resources without exceeding a permit

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criterion based on a total loading figure. Therefore, permit limits based on the total loading approach cannot adequately protect the fisheries resources unless a maximum criteria for each parameter is also established to prevent harmful peak concentrations. This is especially important if water use is decreased.

An additional legal concern regarding the bubble concept is that the *Fisheries Act* requires each outfall to be in compliance with a non-toxic effluent discharge; it does not recognize a total loading concept for all outfalls combined.

As you are no doubt aware, one reason for establishing the special effluent monitoring conditions in the permit was to provide a database that would allow the setting of maximum concentrations for individual outfalls. Although maximum instantaneous concentrations would allow better fisheries protection, this approach would not be reliable at this time given the extreme variability in effluent quality. Thus, limits based on 24-hour composite samples are required.

It is recognized that copper is of concern from a fish toxicity point of view and should therefore be included in the permit. Given the data presented by Cominco at the Workshop, a sufficient database is available to do this.

Finally, we are concerned that any emergency changes to the permit, which use the bubble concept, will set a precedent, become the new "status quo" and be more difficult to change in the future. This concern may be overcome by adopting Recommendation 2 below.

Our recommendations for modifying your proposed approach to take into account the federal government requirements in the emergency permit rewrite are as follows:

1. Adopt a loading criteria for all outfalls combined over a 24-hour period for the following metals: Zn, Pb, Cd, As, Cu, and Hg. In addition, specify a loading criterion for each individual outfall for a 24-hour period for each of these same metals. If information is not currently available to set these loading figures by taking into account fisheries protection objectives and other biological effects then, at the very least, these loading figures should be set so as to allow for enforcement action on all spill events and moderate process upsets that have occurred in the past three years.

../3

2. Conduct a review of the emergency permit on or before December 1994, to evaluate the approach taken, enforceability of the permit, and review of the adequacy of specific numbers given for total loadings for each individual outfall.

This last provision for a review will allow for the implementation of other more substantial changes which can not be considered as part of the emergency review, due to the present time constraints (e.g., site-specific environmental monitoring, maxima total metal concentrations, sulfuric acid clause). We will provide you with further information regarding these changes following our review of the information presented by Cominco at the June 7th Workshop.

To date the federal government has supported the bulk of the provincial permit related to the positive upgrades to pollution abatement measures and the associated trend towards meeting the federal objective of non-toxic effluent discharges and no sublethal impacts within the receiving environment. We appreciate the efforts of the province to improve effluent quality and are impressed with the very real improvements made by Cominco. However, despite improvements to the effluent quality, the discharges still do not meet our long- term federal requirements. If the federal concerns are not included in the emergency rewrite and the permit amendment expected later this year, we will seek other options to address these concerns.

We understand that your proposed emergency permit rewrite is an improvement and will reduce overall loadings of metals to the Columbia River on the basis of present attainability. However, the impetus for controlling process upsets and achieving even better loading levels will be lost without individual outfall controls as well. We do not share your view that these final loading figures should be the end result of negotiations with Cominco, but rather the product of industry, provincial and federal consultation.

../4

We are aware of your time constraints regarding the emergency permit rewrite and will be able to review the draft permit within two or three days. We are encouraged by the formation of the Provincial-Federal Working Group and believe that monthly teleconferences will aid in the development of permit reviews and amendments.

Yours truly,

Martin Pomeroy
Head Industrial Programs Section

cc: M. Nassichuk, EP
G. Ennis, DFO

Environnement Canada / Environment Canada
Conservation et Protection / Conservation and Protection

C > 2nd copy.

LE PLAN VERT DU CANADA
CANADA'S GREEN PLAN

May 13, 1994

4487-37/C68
8900-2-13

ENVIRONMENTAL PROTECTION
MAY 20 1994
NELSON, B.C.

Mr. Rick Crozier
Regional Manager
Environmental Protection
Ministry of Environment, Lands and Parks
401-333 Victoria St.
Nelson, B.C. V1K 4K3

Dear Mr. Crozier,

RE: TERMS OF REFERENCE FOR JUNE 1994 COMINCO PERMIT REVIEWS

Thank you for forwarding the Terms of Reference for the June 1994 permit reviews. We support the idea of a 2 day workshop to exchange information on Cominco, as we see the workshop being the first step towards the preparation of an environmental performance report and the revision of the existing metallurgical and fertilizer operation permits in late 1994.

We endorse your appended Terms of Reference and request that all data summarized for the workshop be made available in electronic format as well as in tabular or graphical format, as appropriate. For example, it would be most useful if we could receive the 1993 Cominco effluent monitoring data (including characterization studies) on diskette before the workshop. We feel that it is essential to focus the examination of the effluent data (Item#1) on the goals of setting instantaneous maximum values, and lowering the 24 h levels presently cited in the permit, in addition to the goal of non-toxic discharges. Trend analysis (Item #4) should also include an examination of effluent variability as it relates to maxima and loadings.

To ensure that federal concerns outlined in our response to you of April 26, 1994 are specifically included as agenda topics, we have attached a list of topics that we will present at the workshop, and others which should be addressed by Cominco and/or BCMELP. We have also attached a short list of some relevant studies on the Columbia River that should be summarized by Cominco and included in your Item #6 (Summary of Columbia R. monitoring data). This would provide an historical review of environmental conditions in relation to the changes in Cominco operations. It is our understanding that both the metallurgical and fertilizer plant effluents will be reviewed on Day 1 of the workshop. There will be a more limited federal presence on Day 2, in order to address transboundary air issues.

...2

We look forward to continued close working relations on this project, especially given the short time-frame available to all parties. In this regard, it would be useful to receive the time line of work items that were being developed related to Cominco projects. Should you require information, or wish to send us further material and information, Martin Pomeroy is the federal coordinator for this project and can be contacted at 666-5193 or 666-9107 (fax).

Yours truly,

M.D. Nassichuk
A/Manager
Pollution Abatement Division

cc G. Ennis (DFO, EBCU)
M. Pomeroy (EP)
G. Kenyon (Cominco)

Some Suggested Agenda Items for Workshop on Cominco June 1994 Permit Review

I. Effluent Data Review including Effluent Characterization Surveys (Cominco)

-implications to reduction of:
- -contaminant loading (total and dissolved)
- -24 h and instantaneous maximum permit levels
- - effluent variability
- - number and magnitude of spill events

-relationship to meeting non-toxic effluent objective

II. Spills (Cominco)

-review of 1992-94 spills
-summary by source area, volume, cause, response, corrective actions
-review of available options to improve: prevention, detection, control, treatment
- removal of sulphuric acid clause from permit

III. Review and Update of Effluents Management Plan (Cominco)
- focus on EMP major projects update: completed and proposed projects
- realized and projected effluent quality/quantity improvements
- Stoney Creek and Duncan flats: arsenic contamination

KIVCET (Cominco)
-projected effluent quality/quantity based on simulated Cominco feedstock trials

IV. Trends & Updates in Receiving Environment & Water Quality Studies

-Summary of Columbia River Studies (Cominco)
-CRIEMP Summary as it relates to Cominco (BCMELP)
-X-Section Water Sampling (DOE: T.Tuominen)
-Fish Health and Distribution (DFO: B. Antcliffe)
-Bioassays (DOE: Al Colodey)
-Site-specific monitoring program (DOE: Al Colodey)

DAY 2: Air Issues

add. Status and Application of Secondary Lead Smelter Regulations (DOE: Poon)

List of Columbia River Studies to be Summarized as Part of June 1994 Permit Review

Fish Health/Contamination Studies:

1 D.E. Boyle, B.A. Bravender, T.J. Brown, D. Kieser, C.D. Levings, W.L. Lockhart, J.A. Servizi, and T.R. Whitehouse. 1992. Baseline monitoring of mountain whitefish, *Prosopium williamsoni*, from the Columbia River system near Castlegar, British Columbia: health, contaminants and biology. Can. Tech. Rep. Fish. Aquat. Sci. 1883: 120 p.

- a preliminary study of the health status of mountain whitefish in January 1990, prior to the planned expansion of the bleached kraft pulp mill at Castlegar.

2. DFO Columbia River Fish Health Study- July 1992. Results to be presented at workshop.

3. Assessment of Mountain Whitefish in the Lower Columbia River, March 1993.

- a follow up study after results of to investigate the incidence of gross physical abnormalities in mountain whitefish on the Columbia River. Four sites were sampled: at Genelle, Rock Island (below Trail), Beaver Creek and a reference site on the Slocan River. A draft report is available for review.

4. Investigation of the Incidence of Abnormalities in Selected Fish Species From the Columbia River 1990 to 1992. Paper prepared by R.L and L Consultants.

-abnormalities in mountain whitefish, suckers (longnose, longscale, and bridgelip) and rainbow trout). Rainbow Trout exhibited a low incidence of abnormalities compared to mountain whitefish or suckers.

5. Smith, A.L. 1987b. Levels of metals and metallothionein in fish of the Columbia River near the International Boundary. For DOE, IWL.

Sites included Birchbank and three other upstream sites, the Old Trail Bridge, and Waneta.

6. Norecol Environmental Consultants Ltd. 1989 Statistical analysis of metal levels in fish of the Columbia River near the International Boundary, 1980 to 1988. For DOE, IWD.

Continued the study reported in Smith (1987b) by sampling July 1986 to July 1988.

Fish Distribution Studies:

7. Winter Fish Sampling in the Columbia River Below the Cominco Smelter at Trail (by R.L and L. Consultants, 1992).

8. Lower Columbia River Fisheries Inventory-1990 Studies by R.L and L. Consultants, Dec. 1991.

9. Lower Columbia River Fisheries Inventory-1993 Study. DRAFT report by R.L and L. Consultants, Dec. 1993.

Slag Related Studies:

10. Slag Bioassay Testing - Report is entitled "Survival and Water Quality Results of Bioassays on Five Species of Aquatic Organisms Exposed to Slag from Cominco's Trail Operation.", by Jennifer Nener, DFO, July 1992. Includes Godin and Hagen 1992. Sediment bioassays.

11. Lower Columbia River Distribution of Slag and the Impact on Fish Habitat. A report prepared by Sigma Consultants in Oct. 1992, for DFO.

Includes a map showing location of slag deposition areas noted in 1991 during a field survey and slag deposition areas noted during March 1992 site visit. Also shows DOE's 1990-91 sediment sampling sites and BC MOE's 1976 sediment sampling sites.

12. Johnson, A., D. Norton, B. Yake, and S. Twiss. 1990. Transboundary metal pollution of the Columbia River (Franklin D. Roosevelt Lake). Bull. Environ. Toxicol., 45:703-710.

Concludes that Roosevelt Lake is the ultimate sink for material discharged from Cominco.

13. Patrick, G. 1993. Cominco Slag in Lake Roosevelt: Review of Current Data. IN: Air Monitoring Data and Evaluation of Health Concerns in Areas of Northeast Tri-County. Wa. State Depart. Health. April 1994.

Bioassays:

14. Tuominen, T.M., G.L Ennis, and S.W. Sheehan. 1987. An algal assay study on the effects of metals and nutrient discharges on the algal growth potential in the Columbia River, British Columbia (Data Report). DOE, IWL. 331 pp.

Environmental Quality:

15. Sheehan, S.W. and M. Lamb. 1987. Water Chemistry of the Columbia and Pend d'Oreille Rivers near the International Boundary (Data Report). DOE, IWL. 312 pp.

16. Environmental Impact Assessment for the Application for Amendment of PE-2753 Dated: September 6, 1991. Produced Jan. 1992. R. Crozier and L McDonald.

This report summarizes previous data on water, sediments and biota and provides intrepretation.

17. Butcher, G.A. 1992. Lower Columbia River Hugh Keenleyside Dam to Birchbank. Water Quality Assessment and Objectives, Technical Appendix. BCMOELP.

18. McDonald, L.E. 1992. Columbia River integrated environmental monitoring program. Bioreconnaisance and sediment contamination study. For CREIMP.

This is the program design. Data are in Norecol (1993) and interpretations are in Aquametrix (1994).

19. Norecol Environmental Consultants Ltd. 1993. A biological impact assessment of the Columbia River between the Hugh Keenleyside Dam and the International Boundary. For CRIEMP.

20 Aquametrix Research Ltd. 1994. CRIEMP 1991-1992 Interpretive Report (DRAFT). For CRIEMP.

MINISTRY OF ENVIRONMENT, LANDS AND PARKS

Environmental Protection

Date: November 29, 1993 **File:** **PE-2753**

From: Kootenay Region **By:** **Carl Johnson**

TECHNICAL REPORT (MINOR/APPROVAL)

LEGAL NAME(S): **Cominco Ltd. - Cominco Ltee.**

LOCAL ADDRESS(S): **Trail BC V1R 4L8**

APPLICATION: To amend permit pE-2753 to specify annual loadings in permit limits for fee purposes

DATED: **November 08, 1993**

OPERATION: **Metallurgical Plants**

GEOGRAPHIC LOCATION: **Trail**

PRODUCTION CAPACITY:

SIC CODE:

1. APPLICATION REQUEST

The applicant is requesting specification of annual contaminant loading in this permit for fee purposes as follows:

Appendix 01

Dissolved Lead	3 tonnes/yr
Dissolved Zinc	3 tonnes/yr
Dissolved Cadmium	.2 tonnes/yr
Dissolved Arsenic	.2 tonnes/yr
Total Mercury	.002 tonnes/yr

Appendix 02

Suspended Solids	600 tonnes/yr
Dissolved Lead	5 tonnes/yr
Dissolved Zinc	25 tonnes/yr
Dissolved Cadmium	.8 tonnes/yr
Dissolved Arsenic	.5 tonnes/yr
Total Mercury	.03 tonnes/yr

Appendix 03

Dissolved Lead	6 tonnes/yr
Dissolved Zinc	25 tonnes/yr
Dissolved Cadmium	1.0 tonnes/yr

Appendix 04

Flow	35,000 m3/day
Suspended Solids	30 tonnes/yr
Dissolved Lead	1 tonnes/yr
Dissolved Zinc	1 tonnes/yr
Dissolved Cadmium	.1 tonnes/yr
Dissolved Arsenic	.1 tonnes/yr
Total Mercury	.01 tonnes/yr

1.1 APPLICATION REVISION

none

2. HISTORY

Prior to the Fees Regulation, all the permit limits were specified in terms of concentration of individual samples. Fees are calculated based on the annual discharge to the environment. If the effluent flow rate is multiplied by permit concentration times 365 days per year this figure is very much higher than what is actually discharged since there are many shutdown days in the year and the volume is not always at the maximum rate

specified in the permit. Cominco has, through many years of monitoring the effluents from the Trail smelter determined the typical annual losses of various contaminants. A safety factor is contained in the annual amounts applied for.

3. TECHNICAL ASPECTS

3.1 SOURCE OF DISCHARGE

The source of these discharges is the metallurgical smelter in Trail. Cominco has made significant improvements in the effluent quality since the mid 1980's as more of the contaminated surface drainage water is collected from the site. Cominco has more recently resolved the sewer 07 (appendix 04) situation by installing an indirect heat exchanger for cooling scrubbing water used at the lead smelter absorption plant. Sewer 07 was previously the most contaminated outfall since it contained most of the mercury, lead, cadmium and arsenic that was discharged from the plant to the Columbia River. Cominco has submitted a plan for the control of the balance of the contaminated surface water. This will result in the construction in 1994 of a large plastic lined lagoon for storage and attenuation of flows prior to the effluent treatment plant.

Cominco has also committed to ceasing the discharge of tail slag to the Columbia River by the end of 1996 with a target date of mid 1995.

3.2 TREATMENT OF DISCHARGE

The only significant change in effluent treatment is the installation of the indirect heat exchanger at sewer 07. A small bleed stream of contaminated cooling water is directed to the effluent treatment plant for metals removal and recovery.

3.3 PUBLIC OR AGENCY CONCERNS

none solicited at this time however a copy of the amended permit will be sent to Environment Canada for their information.

3.4 COMPLIANCE STATUS AND ENVIRONMENTAL IMPACT

The following is an assessment of the environmental impact rating of the proposed discharge:

Criteria	Rating Factors	Rating
Quantity of Discharge	Effluent Discharge >500 m3/d	1
Quality of Receiving Env. in Relation to Ministry Ambient Objectives	Water Quality Objectives attained with up to a 20% safety factor	3
Dilution Capability and Sensitivity of Receiving Env.	initial dilution <200:1	1
Actual or Intended Uses of Receiving Env.	High Resource Value	3
Public/Agency Sensitivity	High Sensitivity	3
Potential and Actual Human Safety and Health	SomeThreat to Human Health due to contact with discharged effluent or air contaminants	1
Total		12

3.5 RECEIVING ENVIRONMENT

No site inspection was done for this application. The Columbia River is the receiving water for effluents from Cominco. The water quality is generally acceptable for most uses except during spill or upset events. The major issue is that metals and slag contained in the effluent generally settle out in Roosevelt Reservoir in USA. There is much public concern about the long term impacts of the smelter on sediments and aquatic life in the reservoir.

3.6 PROPOSED MONITORING

There are no changes proposed to the monitoring program as a result of this application.

3.7 COMPLIANCE WITH POLICY OR OBJECTIVES

At this time the site specific water quality objectives for the lower Columbia River are being developed.

3.8 ASSESSMENT

The permit limits applied for by Cominco are considered achievable since they are based on many months of data accumulation. There is adequate monitoring of the effluent quality and flow that an annual limit is readily calculated. Cominco has adequate QA/QC on the data and flow measurement instrumentation.

4. RECOMMENDATIONS

It is recommended that the amendment be granted as applied for.

Carl Johnson
Industrial Section
Kootenay Region

(I agree with recommendations)
Rick Crozier
Regional Waste Manager
Kootenay Region

Cominco Ltd./Trail, British Columbia, Canada V1R 4L8
Tel. (604) 364-422[illegible] x 041-4426
Fax (604) 364-43[illegible]
COMINCO METALS *A Division of Cominco Ltd.*

Cominco Metals

A Division of Cominco Ltd.

ENVIRONMENTAL PROTECTION
NOV 17 1993
NELSON, B.C.

Mr. R.J.Crozier R.P. Bio.
Regional Manager
Environmental Protection
Ministry of Environment, Lands & Parks
#401, 333 Victoria Street
Nelson, B.C.
V1L 4K3

November 08, 1993

Re: Waste Management Permit PE - 02753

Dear Sir:

Cominco Limited hereby makes application for amendments to Effluent Permit PE-02753.

The nature of the amendments are reductions in the annual discharge rates for appendices 1, 2, 3 and 4 and an increase in the allowable daily flow in appendix 4.

The requested amendments are:

Appendix 1

Dissolved Lead
reduce annual discharge from 6.39 tonnes to 3 tonnes/year

Dissolved Zinc
reduce annual discharge from 12.0 tonnes to 3 tonnes/year

Dissolved Cadmium
reduce annual discharge from 1.28 tonnes to 0.2 tonnes/year

Dissolved Arsenic
reduce annual discharge from 1.28 tonnes to 0.2 tonnes/year

Total Mercury
reduce annual discharge from 0.026 tonnes to 0.002 tonnes/year

Appendix 2

Suspended Solids
reduce annual discharge from 703 tonnes to 600 tonnes/year

2/ PE-02753 Amendments

Appendix 2 (cont)

Dissolved Lead
reduce annual discharge from 10.04 tonnes to 5.0 tonnes/year

Dissolved Zinc
reduce annual discharge from 35.0 tonnes to 25.0 tonnes/year

Dissolved Cadmium
reduce annual discharge from 1.41 tonnes to 0.8 tonnes/year

Dissolved Arsenic
reduce annual discharge from 1.00 tonnes to 0.5 tonnes/year

Total Mercury
reduce annual discharge from 0.100 tonnes to 0.03 tonnes/year

Appendix 3

Dissolved Lead
reduce annual discharge from 12.05 tonnes to 6 tonnes/year

Dissolved Zinc
reduce annual discharge from 50.0 tonnes to 25.0 tonnes/year

Dissolved Cadmium
reduce annual discharge from 2.01 tonnes to 1.0 tonnes/year

Appendix 4

Flow
increase flow to 35,000 M^3/day from 30,000 M^3/day

Suspended Solids
reduce annual discharge from 274 tonnes to 30 tonnes/year

Dissolved Lead
reduce annual discharge from 10.95 tonnes to 1.0 tonnes/year

Dissolved Zinc
reduce annual discharge from 50.0 tonnes to 1.0 tonnes/year

3/ PE-02753 Amendments

Appendix 4 (cont)

Dissolved Cadmium
reduce annual discharge from 5.48 tonnes to 0.10 tonnes/year

Dissolved Arsenic
reduce annual discharge from 2.74 tonnes to 0.10 tonnes/year

Total Mercury
reduce annual discharge from 0.383 tonnes to 0.01 tonnes/year

Yours truly

Douglas M. Glover
Group Leader, Environmental Monitoring
Phone: (604) 364-4301
Fax: (604) 364-4198

cc: WWW, MTM, IAM, SBK, DHM, WAV, WAJ, ARB, GFK, RWA, RLB, NMB

APPLICATION WORK FORM

APPLICANT (name and address) or WORK ORDER ☐

Cominco Ltd. - Cominco Ltee

AGENT (name and address if appointed)

500-200 Burrard Str.
Vancouver, B.C. V6C 3L7

FILE No. PE-2753
APPLICATION DATE NOV. 8 19 93
APPLICATION RECEIVED NOV. 17 19 93
REGION Kootenay
PROCESSING OFFICE CODE 40
SECTION Ind.
ASSIGNED WM OFFICER C. Johnson

OPERATION DESCRIPTION Other Non Ferrous Smelting Ind.
LOCATION DESCRIPTION Trail
INDUSTRY CODE 2959 PRODUCTION CAPACITY 1,225 Tonnes/day

ADMINISTRATIVE CHECK LIST:

1. APPLICATION SIGNED ✓
2. APPLICATION DATED ✓
3. RECEIVED WITHIN 15-DAY LIMIT ✓
4. AGENT AUTHORIZATION COMPLETED (if appointed)
5. APPLICATION FEE PAYMENT (if applicable)
   RECEIVED NOV 22/93 AMOUNT $100.00
   Receipt # 834836 Cheq # 573489

ADMINISTRATIVELY ACCEPTABLE AS APPLICATION: [signature]

PRELIMINARY TECHNICAL CHECK LIST:

1. LAND DESCRIPTION ADEQUATE ✓
2. DESCRIPTION OF SOURCE ✓
3. TYPE AND CHARACTERISTICS OF DISCHARGE ✓
4. QUANTITY OF DISCHARGE ✓
5. ADDITIONAL INFORMATION ✓
6. APPLICATION FEE PAID IN FULL (if applicable) ✓

TECHNICALLY ACCEPTABLE AS APPLICATION: C. Johnson

PROCESSING SCHEDULE:

1. CIRCULATED TO AGENCIES BY _____ 19 __
2. PROOF OF PUBLISHING BY _____ 19 __
3. FINAL OBJECTIVE DATE _____ 19 __
4. SITE INVESTIGATION DATE _____ 19 __
5. TARGET RESUME DATE _____ 19 __
6. TARGET DECISION DATE _____ 19 __

PUBLISHING REQUIREMENTS:

1. PUBLISHING OR POSTING
   ☐ Required ☒ Not Required
   (a) BRITISH COLUMBIA GAZETTE
   (b) _____
   (c) _____ (local papers or post office)
2. PERSONAL SERVICE
   ☐ Required ☐ Not Required
   To: _____

Date _____ (Regional Waste Manager) _____

CIRCULATION INSTRUCTIONS:

☐ E.P. OF ENVIRONMENT OF CANADA
☐ REGIONAL DISTRICT OF _____
☐ HEALTH _____
☐ FISH AND WILDLIFE REGIONAL OPERATIONS
☐ WATER MANAGEMENT BRANCH
☐ AGRICULTURE AND FISHERIES
☐ MINES (TAILINGS POND)
☐ APPLICANT (TAILINGS POND)
☐ CONCERNED PERSONS
☐ OTHERS (SPECIFY)

N/A

DETERMINED BY C. Johnson DATE NOV 22/93

MINOR PERMIT
☐ Publish Manager's Decision Carl Johnson

AMENDMENT IMPOSED BY MANAGER
☐ Publish Decision ☐ Notify Permittee

Cominco Ltd./Trail. British Columbia, Canada V1R 4L8
Tel. (604) 364-4[illegible]/Telex 041-4426
Fax (604) 364-4
COMINCO METALS *A Division of Cominco Ltd.*

file PE 2757 ← Assistance required from Air Resources Branch. Memo of request sent by Carl Johnson.

Cominco Metals

A Division of Cominco Ltd.

Graham F. Kenyon
Manager,
Environment & Health
Tel. (604) 364-4238
Fax (604) 364-4144

Mr. Rick Crozier
Regional Manager
B. C. Environment
Waste Management Branch
3rd Floor, 333 Victoria Street
Nelson, B. C.
V1L 4K3

ENVIRONMENTAL PROTECTION
NOV 04 1993
NELSON, B.C.

October 29, 1993

Dear Mr. Crozier:

Re: **AIR QUALITY CRITERIA**

We need some guidance regarding acceptable air quality criteria for the Trail area, particularly for lead and arsenic.

As you are aware we have been working on the feasibility engineering for the new Kivcet lead smelter which is expected to substantially reduce emissions. We have also initiated engineering studies in the Lead Refineries aimed at substantial reductions from sources there, particularly for arsenic which will not be greatly impacted by the new smelter.

The current B. C. Air Quality Objectives for Mining, Smelting and Related Industries (1979) are expressed as quite wide ranges:

Lead:	1.0 - 2.5 $\mu g/m^3$
Arsenic:	0.1 - 1.0 $\mu g/m^3$

The typical annual average values at our Trail area monitoring sites are around the lower end of those objectives, and have been for the past several years. The 24 hour readings are quite variable, but there is no indication in the Objectives of the relative importance of short term versus longer term average values with regard to any potential health effects.

The Ministry is in the process of reviewing the 1979 Objectives, but we are advised it will be some time before that process is complete.

The influence of weather conditions on emissions dispersion in the Columbia Valley is notorious, as you know; however it seems reasonable to expect that if emissions are reduced by 70-80% there should be a corresponding improvement in air quality. We are obtaining advice from Cirrus Consultants regarding the emissions dispersion mechanisms that can influence air quality up and down the Columbia Valley. We are hopeful that a simple relationship can be developed between historical air quality/emissions data and the reduced emissions anticipated with the new smelter that will confirm the beneficial effect of the new smelter on air quality. The question is, what will be the measure of acceptable air quality?

Presumably the Provincial Objectives were related to health risk when they were established in 1979. Can we be confident that using the most conservative limits in the 1979 Objective ranges will provide a safe level of health protection, given the topography and meteorology of the Trail area? Given that the Objectives are now 14 years old it may be appropriate to review them relative to current health data and in the context of the Trail situation. Lead is being addressed through the Lead Task Force with regard to the potential risk to young children. Arsenic, and perhaps cadmium too, may need to be considered relative to the broader population.

Whatever approach is used, we need assurance that the goals we are working towards with the new smelter technology are practicably achievable and will adequately protect the health of our community. Would you please advise how we should proceed with respect to obtaining that assurance as expeditiously as possible.

Yours truly,

Graham F. Kenyon
Manager, Environment & Health

GFK:D

NOTICE OF AN MINOR AMENDMENTS TO PERMIT NOS. PA-02690, PA-02691, PA-02692, PE-02753 AND PE-05309 ISSUED UNDER THE PROVISIONS OF THE WASTE MANAGEMENT ACT, S.B.C. 1982, c.41, IN THE NAME OF COMINCO LTD. - COMINCO LTEE

Take notice that minor amendments to Permit Numbers PA-02690, PA-02691, PA-02692, PE-02753 and PE-05309 for discharges to the atmosphere and Columbia River located at Trail, British Columbia has been issued.

The amendments consist of:

a) Authorizing a total annual loading of contaminants in the discharges in addition to existing concentration and flow rate limits. In all cases, the total annual loading limit is less than that previously authorized by calculation of losses based on concentration, flow rate and total hours of operation.

b) Deletion of authorization for several discharges no longer in existence.

A copy of the Amended Permits may be viewed at Environmental Protection, B.C. Environment, 617 Vernon Street, Nelson, B.C., V1L 4E9 during normal business hours.

Dated at Nelson, British Columbia this 19th day of November, 1992.

R.J. Crozier, R.P. Bio.
Regional Waste Manager

/sw

PROVINCE OF
BRITISH COLUMBIA

MINISTRY OF
ENVIRONMENT,
LANDS AND PARKS

Environmental Protection
617 Vernon Street
Nelson, BC, V1L 4E9
Telephone: (604) 354-6355
Fax: (604) 354-6367

NOV 19 1992

File: PA-02692

REGISTERED MAIL

Cominco Ltd. - Cominco Ltee
500 - 200 Burrard Street
Vancouver, British Columbia
V6C 3L7

Gentlemen:

Notice of Minor Amendment to Permit No. PA-2692
Issued under the provisions of the Waste Management Act
S.B.C. 1982 C.41, in the name of
Cominco Ltd. - Cominco Ltee

Please remove and destroy the original pages in your Permit package and replace them with the revised version enclosed.

Yours truly,

R.J. Crozier, R.P. Bio.
Regional Waste Manager

/sw
Enclosure

PROVINCE OF
BRITISH COLUMBIA

MINISTRY OF
ENVIRONMENT,
LANDS AND PARKS

Environmental Protection
617 Vernon Street
Nelson, BC, V1L 4E9
Telephone: (604) 354-6355
Fax: (604) 354-6367

NOV 19 1992

File: PA-02692

REGISTERED MAIL

Cominco Ltd. - Cominco Ltee
500 - 200 Burrard Street
Vancouver, British Columbia
V6C 3L7

Gentlemen:

Enclosed is a copy of Amended Permit No. PA-02692 issued under the provisions of the Waste Management Act, in the name of Cominco Ltd. - Cominco Ltee. Your attention is respectfully directed to the terms and conditions outlined in the Permit.

The administration of this Permit will be carried out by staff from our Regional Office located at 617 Vernon Street, Nelson, British Columbia, V1L 4E9 (telephone 354-6355). Plans, data and reports pertinent to the Permit are to be submitted to the Regional Waste Manager at this address.

Yours truly,

R.J. Crozier, R.P. Bio.
Regional Waste Manager

/sw

Enclosure

MINISTRY OF ENVIRONMENT

PERMIT

Under the Provisions of the Waste Management Act

COMINCO LTD. - COMINCO LTEE

500 - 200 Burrard Street, Vancouver, British Columbia, V6C 3L7

is hereby authorized to discharge contaminants

from a zinc smelter and associated plants

located at Trail, British Columbia

to the air.

This permit has been issued under the terms and conditions prescribed in the attached appendices 01 to 07, 09, 10, 19, 20, 23, 24, 26 to 34, 36 to 42, A-1 to A-12, B-1, B-2, C-1, C-2 and C-3

R.J. Crozier, R.P. Bio.
Regional Waste Manager

Date issued September 9, 19 75

Amendments dated January 5, 19 79

April 8, 19 87

NOV 19 1992, 19

Permit No. PA-02692

ENV 1988
cc

MINISTRY OF ENVIRONMENT

WASTE MANAGEMENT BRANCH

APPENDIX No. 01 ·6c

to Permit No. PA-02692
(Air)

(a) The discharge of contaminants into the air to which this Appendix is applicable is from the main zinc stack identified as Z-1 (the source of the emission is the zinc roaster off gas which has been processed through Hg removal plant, acid plants, gas absorption towers and ancillary facilities as shown on the attached Appendix A-5.

(b) The rate of discharge authorized is:
Maximum: 5,260 m^3/min Duration: Intermittent Frequency: as required.

Average daily (based on the normal operating period) 3,670 m^3/min - the normal operating period is 24 hours/day.

(c) The characteristics of the contaminants shall be equivalent to or better than:

Contaminant	Average daily Concentration based on the normal operating period.	Maximum Concentration	Duration	Frequency
SO_2	Control regime as per Appendix C-1			
Total Particulate	230 mg/m^3	230 mg/m^3	24 hrs/day	continuous

Annual total particulate emissions shall not exceed 75 tonnes per year based on the summation of monthly isokinetic measurements of stack emissions.

NOTE: All air and gaseous volumes specified in items (b) and (c) above are at standard conditions which are:
Standard Temperature = 293.15°K
Standard Pressure = 101.325 KPa
Water Vapour zero unless otherwise stated

(d) The works authorized are fans, ducts, tail gas absorption tower, Brink mist eliminator and Brink mist eliminator bypass system, Hg removal plant, stack and related appurtenances.

(e) The location of the facilities from which the discharge originates and to which this Appendix is appurtenant is Lot 3, Plan 4926, Kootenay District.

(f) The works authorized must be completed and in operation on and from the date of this Appendix.

R.J. Crozier, R.P. Bio.
Regional Waste Manager

Date issued September 9, 19 75
Date amended January 5, 19 79
April 8, 19 87

NOV 19 1992

ENV 1993 cc

MINISTRY OF ENVIRONMENT

WASTE MANAGEMENT BRANCH

APPENDIX No. 40 - 2

to Permit No. PA-02692
(Air)

(a) The discharge of contaminants into the air to which this Appendix is applicable is from the Zinc Melting Plant Furnace Baghouse (Source 1) as shown on the attached Appendix A-12.

(b) The rate of discharge authorized is:

Maximum: 3,000 m^3/min Duration: 24 hours/day : continuous.

Average daily (based on the normal operating period) 3,000 m^3/min - the normal operating period is 24 hours/day - continuous.

(c) The characteristics of the contaminants shall be equivalent to or better than:

Contaminant	Average daily Concentration based on the normal operating period.	Maximum Concentration	Duration	Frequency
Total Particulate	46 mg/m^3	46 mg/m^3	24 hrs/day	continuous
Zinc	7 mg/m^3	7 mg/m^3	24 hrs/day	continuous

Annual total particulate emissions shall not exceed 15 tonnes. Annual zinc emissions shall not exceed 7 tonnes.

NOTE: All air and gaseous volumes specified in items (b) and (c) above are at standard conditions which are:
Standard Temperature = 293.15°K
Standard Pressure = 101.325 KPa
Water Vapour zero unless otherwise stated

(d) The works authorized are baghouse, fans, stack and related appurtenances approximately located as shown on the attached Appendix A-12.

(e) The location of the facilities from which the discharge originates and to which this Appendix is appurtenant is Lot A, Plan 12693, Kootenay District.

(f) The works authorized must be completed and in operation on and from the date of this Appendix.

R.J. Crozier, R.P. Bio.
Regional Waste Manager

Date issued April 8, 19 87
Date amended NOV 19 1992, 19
, 19

ENV 1993 cc

MINISTRY OF ENVIRONMENT

WASTE MANAGEMENT BRANCH

APPENDIX No. 42 - 7

to Permit No. PA-02692
(Air)

(a) On and from the date of issuance of this Appendix the total annual sulphur emissions measured as sulphur dioxide from the zinc smelting operations of Cominco Ltd. in Trail, British Columbia shall not exceed 2,380 tonnes per year.

The total loading limit is based on the following:

(i) An annual summation of the daily average SO_2 concentration of gases in the Z-1 stack multiplied by the gas flow rate as estimated by daily average annubar values correlated to actual gas flow rate measurements.

Date issued NOV 19 1992, 19

Date amended ....., 19

....., 19

R.J. Crozier, R.P. Bio.
Regional Waste Manager

ENV 1993 cc

MINISTRY OF ENVIRONMENT

WASTE MANAGEMENT BRANCH

APPENDIX No. C-1

to Permit No. PA-02692

Commencing on the date of issuance of this Amended Permit, the following source and ambient air monitoring program shall be carried out by the Permittee and the results submitted to the Regional Waste Manager.

A. SOURCE MONITORING

	Appendix	I.D.	Description	SO_2	Total Particulate	Zn	Cd
E102935	01	Z-1	Main Zinc Stack	C	M*		
E102953	19	Z-44	#1 Cadmium Furnace				SA
E212106	19	Z-45	#2 Cadmium Furnace				SA
E206936	40	EM-1	Zinc Melting Plant Baghouse		A	A	
E206937	41	EM-3	Zinc Atomizer Stack		A	A	

C = Continuous
M = Monthly
SA = Semi-Annually
A = Annually

NOTE: Continuous SO_2 stack data is to be submitted as the average daily concentration and daily rate of discharge. Record charts are to be retained for a period of 6 months.

* Sampling to be done each month, samples taken when Brink Smoke Eliminator bypassed are not considered for Permit Compliance purposes.

2. Discharge Rate Measurement

Measure and record on the day of sampling of the above emissions, the average daily rate of discharge from each stack in m^3/min. based on the normal operating period.

3. Sampling Facilities

Sampling ports shall be provided with nearby electrical and pneumatic outlets and, where required, approved access ladders and adequately sized platforms, for the discharges covered by Appendices 01, 19, 40 and 41 to enable Waste Management Personnel to monitor these emissions.

R.J. Crozier, R.P. Bio.
Regional Waste Manager

Date issued April 8, 19 87

Date amended NOV 19 1992, 19

, 19

ENV 1993 cc

File: 0262100-PA-2691

Date: November 9, 1979

From: Processing Division
Mining Section (PO)

RESUME FOR PERMIT AMENDMENT APPLICATION

Application on behalf of Cominco (Trail) Ltd. dated September 19, 1979

1. APPLICATION

Cominco has applied to cover the installation of an emergency bypass stack on the bismuth pot ventilation system. This stack will be used in the event of a breakdown or failure of the Refinery Scrubber. The maximum emission rate will be 19.6 moles per second for a maximum duration of eight hours per year. There will be no treatment of this bypass emission. The emission quality will average 0.27 milligrams per mole particulate lead, 0.017 milligrams per mole particulate arsenic, trace levels of particulate bismuth, trace levels of gaseous chlorine and trace levels of gaseous fluorine.

2. AMENDMENT PROPOSED BY P.C.B.

None.

3. PERMIT

The original permit was amended on October 16, 1978 and is still valid. No other amendments or changes are required at this time.

4. ADMINISTRATIVE ASPECTS

The various agencies were advised of the amendment application on October 12, 1979, however no comments were received. Publishing was not required.

5. REGIONAL SITE INSPECTION

There was no inspection because of the minor nature of this application.

6. DISCUSSION OF TECHNICAL ASPECTS

The Bismuth pot is located at the north-west end of the Silver Refinery. This pot is used on a campaign basis two to three times per year for a one month duration each time. Normally the ventilation of this pot is directed to the refinery scrubber and discharged via Stack R1A. However in the event of a breakdown of the refinery scrubber, these emissions must be bypassed until the pot can be shut down. At present there is no bypass provision on this emission source, and therefore if an emergency shut down of the refinery scrubber occurs, the bismuth pot ventilation system would have to be shut down resulting in a severe impairment of the working environment within the silver refinery. All of the other emission sources reporting to the refinery scrubber bypass using their previous stacks and treatment works.

The present bypass clause is shown below:

E. BYPASSES

The discharge of contaminants from any of the sources of emission to the air which has bypassed any portion of the designated treatment works under Permit is prohibited.

.../2

Any use of the lead blast furnaces baghouse bypass shall be recorded as to time, date, duration, and reason for the bypasses. Any use of the foundry furnace bypasses shall be totallized. All bypass records are to be submitted annually accompanying the report required under Section D of the Monitoring Program.

In order to cover the situation indicated on this application and any such condition whereby treatment works are bypassed due to emergency conditions, a new bypass clause is required. The wording for this clause is contained in the recommendation.

7. RECOMMENDATION

It is recommended that the Director amend Clause E of Pollution Control Permit PA-2691 entitled "Bypasses" so that circumstances indicated in the amendment application would be covered. The amended clause should read as follows:

E. Bypasses

The discharge of contaminants from any of the sources of emission to the air which has bypassed any portion of the designated treatment works under Permit is prohibited, unless and except where an emergency condition arises. In such cases, bypasses are to be minimized as to duration and volume and the Permittee shall ensure that the emission quality is the best obtainable under the circumstances of the emergency. All such instances of bypass are to be reported to the Regional Manager immediately, followed by a summary report within two weeks.

Any use of the lead blast furnaces baghouse bypass shall be recorded as to time, date, duration, and reason for the bypasses. Any use of the foundry furnace bypasses shall be totallized. All bypass records are to be submitted annually accompanying the report required under Section D of the Monitoring Program.

P. Olthof

PO/bg

Environment Canada / Environnement Canada
Conservation and Protection / Conservation et Protection
Environmental Protection
224 West Esplanade
North Vancouver, BC V7M 3H7

CANADA'S GREEN PLAN
LE PLAN VERT DU CANADA

ENVIRONMENTAL PROTECTION
JUN 2 - 1992
NELSON, B.C.

Your file / Votre référence
Our file / Notre référence
4487-37/C685

June 15, 1992

Mr. R.J. Crozier
Regional Manager
Environmental Protection
Ministry of Environment, Lands and Parks
617 Vernon Street
NELSON, BC
V1L 4E9

Dear Mr. Crozier:

Re: Amended Permits pursuant to the Waste Management Act
on behalf of Cominco Ltd.
issued February 14, 1992

Staff of Environment Canada and the Department of Fisheries and Oceans have had the opportunity to review the amended permits referenced above and evaluate the permit provisions relative to the federal recommendations outlined in M. Ito's letter dated December 6, 1991. Our position is summarized below.

PE-2753

We note that the dates for study submissions and implementation have slipped from our recommended schedules. We are concerned with delays in resolving the pollution problems at this site, however, we recognize that the permits must reflect a compromise between the need to implement further environmental improvements and the difficulties experienced in commissioning the new lead smelter. We accept that most dates represent realistic deadlines for the Company, and are pleased that many of our recommendations for studies have been included explicitly in the Permit. We are particularly pleased with the requirement for a comprehensive review of the Permit to be completed by June 1, 1994 (Section 1.13), and the inclusion of additional monitoring which will allow total metals and dissolved copper maximum grab and 24-hour composite permit criteria to be established. We are also pleased with the requirement for an annual environmental report (Section 3.1, Part 3) and note that this report should identify the frequency and severity of spills and describe

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improvements in spill control as recommended in our December 6th letter (Specific Recommendation #3). We recognize that several of our recommendations require an amendment to the fertilizer plant permit (PE-5309) which, we understand, is under way.

We do note, however, that many of our recommendations are not explicitly incorporated in the Permit. Lack of detail in the permit conditions leads us to conclude that frequent communication is needed with your staff and Cominco personnel to ensure study details, and other matters, are addressed to the satisfaction of the federal and provincial governments. As an example, our difficulties identified with the Surface Drainage Collection terms of reference, Special Effluents Evaluation and the QA/QC Plan could have been more effectively dealt with by prior discussion and/or agreement on the terms of reference.

Identification of the most toxic effluent streams, and efforts to reduce, reuse or recycle water within the Trail complex are seen as key components in Cominco's pollution abatement strategy. Thus, we consider it imperative that both your office and ourselves be directly involved in giving detailed direction to these studies, and receive the results as soon as they are available. To this end, we reiterate our recommendation for the establishment of a joint Company/provincial/federal working group whose first task would be to review the terms of reference for activities such as terms of reference for on-land slag disposal studies, and detailed elements of the Company's proposed effluent assessment program. This group should meet every six weeks and/or at critical times identified in the Permits in order to reach agreement on study items as well as provide status updates and information exchange.

There are several aspects of PE-2753 which we cannot endorse. These include the provisions which condone emergency sulfuric acid discharges (Section 1.9), and the lack of a source-specific environmental effects monitoring program. Reliance on the Columbia River Integrated Environmental Monitoring Program (CRIEMP) to develop such a program (Section 2.7, Part 1) has not worked to date, and should be revisited.

We are very concerned with the provision which allows continued slag discharge to the Columbia River until December 31, 1996, with on-land disposal as part of Phase II lead smelter modernization (Section 1.7). We realize that this date was selected to represent a worst case covering the unlikely possibility of significant delays in commissioning the new lead smelter. However, recent information suggests that the

slag is not as chemically stable and inert as previously stated by the Company. Thus, the requirement to cease the discharge of slag to the Columbia River has increased. We understand the Company's reluctance to construct costly and "redundant" slag handling facilities in the absence of clear information on the environmental implications of slag disposal.

In the absence of such facilities, we understand that timing for on-land slag disposal would be influenced by the Company's decision on lead smelter technology. The Permit (Section 1.12) required this decision to be submitted by June 1, 1992. However, a letter report recently submitted by the Company, to comply with this section of the Permit, indicates that no choice on technology will be made until October 1992. Thus, an implementation schedule for the start of "non-redundant" on-land slag disposal has again been delayed.

As stated in our December 6th letter, the proposal to delay on-land slag disposal until Phase II of the lead smelter modernization (four to five years from the date of that December 6, 1991 letter) was not, at that time, considered acceptable. As outlined above, new information (both technical effects data and Company schedule delays) continue to create federal concern over the slag handling issue. Accordingly, Environment Canada and the Department of Fisheries and Oceans will be conferring, both in our regional and national headquarters offices, to develop a federal position regarding the timing of on-land slag disposal. In the meantime, we urge you to reconsider your permit conditions regarding the discharge of slag to the Columbia River so that the discharge ceases as soon as feasible. Staff of Environment Canada and the Department of Fisheries and Oceans will be pleased to review our information with you to aid your decision-making process.

PA-02691

We understand the Permit does not incorporate the requirements of the Secondary Lead Smelter Release Regulations pursuant to the Canadian Environmental Protection Act (CEPA). We will therefore proceed independently to determine which emissions are subject to the Regulations and if these emissions are in compliance.

We trust that our position in this matter is clear. We look forward to continuing to work with your staff and Cominco personnel to ensure implementation of our detailed recommendations and to improve pollution

control at the Cominco smelter as required by the CEPA and the federal Fisheries Act. Please contact Peri Mehling at 604-666-2399 if you have any questions.

Yours truly,

Leslie M. Churchland
Acting Manager
Pollution Abatement Branch

cc: G. Kenyon, Cominco Ltd., Trail
G. Ennis, DFO, Eastern B.C. Unit, Vancouver
P. Ricard-Desjardins, ISTC, Ottawa
J. Keating, EMR, Ottawa
D. Deans, DFO, Vancouver

PROVINCE OF
BRITISH COLUMBIA

MINISTRY OF
ENVIRONMENT,
LANDS AND PARKS

Environmental Protection
617 Vernon Street
Nelson, BC, V1L 4E9
Telephone: (604) 354-6355
Fax: (604) 354-6367

FEB 14 1992

File: PE-02753

REGISTERED MAIL

Cominco Ltd.
500 - 200 Burrard Street
Vancouver, British Columbia
V6C 3L7

Gentlemen:

Enclosed is a copy of Amended Permit No. PE-02753 issued under the provisions of the Waste Management Act, in the name of Cominco Ltd. Your attention is respectfully directed to the terms and conditions outlined in the Permit.

The administration of this Permit will be carried out by staff from our Regional Office located at 617 Vernon Street, Nelson, British Columbia, V1L 4E9 (telephone 354-6355). Plans, data and reports pertinent to the Permit are to be submitted to the Regional Waste Manager at this address.

Yours truly,

R.J. Crozier, R.P. Bio.
Assistant Regional Waste Manager

/sw

Enclosure

MINISTRY OF ENVIRONMENT, LANDS AND PARKS

PERMIT

Under the Provisions of the Waste Management Act

COMINCO LTD.

500 - 200 BURRARD STREET

VANCOUVER, BRITISH COLUMBIA

V6C 3L7

is authorized to discharge effluent from a lead - zinc smelter located in Trail, British Columbia, to the Columbia River, subject to the following terms and conditions outlined in attached Pages 2 to 18 and Appendices 01, 02, 03, 04, A-1.

An annual permit fee will be determined on the basis of your industrial code and capacity in accordance with the Waste Management Fees Regulation.

This Permit does not authorize entry upon, crossing over, or use for any purpose of private or Crown lands or works, unless and except as authorized by the owner of such lands or works. The responsibility for obtaining such authority shall rest with the Permittee.

Date issued: November 29, 1978

Amendment date: FEB 14 1992
(most recent)

R.J. Crozier, R.P. Bio.
Assistant Regional Waste Manager

Permit Number: PE-02753

SECTION ONE: GENERAL

1.1 MAINTENANCE OF WORKS

The Permittee shall inspect the pollution control works regularly and maintain them in good working order. The Permittee shall notify the Regional Waste Manager of any malfunction of these works.

1.2 EMERGENCY PROCEDURES

In the event of an emergency or condition beyond the control of the Permittee which prevents continuing operation of the approved method of pollution control, the Permittee shall immediately notify the Regional Waste Manager and take appropriate remedial action. The Permittee shall submit a report to the Regional Waste Manager detailing the circumstances and environmental effects of the incident within 10 working days.

1.3 BYPASSES

The discharge of effluent which has bypassed the designated treatment works is prohibited unless the approval of the Director or the Regional Waste Manager is obtained and confirmed in writing.

1.4 PROCESS MODIFICATIONS

The Permittee shall notify the Regional Waste Manager prior to implementing changes to any process that may affect the quality and/or quantity of the discharge.

R.J. Crozier, R.P. Bio.
Assistant Regional Waste Manager

Date issued: November 29, 1978

Amendment date: FEB 14 1992
(most recent)

1.5 AREA RUNOFF COLLECTION AND TREATMENT EVALUATION

In order to further reduce dissolved and total metals discharges to the Columbia River, the Permittee shall continue to evaluate the need for additional area runoff collection including but not limited to: process spills, roof drainage, precipitation and snow melt events.

The Permittee shall evaluate the need for increased effluent treatment capacity and evaluate other possible options.

The Permittee shall submit to the Regional Waste Manager the Terms of Reference of the above evaluation on or before April 30, 1992.

The Permittee shall submit to the Regional Waste Manager for his approval on or before March 31, 1993 a report outlining the findings of the above investigations, identification of priority areas, and a timetable for installation of additional works.

The Permittee shall submit to the Regional Waste Manager on or before May 31, 1993, evidence of funding to commence the construction of additional containment areas and to provide sufficient treatment capacity for anticipated future needs.

Approved works shall be installed and operational by September 1, 1994.

1.6 VEHICLE CONTAMINANT CONTROL

The Permittee shall ensure, to the satisfaction of the Regional Waste Manager, that contaminants are not transported off the plant site on the wheels and undercarriage of vehicles.

R.J. Crozier, R.P. Bio.
Assistant Regional Waste Manager

Date issued: November 29, 1978

Amendment date: FEB 14 1992
(most recent)

1.7 TAIL SLAG DISPOSAL

The Permittee shall submit to the Regional Waste Manager on or before June 30, 1993 an application for a Waste Discharge Permit for land disposal of tail slag, for his adjudication or provide a commitment for an alternate use of tail slag. An application for land disposal shall be supported by an Engineering Feasibility Study and Environmental Impact Assessment of the preferred land disposal method and location.

If a new lead smelting technology is chosen, the Permittee shall, in conjunction with Sub-Section 1.12 of this Permit, investigate and report on the feasibility of construction of new slag fuming facilities, slag handling and dewatering facilities coincident with the construction of a new lead smelter. This report shall be submitted to the Regional Waste Manager for his consideration by September 1, 1992. If considered feasible, evidence, satisfactory to the Regional Waste Manager, of commencement of construction of works or commitment of adequate funding for works designed to eliminate the discharge of tail slag to the Columbia River shall be submitted to him on or before December 31, 1993.

If simultaneous construction of smelting, new slag fuming and slag handling facilities is not feasible, evidence, satisfactory to the Regional Waste Manager, of commencement of construction of works or commitment of adequate funding for works designed to eliminate the discharge of tail slag to the Columbia River shall be submitted to the Regional Waste Manager on or before December 31, 1994.

The authority to discharge tail slag to the Columbia River ceases effective December 31, 1996.

R.J. Crozier, R.P. Bio.
Assistant Regional Waste Manager

Date issued: November 29, 1978

Amendment date: FEB 14 1992
(most recent)

1.8 TANK CLEAN OUT

Prior to the clean out of any process tank or vessel the Permittee shall obtain representative samples and analyses of the material to be disposed of and shall notify the Regional Waste Manager in order to obtain prior approval for the disposal method.

During the period of any tank clean out involving discharge to the Columbia River the Permittee shall take continuous samples or sample as required by the Regional Waste Manager, to determine the resultant effect on the final discharge quality. Analysis for contaminants shall be carried out at a frequency and for parameters determined by the Regional Waste Manager.

1.9 EMERGENCY DISCHARGE OF SULPHURIC ACID TO THE COLUMBIA RIVER

Subject to the written approval of the Regional Waste Manager, the Permittee is authorized to discharge up to 200 tonnes/day of product 93% sulphuric acid to the Columbia River via Sewer IV from the Warfield Fertilizer Plant at a controlled rate such that the following conditions are satisfied:

1. All reasonable alternate methods for consumption or disposal of the excess acid have been exhausted.

2. The period of discharge **must be approved in writing by** the Regional Waste Manager.

3. The pH of the Columbia River at the midpoint of the new Trail Bridge shall not be less than 6.5 units and the maximum pH depression at this location compared to the Columbia River upstream of the confluence of Stoney Creek shall not be greater than 1 unit.

4. A monitoring program as specified in Sub-Section 2.4 shall be carried out.

Date issued: November 29, 1978

R.J. Crozier, R.P. Bio.
Assistant Regional Waste Manager

Amendment date: (most recent) FEB 14 1992

1.10 SEWER 07 ELIMINATION PROGRAM

The Permittee shall provide evidence, satisfactory to the Regional Waste Manager, by December 31, 1993 of commencement of works designed to eliminate the discharge of effluent to the Columbia River from the Lead Smelter Absorption Plant via Sewer 07 outfall.

Evaluation and implementation of interim measures to reduce contaminant discharges from the lead smelter absorption plant shall be considered as part of the Effluent Management Plan (Sub-Section 1.11).

The authority to discharge effluent from the Lead Smelter Absorption Plant via Sewer 07 outfall expires December 31, 1995.

R.J. Crozier, R.P. Bio.
Assistant Regional Waste Manager

Date issued: November 29, 1978

Amendment date: FEB 14 1992
(most recent)

1.11 EFFLUENT MANAGEMENT PLAN

The objective of this program is to identify further opportunities for reducing the loading of contaminants currently discharged to the Columbia River.

The Permittee shall submit to the Regional Waste Manager for his approval on or before March 31, 1993 a comprehensive Effluent Management Plan which shall contain at a minimum the following:

- a characterization of current metal discharges;
- an assessment of those discharges with respect to toxicity, persistence and potential environmental impact;
- an assessment of the technological and economic feasibility of source reduction and/or treatment options;
- identification of the contributing sources within the operations including discharges from plants, surface drainage catchment areas, containment facilities;
- a determination of priorities for effluent reductions based on the foregoing.

The Permittee shall submit to the Regional Waste Manager for his approval on or before September 1, 1993 a schedule for installation of works identified by the above Effluent Management Plan.

Date issued: November 29, 1978

Amendment date: (most recent) FEB 14 1992

R.J. Crozier, R.P. Bio.
Assistant Regional Waste Manager

1.12 DATE FOR LEAD SMELTING TECHNOLOGY DECISION AND COMMITMENT

The Permittee shall submit to the Regional Waste Manager by June 1, 1992, the company's decision with regard to technology choice for the continued modernization of the lead smelter.

The report shall include the rationale for this decision including environmental implications of the chosen technology. Assuming that a viable and economically supportable technology is identified, the Permittee shall provide by September 1, 1992 a schedule for approvals, engineering, construction, commissioning, and startup, together with more details of the environmental assessment. If not, the Permittee shall provide a contingent program.

1.13 ENVIRONMENTAL PERFORMANCE REVIEW DATE

On or before June 1, 1994, a comprehensive review of the permit operational requirements will be conducted and the effluent quality and quantity specified in Appendices 01, 02, 03 and 04 of this Permit will be reviewed and compared with data obtained from sampling of effluent by both the Permittee and the Ministry of Environment.

The goal of the review is to assess the effectiveness of the Effluent Management Plan (Sub-Section 1.11) towards reduction of total metals and other contaminants discharged to the Columbia River. As part of this review, the Ministry of Environment will assess the total and dissolved metal effluent monitoring data, and the Columbia River monitoring data generated by Columbia River Integrated Environmental Monitoring Program (C.R.I.E.M.P.) and may determine that permit limits be specified as total metals concentration and/or loadings.

R.J. Crozier, R.P. Bio.
Assistant Regional Waste Manager

Date issued: November 29, 1978

Amendment date: (most recent) FEB 14 1992

SECTION TWO, MONITORING

2.1 SEWER MONITORING

Commencing immediately, the following Monitoring Program shall be performed by the Permittee and the results submitted to the Regional Waste Manager. The need for increased or decreased monitoring shall be based on the results of sampling specified below. The Regional Waste Manager may, at his discretion, modify this monitoring program.

SEWER	CONTAMINANT	FREQUENCY
I, II, III, & 07	flow*	
	pH**	continuous
	total zinc	weekly
	dissolved zinc	weekly
	total lead	weekly
	dissolved lead	weekly
	total arsenic	weekly
	dissolved arsenic	weekly
	total cadmium	weekly
	dissolved cadmium	weekly
	total copper	weekly
	dissolved copper	weekly
	total mercury	daily

* Flow in Sewers II, III and 07 is to be measured continuously while Sewer I is to be measured using lithium tracer at least once per month.

** For Sewer I pH is to be measured as the Blast Furnace Pond overflow.

R.J. Crozier, R.P. Bio.
Assistant Regional Waste Manager

Date issued: November 29, 1978

Amendment date: FEB 14 1992
(most recent)

Permit Number: PE-02753

2.2 ADDITIONAL EVALUATION OF EFFLUENT CHARACTERISTICS

During the calendar year 1992, the Permittee shall carry out the following Special Sewer Monitoring Program. The final monitoring program design shall be submitted to the Regional Waste Manager on or before May 1, 1992 for his approval prior to the sampling and analysis.

The results of the following sampling and analysis are to be submitted to the Regional Waste Manager in conjunction with the Effluent Management Plan Report (Sub-Section 1.11) which is to be submitted on or before March 31, 1993.

Additional monitoring may be required by the Regional Waste Manager following the review of this report.

Frequency: 2 times - once under dry conditions and once during wet weather.

Program 1

Parameters: ICP total and dissolved metals scan, organic contaminants to be determined through a review of potential contaminants on the plant site, ammonia, nitrite, 96 hour LC_{50} rainbow trout bioassay.

Sampling Method: All Sewers are to be monitored by 24 hour composite sample except slag discharge launder which may be sampled using grab samples during all phases of a furnace tapping cycle.

Program 2

Parameters: ICP total and dissolved metals scan, ammonia and nitrite.

Sampling Method: Hourly grab samples taken over a 24 hour time period for Sewers I, II, III, 07 and the slag launder, which is to be sampled using grab samples taken during all phases of the tapping cycle.

Date issued: November 29, 1978

R.J. Crozier, R.P. Bio.
Assistant Regional Waste Manager

Amendment date: (most recent) FEB 14 1992

2.3 SPECIAL MONITORING OF EFFLUENTS AFTER STARTUP OF MAJOR PROJECTS

Special effluent and the receiving environment monitoring programs associated with the startup of major new processes or plants may be required as specified by the Regional Waste Manager.

Date issued: November 29, 1978

Amendment date: FEB 14 1992
(most recent)

R.J. Crozier, R.P. Bio.
Assistant Regional Waste Manager

2.4 SPECIAL MONITORING DURING DISCHARGE OF SULPHURIC ACID

During the discharge of sulphuric acid to the Columbia River as authorized by the Regional Waste Manager the following monitoring shall be carried out:

1. Upon commencement of the acid release, the Permittee shall record the pH of the 24 hour composite sample of Sewer IV on a daily basis.

2. Upon commencement of the acid release, the Permittee shall monitor the pH of the Columbia River at the mid point of the new Trail Bridge at a frequency of once per hour or as specified by the Regional Waste Manager.

3. Upon commencement of the acid release, the Permittee shall monitor the pH of the Columbia River immediately upstream of its confluence with Stoney Creek at a frequency of twice per day.

4. Upon commencement of the acid release, the Permittee shall monitor the pH of the Columbia River at Waneta continuously and shall report the pH data collected to the Regional Waste Manager on a daily basis.

5. The Permittee shall determine the daily flow rate of the Columbia River during the acid release.

6. During the release of acid to the Columbia River, Sewer IV shall be sampled daily (24 hour composite) and shall be analyzed for parameters specified in Sub-Section 2.1 or as required by the Regional Waste Manager.

R.J. Crozier, R.P. Bio.
Assistant Regional Waste Manager

Date issued: November 29, 1978

Amendment date:
(most recent) FEB 14 1992

Permit Number: PE-02753

2.5 SAMPLING METHOD

All samples for compliance evaluation with the limits specified in Appendices 02 and 03 are to be obtained in a flow proportional 24 hour composite manner except for pH which is to be measured and recorded continuously. Samples of Sewers specified in Appendices 01 and 04 shall be 24 hour composite samples.

2.6 DAILY SEWER SAMPLING FOR SPILL OR UPSET ASSESSMENT

The Permittee shall continue a spill/upset monitoring program where all operational Sewers are sampled continuously with the daily samples retained for at least one week. Should a spill or other process upset occur, the 24 hour samples from the days of, prior to and following the occurrence shall be analyzed for the specified permit compliance parameters as well as any other parameters specified by the Regional Waste Manager.

R.J. Crozier, R.P. Bio.
Assistant Regional Waste Manager

Date issued: November 29, 1978

Amendment date:
(most recent) FEB 14 1992

Permit Number: PE-02753

2.7 RECEIVING ENVIRONMENT MONITORING

1. The Permittee is participating in the Columbia River Integrated Environmental Monitoring Program (C.R.I.E.M.P.). This program is intended to determine the status of water quality, sediments, fish habitat, bioconcentration/ bioaccumulation, and plant and animal community structure in the Columbia River. The program will also identify the ongoing monitoring programs necessary to ensure adequate controls and to measure trends. These programs as they apply to the Permittee, will be reviewed and a monitoring program approved in writing by the Regional Waste Manager.

2. In the event of a spill or upset condition that the Regional Waste Manager determines has the potential to impact the water quality of the Columbia River, the Permittee shall obtain a sequential series of grab samples at Waneta (BCE site 0200559). Initiation of sampling, sampling frequency, sampling duration and parameters will be determined in consultation with the Regional Waste Manager.

3. The Permittee shall continue to operate a continuous sampler on the Columbia River at Waneta (BCE site 0200559) and on the Columbia River at Stoney Creek (BCE site 0200557) and shall collect daily 24 hour composite samples. Samples not required for immediate analysis shall be preserved and stored for a period of one week after the day of sampling for subsequent analysis if required by the Regional Waste Manager.

R.J. Crozier, R.P. Bio.
Assistant Regional Waste Manager

Date issued: November 29, 1978

Amendment date: (most recent) FEB 14 1992

Permit Number: PE-02753

2.8 ANALYSES

Analyses are to be carried out in accordance with procedures described in the Second Edition of "A Laboratory Manual for the Chemical Analysis of Waters, Wastewaters, Sediments and Biological Materials (1976 edition including updates)", April 1989, 615 pp., or by suitable alternative procedures as approved by the Regional Waste Manager.

Copies of the above mentioned manual are available from the Environmental Protection Division, Program Planning and Evaluation Branch, Laboratory and Program Evaluation Section, 810 Blanshard Street, Victoria, British Columbia, V8V 1X5, at a cost of $70.00, or if Part 1 only, 1976 edition, 389 pp., $40.00 and Part 2 only, supplement, 226 pp., $40.00, (payable to the Minister of Finance), and are also available for inspection at all Environmental Protection Offices.

2.9 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

Minimum detection concentrations for all discharge and receiving environment sample analyses, sampling and laboratory quality assurance and quality control procedures must be approved by the Regional Waste Manager. A report documenting detection limits and QA/QC procedures shall be submitted to the Regional Waste Manager for his approval on or before May 1, 1992.

R.J. Crozier, R.P. Bio.
Assistant Regional Waste Manager

Date issued: November 29, 1978

Amendment date:
(most recent) FEB 14 1992

Permit Number: PE-02753

SECTION THREE: REPORTING REQUIREMENTS

3.1 REPORTING

1. All results obtained from effluent and receiving water monitoring specified above are to be tabulated and submitted to the Regional Waste Manager monthly. In conjunction with this report, the Permittee shall submit records of use of standby launders.

2. Sulphuric Acid Discharge

   A report detailing the cause of each incident, the pH monitoring data collected and the actions taken to prevent a reoccurrence of a similar incident shall be submitted to the Regional Waste Manager within 10 days after the release of acid has stopped.

3. The Permittee shall prepare an annual report suitable for release to the public, that tabulates and explains the sewer sampling and analyses as well as any results of receiving water quality monitoring carried out by the company.

   This report shall include an explanation of any installation of works or changes to the process that have taken place over the previous 12 months, and the progress made with regard to studies and plans.

This annual report is due by March 31, of the following year.

R.J. Crozier, R.P. Bio.
Assistant Regional Waste Manager

Date issued: November 29, 1978

Amendment date: FEB 14 1992
(most recent)

Permit Number: PE-02753

SECTION FOUR: DEFINITIONS

4.1 BIOACCUMULATE

The tendency of some contaminants to accumulate in the tissues of plants or animals. This occurs because an organism's ability to excrete a contaminant is exceeded by its rate of uptake. The bioaccumulation ratio (concentration of contaminant in tissue/concentration of contaminant in water) varies with each contaminant and each species of organism. Used synonymously with the term 'bioconcentrate'.

4.2 COLUMBIA RIVER INTEGRATED ENVIRONMENTAL MONITORING PROGRAM (C.R.I.E.M.P.)

A committee directed program of environmental monitoring for the Columbia River from the Hugh Keenlyside Dam to the U.S. Border. Participants include: B.C. Environment, Environment Canada, Fisheries and Oceans Canada, Cominco Ltd., Celgar Pulp Ltd., B.C. Hydro, the City of Castlegar and the City of Trail. The objective is to coordinate efforts by all stakeholders in documenting the current environmental status of the Columbia River, thereby making more efficient use of available resources.

4.3 DISSOLVED METALS

A term based on analytical procedure. A whole water sample is filtered with a 0.45 µm pore size membrane filter and the filtrate is then strong acid digested and then analyzed for the particular metal. All the 'dissolved' metal is available for uptake by most organisms and is thus a toxic fraction of the total metal.

Date issued: November 29, 1978

Amendment date: FEB 14 1992
(most recent)

R.J. Crozier, R.P. Bio.
Assistant Regional Waste Manager

4.4 TOTAL METALS

A term based on analytical procedure. A whole water sample is strong acid digested and then analyzed for a particular metal (ie. no filtration). The digestion is intended to ionize all the elemental metal present even that found in the crystalline structure of suspended particles. All the 'total' metal is not necessarily available to aquatic organism for uptake but some of that which would be caught on a filter (ie. particulate metal) may be, or may become (weakly bound), available and thus be toxic. As such water quality criteria and objectives are established for 'total' metals until an analytical procedure is developed to analyze 'bioavailable' metals.

R.J. Crozier, R.P. Bio.
Assistant Regional Waste Manager

Date issued: November 29, 1978

Amendment date: (most recent) FEB 14 1992

Permit Number: PE-02753

APPENDIX 01
PERMIT NUMBER PE-02753

(a) The discharge of effluent to which Appendix 01 is applicable is from Metallurgical Plant Sewer I which replaces Sewer T-2 and the Blast Furnace Pond Overflow to the Columbia River as shown on the attached Appendix A-1.

(b) The maximum rate at which effluent may be discharged is 70,000 m^3/day.

(c) The characteristics of a 24 hour composite sample of effluent shall be:

Total Suspended Solids	10,000 mg/l
Dissolved Zinc	1.0 mg/l
Dissolved Arsenic	.05 mg/l
Dissolved Lead	.25 mg/l
Dissolved Cadmium	.05 mg/l
Total Mercury	.001 mg/l
pH Range	6.5 - 8.5

(d) The works authorized are a combined sewer, outfall and related appurtenances, approximately located as shown on the attached Appendix A-1.

(e) The location of the facilities from which the emission originates and to which Appendix 01 is appurtenant is Lots 1 and 2, Plan 4926, Kootenay District.

(f) The location of the point of discharge and to which Appendix 01 is appurtenant is Lots 1 and 2, Plan 4926, Kootenay District.

(g) The authority to discharge effluent of the quality specified in (c) above expires on December 31, 1995.

R.J. Crozier, R.P. Bio.
Assistant Regional Waste Manager

Date issued: November 29, 1978

Amendment date: FEB 14 1992
(most recent)

APPENDIX 02
PERMIT NUMBER PE-02753

(a) The discharge of effluent to which Appendix 02 is applicable is from Metallurgical Plant Sewer II which replaces Sewers T-1, T-3, T-4, T-5 and T-6 (effluents from the lead fuming furnaces, sinter plant and zinc plant) to the Columbia River as shown on the attached Appendix A-1.

(b) The maximum rate at which effluent may be discharged is 55,000 m^3/day.

(c) The characteristics of a 24 hour flow proportional composite sample of the effluent shall be:

Total Suspended Solids	35 mg/l
Dissolved Zinc	5 mg/l
Dissolved Arsenic	.05 mg/l
Dissolved Lead	.5 mg/l
Dissolved Cadmium	.07 mg/l
Total Mercury	.005 mg/l
pH Range	6.5 - 8.5

(d) The works authorized are a combined sewer, outfall and related appurtenances, approximately located as shown on the attached Appendix A-1.

(e) The location of the facilities from which the emission originates and to which Appendix 02 is appurtenant is Lots 1, 2, 3 and 4, Plan 4926, Kootenay District.

(f) The location of the point of discharge and to which Appendix 02 is appurtenant is Lots 1, 2, 3 and 4, Plan 4926, Kootenay District.

(g) The authority to discharge effluent of the quality specified in (c) above expires on December 31, 1995.

R.J. Crozier, R.P. Bio.
Assistant Regional Waste Manager

Date issued: November 29, 1978

Amendment date: FEB 14 1992
(most recent)

APPENDIX 03
PERMIT NUMBER PE-02753

(a) The discharge of effluent to which Appendix 03 is applicable is from Metallurgical Plant Sewer III which replaces Sewers T-8, T-9, T-10 and T-13 (effluents from the lead and silver refinery, acid plants, zinc plant, assay office and effluent treatment plant) to the Columbia River as shown on the attached Appendix A-1.

(b) The maximum rate at which effluent may be discharged is 110,000 m^3/day.

(c) The characteristics of a 24 hour flow proportional composite sample of the effluent shall be:

Total Suspended Solids	25 mg/l
Dissolved Zinc	5 mg/l
Dissolved Arsenic	.05 mg/l
Dissolved Lead	.3 mg/l
Dissolved Cadmium	.05 mg/l
Total Mercury	.005 mg/l
pH Range	6.5 - 9.5

(d) The works authorized are a combined sewer, outfall, lime water treatment plant, No. 12 Lagoon, No. 13 Lagoon and related appurtenances approximately located as shown on the attached Appendix A-1.

(e) The location of the facilities from which the emission originates and to which Appendix 03 is appurtenant is Lots 1, 2, 3 and 4, Plan 4926, Kootenay District.

(f) The location of the point of discharge and to which Appendix 03 is appurtenant is Lots 1, 2, 3 and 4, Plan 4926, Kootenay District.

(g) The authority to discharge effluent of the quality specified in (c) above expires on December 31, 1995.

Date issued: November 29, 1978

R.J. Crozier, R.P. Bio.
Assistant Regional Waste Manager

Amendment date:
(most recent) FEB 14 1992

APPENDIX 04
PERMIT NUMBER PE-02753

(a) The discharge of effluent to which Appendix 04 is applicable is from Metallurgical Plant Sewer T-7 (effluent from the lead smelter absorption plant) to the Columbia River as shown on the attached Appendix A-1.

(b) The maximum rate at which effluent may be discharged is 30,000 m^3/day.

(c) The characteristics of a 24 hour composite sample of the effluent shall be:

Total Suspended Solids	25 mg/l
Dissolved Zinc	1.0 mg/l
Dissolved Arsenic	.25 mg/l
Dissolved Lead	1.0 mg/l
Dissolved Cadmium	.5 mg/l
Total Mercury	.035 mg/l
pH Range	2.0 - 8.5

(d) The works authorized are a submerged outfall, air return line and related appurtenances, approximately located as shown on the attached Appendix A-1.

(e) The location of the facilities from which the emission originates and to which Appendix 04 is appurtenant is Lots 1, 2, 3 and 4, Plan 4926, Kootenay District.

(f) The location of the point of discharge and to which Appendix 04 is appurtenant is Lots 1, 2, 3 and 4, Plan 4926, Kootenay District.

(g) The authority to discharge effluent via this outfall expires on December 31, 1995.

Date issued: November 29, 1978

R.J. Crozier, R.P. Bio.
Assistant Regional Waste Manager

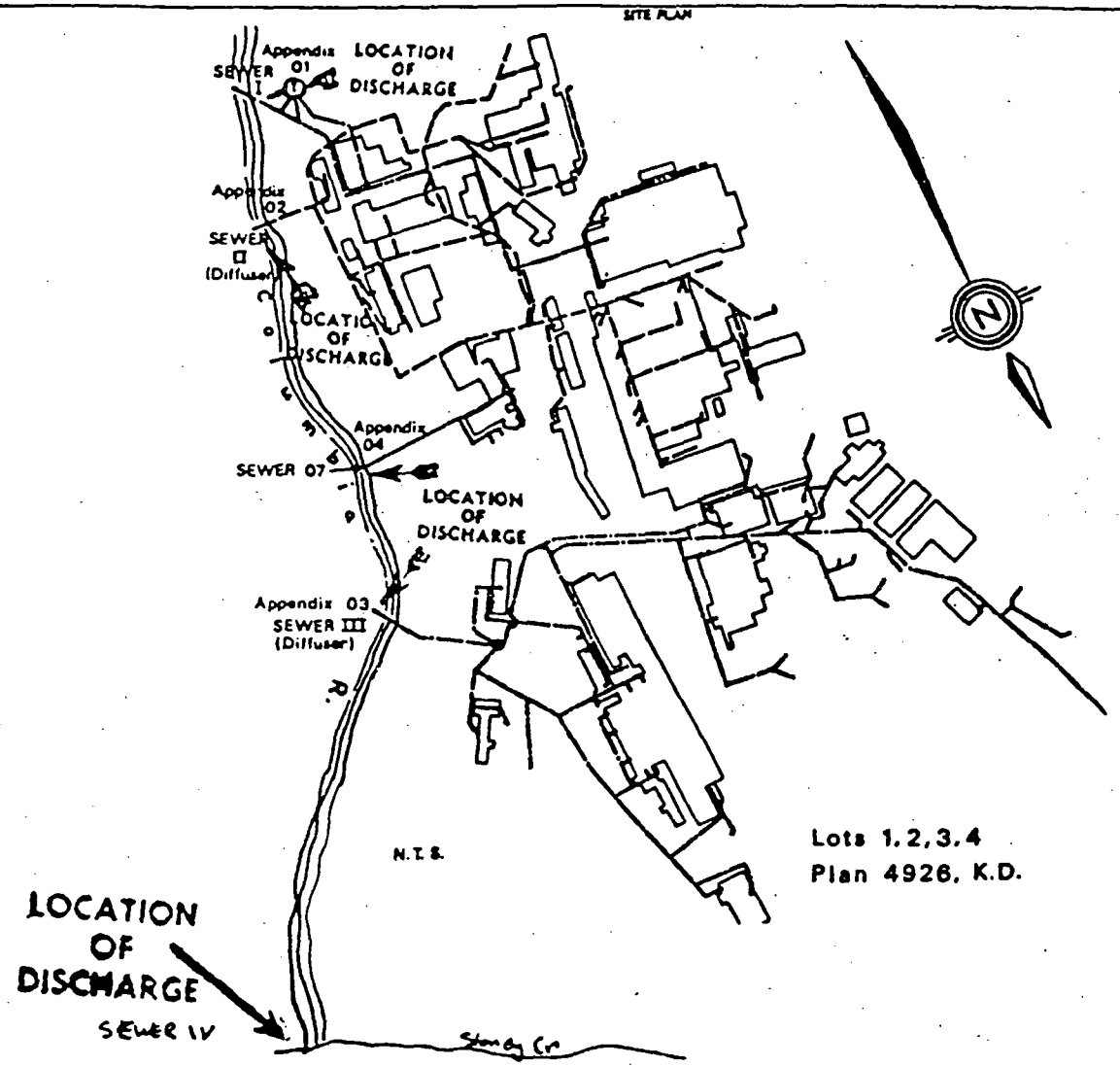
Amendment date: FEB 14 1992
(most recent)

Province of British Columbia

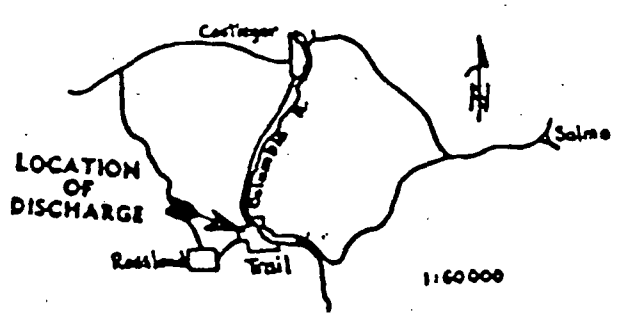
Ministry of Environment

WASTE MANAGEMENT BRANCH

SITE PLAN



LOCATION MAP



Cominco Ltd. - Cominco Ltee.

(Name of applicant(s))

(Date) (Signature of applicant(s) or agent)

(FOR OFFICE USE ONLY)

Date Received FEB 12 1991

Date Amended

Jim McLaren, P. Eng.
Regional Waste Manager

FEB 14 1992

R.J. Crozier, R.P. Bio.
Assistant Regional Waste Manager

Appendix A-1 to Permit No. PE-02753

Approval No.

ENV 1987

NOTICE OF A MAJOR AMENDMENT TO PERMIT NO. PE-02753
ISSUED UNDER THE PROVISIONS OF
THE WASTE MANAGEMENT ACT, S.B.C. 1982, c.41,
IN THE NAME OF COMINCO LTD.

Take notice that a major amendment to Permit Number PE-02753 for discharges of effluent from a Lead/Zinc Smelter to the Columbia River located at Trail, British Columbia has been issued. The amendment consists of the following principal requirements:

- Ceasing to discharge Tail Slag to the Columbia River on or before December 31, 1996.
- Collection and treatment of additional contaminated surface water from the plant site on or before September 1, 1994.
- Elimination of the discharge of effluent from Sewer 07 on or before December 31, 1995.
- Providing various plans and schedules with regard to the installation of new lead smelting technology and installation of additional pollution control equipment.
- Increased monitoring of effluent quality and quantity characteristics.
- Formal environmental review of effluent quality and operational requirements by June 1, 1994.

A copy of the Amended Permit may be viewed at Environmental Protection, B.C. Environment, 617 Vernon Street, Nelson, B.C., V1L 4E9 during normal business hours.

Dated at Nelson, British Columbia this 14th day of February, 1992.

R.J. Crozier, R.P. Bio.
Acting Regional Waste Manager

/sw

PROVINCE OF
BRITISH COLUMBIA

MINISTRY OF
ENVIRONMENT,
LANDS AND PARKS

Environmental Protection
617 Vernon Street
Nelson, BC, V1L 4E9
Telephone: (604) 354-6355
Fax: (604) 354-6367

FEB 14 1992

File: PA-02691

REGISTERED MAIL

Cominco Ltd.
500 - 200 Burrard Street
Vancouver, British Columbia
V6C 3L7

Gentlemen:

Enclosed is a copy of Amended Permit No. PA-02691 issued under the provisions of the Waste Management Act, in the name of Cominco Ltd. Your attention is respectfully directed to the terms and conditions outlined in the Permit.

The administration of this Permit will be carried out by staff from our Regional Office located at 617 Vernon Street, Nelson, British Columbia, V1L 4E9 (telephone 354-6355). Plans, data and reports pertinent to the Permit are to be submitted to the Regional Waste Manager at this address.

Yours truly,

R.J. Crozier, R.P. Bio.
Assistant Regional Waste Manager

/sw

Enclosure

MINISTRY OF ENVIRONMENT, LANDS AND PARKS

PERMIT

Under the Provisions of the Waste Management Act

COMINCO LTD.

500 - 200 BURRARD STREET

VANCOUVER, BRITISH COLUMBIA

V6C 3L7

is authorized to discharge contaminants from a lead smelter located at Trail British Columbia, to the atmosphere, subject to the following terms and conditions outlined in attached Pages 2 to 9, Appendices 01, 02, 03, 04, 05, 06, 07, 08, 09, 10, 11, 12, 14, 14, 15, 16, 26, 27, 28, 29, 30, 31, 32, 33, 34, 36, 37, 38, 39, 40 and 41, A-1 to A-10 and Tables 1 and 2.

An annual fee will be determined on the basis of your industrial code and capacity in accordance with the Waste Management Fees Regulation.

This Permit does not authorize entry upon, crossing over, or use for any purpose of private or Crown lands or works, unless and except as authorized by the owner of such lands or works. The responsibility for obtaining such authority shall rest with the Permittee.

R.J. Crozier, R.P. Bio.
Assistant Regional Waste Manager

Date issued: September 9, 1975

Amendment date: FEB 14 1992
(most recent)

Permit Number: PA-02691

SECTION ONE: GENERAL

1.1 MAINTENANCE OF WORKS

The Permittee shall inspect the pollution control works regularly and maintain them in good working order. The Permittee shall notify the Regional Waste Manager of any malfunctions of these works.

1.2 EMERGENCY PROCEDURES

In the event of an emergency or condition beyond the control of the Permittee which prevents continuing operation of the approved method of pollution control, the Permittee shall immediately notify the Regional Waste Manager and take appropriate remedial action.

The Permittee shall submit a report to the Regional Waste Manager detailing the circumstances and environmental effects of the incident within 10 working days.

1.3 BYPASSES

The discharge of contaminants which have bypassed the designated treatment works is prohibited unless the approval of the Director or the Regional Waste Manager is obtained and confirmed in writing.

1.4 PROCESS MODIFICATIONS

The Permittee shall notify the Regional Waste Manager prior to implementing changes to any process that may affect the quality and/or quantity of the discharge.

R.J. Crozier, R.P. Bio.
Assistant Regional Waste Manager

Date issued: September 9, 1975

Amendment date: FEB 14 1992
(most recent)

1.5 AMBIENT SULPHUR DIOXIDE CONTROL REGIME

Sulphur Dioxide emissions from the entire operation are to be controlled as outlined below:

a) The annual arithmetic mean at any one continuous ambient sensor shall not exceed .03 ppm (80 ug/m^3).

b) The maximum 24 hour (average) concentration at any continuous ambient sensor shall not exceed .14 ppm (375 ug/m^3).

c) The maximum 3 hour (average) concentration at any continuous ambient sensor shall not exceed .3 ppm (800 ug/m^3). The 3 hour average concentration is to be updated hourly for each ambient SO_2 sensor.

d) All ambient sulphur dioxide monitoring stations: Oasis (BCE site No. 0260022), W.K.P.L. (BCE site No. 0260010), Warfield (BCE site No. 0260011), including the station at Butler Park (BCE site No. 0250009) currently operated by the Ministry of Environment must comply with the above limits.

1.6 FUGITIVE DUST CONTROL

The Permittee shall suppress fugitive dust created within the operation area as required by the Regional Waste Manager.

R.J. Crozier, R.P. Bio.
Assistant Regional Waste Manager

Date issued: September 9, 1975

Amendment date: (most recent) FEB 14 1992

Permit Number: PA-02691

1.7 DATE FOR LEAD SMELTING TECHNOLOGY DECISION AND COMMITMENT

The Permittee shall submit to the Regional Waste Manager by June 1, 1992, the company's decision with regard to technology choice for the continued modernization of the lead smelter.

The report shall include the rational for this decision including environmental implications of the chosen technology.

Assuming that a viable and economically supportable technology is identified, the Permittee shall provide by September 1, 1992 a schedule for approvals, engineering, construction, commissioning and startup, together with more details of the environmental assessment. If not, the Permittee shall provide a contingent program.

1.8 MATERIALS MANAGEMENT PLAN

The Permittee shall submit to the Regional Waste Manager for his approval on or before September 1, 1992 a plan consisting of the following:

- current inventory of materials deemed to have the potential to create airborne contamination by the Regional Waste Manager;
- management proposals for containment and usage of these materials;
- the proposed final disposition location and estimated time frame for disposal or consumption these of materials within the process;
- details of facilities in place and planned to minimize fugitive emissions during transport of materials within the site;
- procedures to control the transport of materials off the site and into the populated areas of Trail.

Date issued: September 9, 1975

R.J. Crozier, R.P. Bio.
Assistant Regional Waste Manager

Amendment date: FEB 14 1992
(most recent)

1.9 EMISSION ASSESSMENT AND MANAGEMENT PLAN

The Permittee shall submit to the Regional Waste Manager on or before April 30, 1993 a comprehensive Emissions Assessment and Management Plan for the lead smelter and related facilities and proposed schedule for installation of works which shall contain at a minimum:

- identify and provide a schedule for installation of improvements to abatement works, operating and maintenance procedures that reduce stack emissions;

- identify and provide a schedule for installation of additional surveillance devices, systems or procedures where feasible to ensure consistency of emission quality and prompt response to process upsets.

1.10 ENVIRONMENTAL PERFORMANCE REVIEW DATE

On or before June 1, 1994, the Ministry of Environment will conduct a comprehensive review of the permit operational requirements and emission quality and quantities specified in the Appendices to this Permit by comparing data obtained from sampling of the emissions by both the Permittee and the Ministry of Environment.

The goal of the review is to assess the effectiveness of the Emission Management Plan (Sub-Section 1.9) reducing emissions of particulate and metals to the atmosphere from both stack and fugitive dust sources. As part of the review, the Ministry of Environment will assess the relationship between emissions and ambient air quality.

Date issued: September 9, 1975

Amendment date: FEB 14 1992
(most recent)

R.J. Crozier, R.P. Bio.
Assistant Regional Waste Manager

SECTION TWO: MONITORING REQUIREMENTS

2.1 SOURCE MONITORING

The Permittee shall carry out the Source Monitoring Program attached as Table 1.

2.2 AMBIENT MONITORING

The Permittee shall carry out the Ambient Air Program attached as Table 2.

2.3 SOURCE TESTING - PARTICULATE

Source testing procedures for the determination of particulate matter concentrations and the rate of discharge (flow rate) are to be carried out in accordance with those procedures described in the "Source Testing Code for the Measurement of Emissions of Particulates from Stationary Sources, 1982". Alternative test methods may be used provided that the alternative methods are approved by the Director or Regional Waste Manager prior to performing the actual source testing.

Copies of the above mentioned manual are available from the Environmental Protection Division, 810 Blanshard Street, Victoria, British Columbia, V8V 1X5, at a cost of $5.00. The manual is also available for inspection at all Environmental Protection Offices.

R.J. Crozier, R.P. Bio.
Assistant Regional Waste Manager

Date issued: September 9, 1975

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(most recent)

2.4 SOURCE TESTING - SULPHUR DIOXIDE

The source testing procedure for the measurement of Sulphur Dioxide is to be carried out in accordance with procedure described in the "Source Testing Code for the Measurement of Emissions of Sulphuric Acid Mist and Sulphur Dioxide from Stationary Sources, Ministry of Environment Manual 6 (1984)". Alternative test methods may be used provided that the alternative methods are approved by the Director or Regional Waste Manager prior to performing the actual source testing.

Copies of the above mentioned manual are available from the Environmental Protection Division, 810 Blanshard Street, Victoria, British Columbia, V8V 1X5, at a cost of $7.50. The manual is also available for inspection at all Environmental Protection Offices.

2.5 SAMPLING FACILITIES

Sampling ports shall be provided with nearby electrical and pneumatic outlets and, where required, approved access ladders and adequately sized platforms to enable Waste Management Personnel to monitor these emissions.

2.6 SAMPLING LOCATIONS AND TECHNIQUES

All sampling locations, techniques and equipment are to be approved by the Regional Waste Manager prior to use. Sampling and monitoring data, which also should include rate of discharge measurements, shall be accompanied by process data relevant to the operation of the source of the emissions and to the performance of the pollution abatement equipment involved in the testing.

2.7 DISCHARGE RATE MEASUREMENT

Measure and record on the day of sampling of the above emissions, the average rate of discharge in m^3/min from the stack based on normal operation of the plant in question for the period of sampling.

R.J. Crozier, R.P. Bio.
Assistant Regional Waste Manager

Date issued: September 9, 1975

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(most recent)

2.8 PM_{10}/TSP CORRELATION

The Permittee shall continue to develop a correlation between PM_{10} and Total Suspended Particulate and Total Suspended Particulate Metals and PM_{10} Metals by installation and operation of a PM_{10} monitoring device adjacent to an existing Hi-Volume sampler at the W.K.P.L. Building Station (BCE site No. 0260010) for a period of at least 9 months in order to collect enough samples for statistical analysis of the monitoring results.

A similar correlation is to be developed at the Oasis Station (BCE site No. 0260022) by monitoring using both types of monitors for a period of at least 9 months during 1992.

The Permittee shall submit a report of his findings to the Regional Waste Manager for his approval on or before December 31, 1992.

2.9 QUALITY ASSURANCE/QUALITY CONTROL

A report documenting sampling and analytical QA/QC procedures shall be submitted to the Regional Waste Manager for his approval on or before May 15, 1992.

2.10 SPECIAL EVALUATION OF AMBIENT AIR QUALITY

Four times during the calendar year 1992, (once in each quarter), the Permittee shall collect and analyze, using ICP scan techniques, a 24 hour Hi-Volume Total Suspended Particulate sample from each site equipped with a Hi-Vol sampler. The date of sampling shall be co-ordinated with the Ministry of Environment in order to facilitate similar sampling at other sites in the Province as background data points. The results of this program are to be reported to the Regional Waste Manager as part of the monthly data submission .

R.J. Crozier, R.P. Bio.
Assistant Regional Waste Manager

Date issued: September 9, 1975

Amendment date: FEB 14 1992
(most recent)

SECTION THREE: REPORTING REQUIREMENTS

3.1 REPORTING

1. The Permittee shall submit an annual report to the Regional Waste Manager which includes:

   a) All source testing results.

   b) A summary of the ambient air monitoring results.

   c) A discussion of the remedial measures proposed for those emissions, if any, shown to be in excess of permit limits.

   d) The report is to be written in a form suitable for public release.

   e) The report is due by April 1 of the following year.

2. The Permittee shall submit to the Regional Waste Manager monthly the available results of the previous month's ambient air quality and stack emission monitoring. This data is to be submitted in machine readable format as well as hard copy in a form suitable for subsequent release to the public.

R.J. Crozier, R.P. Bio.
Assistant Regional Waste Manager

Date issued: September 9, 1975

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(most recent)

APPENDIX 01

PERMIT NUMBER PA-02691

(a) The discharge of contaminants to which this Appendix is applicable is from the D & L Stack identified as S-1 as shown on the attached Appendix A-1.

(b) The maximum volume which may be discharged is 8,000 m^3/min.

(c) The characteristics of the discharge shall not exceed:

SO_2	control regime as per Sub-Section 1.6 Page 3
Total Particulate	400 mg/m^3
Lead	23 mg/m^3

NOTE: All air and gaseous volumes specified in (b) and (c) above are at standard conditions which are:

Standard temperature = 293.15° K

Standard pressure = 101.325 KPa

Water Vapour zero unless otherwise stated

(d) The works authorized are ducts, fans, stack, ammonia absorption plant and related appurtenances, approximately located as shown on the attached Appendix A-1.

(e) The location of the facilities from which the emission originates and to which Appendix 01 is appurtenant is Lot 1, Plan 4926, Kootenay District.

(f) The location of the point of discharge and to which Appendix 01 is appurtenant is Lot 1, Plan 4926, Kootenay District.

(g) This emission source is to be eliminated by December 31, 1995. Stack S-1 may continue to be used as a start up stack for the new QSL lead smelter.

R.J. Crozier, R.P. Bio.
Assistant Regional Waste Manager

Date issued: September 9, 1975

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APPENDIX 02

PERMIT NUMBER PA-02691

(a) The discharge of contaminants to which Appendix 02 is applicable is from the lead blast furnaces and drossing plant stack identified as S-32 as shown on the attached Appendix A-2.

(b) The maximum volume which may be discharged is 15500 m^3/min.

(c) The characteristics of the discharge shall not exceed:

SO_2	control regime as per Sub-Section 1.6 Page 3
Particulate	23 mg/m^3
Lead	7 mg/m^3

NOTE: All air and gaseous volumes specified in (b) and (c) above are at standard conditions which are:

Standard temperature = 293.15° K

Standard pressure = 101.325 KPa

Water Vapour zero unless otherwise stated

(d) The works authorized are fans, ducts, stack, baghouse, bypass stack and related appurtenances, approximately located as shown on the attached Appendix A-2.

(e) The location of the facilities from which the emission originates and to which Appendix 02 is appurtenant is Lot 1, Plan 4926, Kootenay District.

(f) The location of the point of discharge and to which Appendix 02 is appurtenant is Lot 1, Plan 4926, Kootenay District.

(g) This emission source is to be eliminated by December 31, 1995.

R.J. Crozier, R.P. Bio.
Assistant Regional Waste Manager

Date issued: September 9, 1975

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(most recent)

APPENDIX 03

PERMIT NUMBER PA-02691

(a) The discharge of contaminants to which Appendix 03 is applicable is from the Sinter plant wet mix dryers stack identified as S-8 as shown on the attached Appendix A-2.

(b) The maximum volume which may be discharged is 3500 m^3/min.

(c) The characteristics of the discharge shall not exceeed:

SO_2	control regime as per Section 1.6 page 3
Lead	40 mg/m^3

NOTE: All air and gaseous volumes specified in (b) and (c) above are at standard conditions which are:

Standard temperature = 293.15° K

Standard pressure = 101.325 KPa

Water Vapour zero unless otherwise stated

(d) The works authorized are fans, ducts, stack, wet impingers and related appurtenances approximately located as shown on the attached Appendix A-2.

(e) The location of the facilities from which the emission originates and to which Appendix 03 is appurtenant to is Lot 1, Plan 4926, Kootenay District.

(f) The location of the point of discharge and to which Appendix 03 is appurtenant is Lot 1, Plan 4926, Kootenay District.

(g) This emission source is to be eliminated by December 31, 1995.

R.J. Crozier, R.P. Bio.
Assistant Regional Waste Manager

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APPENDIX 04

PERMIT NUMBER PA-02691

(a) The discharge of contaminants to which Appendix 04 is applicable is from the slag fuming furnaces baghouse stack identified as S-40 as shown on the attached Appendix A-1.

(b) The maximum volume which may be discharged is 6500 m^3/min.

(c) The characteristics of the discharge shall not exceed:

SO_2	control regime as per Sub-Section 1.6 Page 3
Zinc	11.5 mg/m^3

NOTE: All air and gaseous volumes specified in (b) and (c) above are at standard conditions which are:

Standard temperature = 293.15° K

Standard pressure = 101.325 KPa

Water Vapour zero unless otherwise stated

(d) The works authorized are fans, ducts, stack, baghouse and related appurtenances, approximately located as shown on the attached Appendix A-1.

(e) The location of the facilities from which the emission originates and to which Appendix 04 is appurtenant is Lot 1, Plan 4926, Kootenay District.

(f) The location of the point of discharge and to which Appendix 04 is appurtenant is Lot 1, Plan 4926, Kootenay District.

(g) This emission source is to be eliminated by December 31, 1996.

R.J. Crozier, R.P. Bio.
Assistant Regional Waste Manager

Date issued: September 9, 1975

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(most recent) FEB 14 1992

APPENDIX 05

PERMIT NUMBER PA-02691

(a) The discharge of contaminants to which Appendix 05 is applicable is from sinter and coke conveying, handling, crushing and storage vents identified as S-2, S-3, S-4, S-5, S-6, S-7, S-9, S-10, S-11 and S-13 as shown on the attached Appendix A-2.

(b) The maximum volume which may be discharged is 4815 m^3/min.

(c) The characteristics of the discharges shall not exceed:

Particulate 23 mg/m^3

NOTE: All air and gaseous volumes specified in (b) and (c) above are at standard conditions which are:

Standard temperature = 293.15° K

Standard pressure = 101.325 KPa

Water Vapour zero unless otherwise stated

(d) The works authorized are fans, ducts, 10 stacks, 10 wet scrubbers and related appurtenances, approximately located as shown on the attached Appendix A-2.

(e) The location of the facilities from which the emissions originate and to which Appendix 05 is appurtenant is Lot 1, Plan 4926, Kootenay District.

(f) The location of the points of discharge and to which Appendix 05 is appurtenant is Lot 1, Plan 4926, Kootenay District.

(g) These emission sources are to be eliminated by December 31, 1995.

R.J. Crozier, R.P. Bio.
Assistant Regional Waste Manager

Date issued: September 9, 1975

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(most recent)

APPENDIX 06

PERMIT NUMBER PA-02691

(a) The discharge of contaminants to which Appendix 06 is applicable is from the sinter plant ventilation fans, identified as S-17 to S-31 inclusive, as shown on the attached Appendix A-2.

(b) The maximum volume which may be discharged is 1500 m^3/min.

(c) The characteristics of the discharges shall not exceed:

Particulate 23 mg/m^3

NOTE: All air and gaseous volumes specified in (b) and (c) above are at standard conditions which are:

Standard temperature = 293.15° K

Standard pressure = 101.325 KPa

Water Vapour zero unless otherwise stated

(d) The works authorized are fans and related appurtenances, approximately located as shown on the attached Appendix A-2.

(e) The location of the facilities from which the emissions originate and to which Appendix 06 is appurtenant is Lot 1, Plan 4926, Kootenay District.

(f) The location of the points of discharge and to which Appendix 06 is appurtenant is Lot 1, Plan 4926, Kootenay District.

(g) These emission sources will be eliminated by December 31, 1995.

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R.J. Crozier, R.P. Bio.
Assistant Regional Waste Manager

APPENDIX 07

PERMIT NUMBER PA-02691

(a) The discharge of contaminants to which Appendix 07 is applicable is from the dryer and sinter machine feed conveyors and nodulizer vent stacks identified as S-12, S-14, S-15 and S-16, as shown on the attached Appendix A-1.

(b) The maximum volume which may be discharged is 2100 m^3/min.

(c) The characteristics of the discharge shall not exceed:

Particulate 23 mg/m^3

NOTE: All air and gaseous volumes specified in (b) and (c) above are at standard conditions which are:

Standard temperature = 293.15° K

Standard pressure = 101.325 KPa

Water Vapour zero unless otherwise stated

(d) The works authorized are fans, ducts, 4 stacks, 4 wet scrubbers and related appurtenances, approximately located as shown on the attached Appendix A-1.

(e) The location of the facilities from which the emissions originate and to which Appendix 07 is appurtenant is Lot 1, Plan 4926, Kootenay District.

(f) The location of the points of discharge and to which Appendix 07 is appurtenant is Lot 1, Plan 4926, Kootenay District.

(g) These emission sources are to be eliminated by December 31, 1995.

R.J. Crozier, R.P. Bio.
Assistant Regional Waste Manager

Date issued: September 9, 1975

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APPENDIX 08

PERMIT NUMBER PA-02691

(a) The discharge of contaminants to which Appendix 08 is applicable is from the sinter and coke conveying and storage vents identified as S-57, S-58 and S-59 as shown on the attached Appendix A-2.

(b) The maximum volume which may be discharged is 390 m^3/min.

(c) The characteristics of the discharge shall not exceed:

Lead	23 mg/m^3

NOTE: All air and gaseous volumes specified in (b) and (c) above are at standard conditions which are:

Standard temperature = 293.15° K

Standard pressure = 101.325 KPa

Water Vapour zero unless otherwise stated

(d) The works authorized are fans, ducts, 3 stacks and related appurtenances, approximately located as shown on the attached Appendix A-2.

(e) The location of the facilities from which the emissions originate and to which Appendix 08 is appurtenant is Lot 1, Plan 4926, Kootenay District.

(f) The location of the points of discharge and to which Appendix 08 is appurtenant is Lot 1, Plan 4926, Kootenay District.

(g) These emission sources are to be eliminated by December 31, 1995.

R.J. Crozier, R.P. Bio.
Assistant Regional Waste Manager

Date issued: September 9, 1975

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(most recent)

APPENDIX 09

PERMIT NUMBER PA-02691

(a) The discharge of contaminants to which Appendix 09 is applicable is from lead blast furnace and slag furnace vents, and granulating launder vents identified as S-33, S-34, S-35, S-36, S-42, S-49, S-51 and S-52 as shown on the attached Appendix A-2.

(b) The maximum volume which may be discharged is 6000 m^3/min.

(c) The characteristics of the discharge shall not exceed:

Lead	7 mg/m^3

NOTE: All air and gaseous volumes specified in (b) and (c) above are at standard conditions which are:

Standard temperature = 293.15° K

Standard pressure = 101.325 KPa

Water Vapour zero unless otherwise stated

(d) The works authorized are fans, ducts, 8 stacks and related appurtenances, approximately located as shown on the attached Appendix A-2.

(e) The location of the facilities from which the emissions originate and to which Appendix 09 is appurtenant is Lot 1, Plan 4926, Kootenay District.

(f) The location of the points of discharge and to which Appendix 09 is appurtenant is Lot 1, Plan 4926, Kootenay District.

(g) This emission source is to be eliminated by December 31, 1996.

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(most recent)

R.J. Crozier, R.P. Bio.
Assistant Regional Waste Manager

APPENDIX 10

PERMIT NUMBER PA-02691

(a) The discharge of contaminants to which Appendix 10 is applicable is from the slag fuming furnaces granulating launder vent identified as S-47 as shown on the attached Appendix A-2.

(b) The maximum volume which may be discharged is 450 m^3/min.

(c) The characteristics of the discharge shall not exceed:

Particulate 23 mg/m^3

NOTE: All air and gaseous volumes specified in (b) and (c) above are at standard conditions which are:

Standard temperature = 293.15^0 K

Standard pressure = 101.325 KPa

Water Vapour zero unless otherwise stated

(d) The works authorized are fans, duct, stack and related appurtenances, approximately located as shown on the attached Appendix A-2.

(e) The location of the facilities from which the emission originates and to which Appendix 10 is appurtenant is Lot 1, Plan 4926, Kootenay District.

(f) The location of the point of discharge and to which Appendix 10 is appurtenant is Lot 1, Plan 4926, Kootenay District.

(g) This emission source is to be eliminated by December 31, 1996.

Date issued: September 9, 1975

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(most recent)

R.J. Crozier, R.P. Bio.
Assistant Regional Waste Manager

APPENDIX 11

PERMIT NUMBER PA-02691

(a) The discharge of contaminants to which Appendix 11 is applicable is from the No. 2 and No. 6 crane isle vents identified as S-37 and S-53, as shown on the attached Appendix A-2.

(b) The maximum volume which may be discharged is 3400 m^3/min.

(c) The characteristics of the discharge shall not exceed:

Lead	7 mg/m^3

NOTE: All air and gaseous volumes specified in (b) and (c) above are at standard conditions which are:

Standard temperature = 293.15° K

Standard pressure = 101.325 KPa

Water Vapour zero unless otherwise stated

(d) The works authorized are fans, ducts, 3 stacks and related appurtenances, approximately located as shown on the attached Appendix A-2.

(e) The location of the facilities from which the emissions originate and to which Appendix 11 is appurtenant is Lot 1, Plan 4926, Kootenay District.

(f) The location of the points of discharge and to which Appendix is appurtenant is Lot 1, Plan 4926, Kootenay District.

(g) This emission source is to be eliminated by December 31, 1995.

Date issued: September 9, 1975

Amendment date: FEB 14 1992
(most recent)

R.J. Crozier, R.P. Bio.
Assistant Regional Waste Manager

APPENDIX 12

PERMIT NUMBER PA-02691

(a) The discharge of contaminants to which Appendix 12 is applicable is from the slag fuming furnaces area vents identified as S-47A and S-47B as shown on the attached Appendix A-2.

(b) The maximum volume which may be discharged is 180 m^3/min.

(c) The characteristics of the discharge shall not exceed:

Lead	7 mg/m^3
Zinc	7 mg/m^3

NOTE: All air and gaseous volumes specified in (b) and (c) above are at standard conditions which are:

Standard temperature = 293.15° K

Standard pressure = 101.325 KPa

Water Vapour zero unless otherwise stated

(d) The works authorized are fans, ducts, 2 stacks, 2 baghouses and related appurtenances, approximately located as shown on the attached Appendix A-2.

(e) The location of the facilities from which the emissions originate and to which Appendix 12 is appurtenant is Lot 1, Plan 4926, Kootenay District.

(f) The location of the points of discharge and to which Appendix 12 is appurtenant is Lot 1, Plan 4926, Kootenay District.

(g) This emission source is to be eliminated by December 31, 1996.

R.J. Crozier, R.P. Bio.
Assistant Regional Waste Manager

Date issued: September 9, 1975

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(most recent)

APPENDIX 13

PERMIT NUMBER PA-02691

(a) The discharge of contaminants to which Appendix 13 is applicable is from the fume leach solids preparation baghouse identified as S-41 as shown on the attached Appendix A-1.

(b) The maximum volume which may be discharged is 130 m^3/min.

(c) The characteristics of the discharge shall not exceed:

Zinc	7 mg/m^3

NOTE: All air and gaseous volumes specified in (b) and (c) above are at standard conditions which are:

Standard temperature = 293.15^0 K

Standard pressure = 101.325 KPa

Water Vapour zero unless otherwise stated

(d) The works authorized are fans, ducts, stack, baghouse and related appurtenances, approximately located as shown on the attached Appendix A-1.

(e) The location of the facilities from which the emission originates and to which Appendix 13 is appurtenant is Lot 1, Plan 4926, Kootenay District.

(f) The location of the point of discharge and to which Appendix 13 is appurtenant is Lot 1, Plan 4926, Kootenay District.

Date issued: September 9, 1975

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R.J. Crozier, R.P. Bio.
Assistant Regional Waste Manager

APPENDIX 14

PERMIT NUMBER PA-02691

(a) The discharge of contaminants to which Appendix 14 is applicable is from coal mill ventilation identified as S-43 and S-45 as shown on the attached Appendix A-2.

(b) The maximum volume which may be discharged is 410 m^3/min.

(c) The characteristics of the discharge shall not exceed:

Particulate 115 mg/m^3

NOTE: All air and gaseous volumes specified in (b) and (c) above are at standard conditions which are:

Standard temperature = 293.15° K

Standard pressure = 101.325 KPa

Water Vapour zero unless otherwise stated

(d) The works authorized are fans, ducts, 2 stacks, 2 cyclones, 2 baghouses and related appurtenances, approximately located as shown on the attached Appendix A-2.

(e) The location of the facilities from which the emissions originate and to which Appendix 14 is appurtenant is Lot 1, Plan 4926, Kootenay District.

(f) The location of the points of discharge and to which Appendix 14 is appurtenant is Lot 1, Plan 4926, Kootenay District.

Date issued: September 9, 1975

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R.J. Crozier, R.P. Bio.
Assistant Regional Waste Manager

APPENDIX 15

PERMIT NUMBER PA-02691

(a) The discharge of contaminants to which Appendix 15 is applicable is from the coal dryer vent stack as shown on the attached Appendix A-2.

(b) The maximum volume which may be discharged is 325 m^3/min.

(c) The characteristics of the discharge shall not exceed:

Particulate 115 mg/m^3

NOTE: All air and gaseous volumes specified in (b) and (c) above are at standard conditions which are:

Standard temperature = 293.15° K

Standard pressure = 101.325 KPa

Water Vapour zero unless otherwise stated

(d) The works authorized are fans, ducts, stack, wet scrubber and related appurtenances, approximately located as shown on the attached Appendix A-2.

(e) The location of the facilities from which the emission originates and to which Appendix 15 is appurtenant is Lot 1, Plan 4926, Kootenay District.

(f) The location of the point of discharge and to which Appendix 15 is appurtenant is Lot 1, Plan 4926, Kootenay District.

Date issued: September 9, 1975

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(most recent)

R.J. Crozier, R.P. Bio.
Assistant Regional Waste Manager

APPENDIX 16

PERMIT NUMBER PA-02691

(a) The discharge of contaminants to which Appendix 16 is applicable is from the holding pot combustion gas stack (S-50A) as shown on the attached Appendix A-2.

(b) The maximum volume which may be discharged is 1360 m^3/min.

(c) The characteristics of the discharge shall not exceed:

Particulate 23 mg/m^3

NOTE: All air and gaseous volumes specified in (b) and (c) above are at standard conditions which are:

Standard temperature = 293.15° K

Standard pressure = 101.325 KPa

Water Vapour zero unless otherwise stated

(d) The works authorized are fans, ducts, 2 stacks, and related appurtenances, approximately located as shown on the attached Appendix A-2.

(e) The location of the facilities from which the emissions originate and to which Appendix 16 is appurtenant is Lot 1, Plan 4926, Kootenay District.

(f) The location of the points of discharge and to which Appendix 16 is appurtenant is Lot 1, Plan 4926, Kootenay District.

(g) These emission sources are to be eliminated by December 31, 1995.

Date issued: September 9, 1975

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(most recent)

R.J. Crozier, R.P. Bio.
Assistant Regional Waste Manager

APPENDIX 26

PERMIT NUMBER PA-02691

(a) The discharge of contaminants to which Appendix 26 is applicable is from the arsenic recovery section (antimony plant) vent identified as R-14 as shown on the attached Appendix A-3.

(b) The maximum volume which may be discharged is 250 m^3/min.

(c) The characteristics of the discharge shall not exceed:

Arsenic	7 mg/m^3

NOTE: All air and gaseous volumes specified in (b) and (c) above are at standard conditions which are:

Standard temperature = 293.15° K

Standard pressure = 101.325 KPa

Water Vapour zero unless otherwise stated

(d) The works authorized are fans, ducts, stack, baghouse and related appurtenances, approximately located as shown on the attached Appendix A-3.

(e) The location of the facilities from which the emission originates and to which Appendix 26 is appurtenant is Lot 4, Plan 4926, Kootenay District.

(f) The location of the point of discharge and to which Appendix 26 is appurtenant is Lot 4, Plan 4926, Kootenay District.

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Amendment date: (most recent) FEB 14 1992

R.J. Crozier, R.P. Bio.
Assistant Regional Waste Manager

APPENDIX 27

PERMIT NUMBER PA-02691

(a) The discharge of contaminants to which Appendix 27 is applicable is from 2 foundry furnace baghouse stacks identified as F-3 and F-4 as shown on the attached Appendix A-7.

(b) The maximum volume which may be discharged is 1500 m^3/min.

(c) The characteristics of the discharge shall not exceed:

Particulate 23 mg/m^3

NOTE: All air and gaseous volumes specified in (b) and (c) above are at standard conditions which are:

Standard temperature = 293.15° K

Standard pressure = 101.325 KPa

Water Vapour zero unless otherwise stated

(d) The works authorized are fans, ducts, 2 stacks, 2 baghouses, 2 baghouse bypass stacks and related appurtenances, approximately located as shown on the attached Appendix A-7.

(e) The location of the facilities from which the emissions originate and to which Appendix 27 is appurtenant is Lot 1, Plan 4926, Kootenay District.

(f) The location of the points of discharge and to which Appendix 27 is appurtenant is Lot 1, Plan 4926, Kootenay District.

Date issued: September 9, 1975

Amendment date: (most recent) FEB 14 1992

R.J. Crozier, R.P. Bio.
Assistant Regional Waste Manager

APPENDIX 28

PERMIT NUMBER PA-02691

(a) The discharge of contaminants to which Appendix 28 is applicable is from 54 miscellaneous lead smelter sources identified as numbers 1 to 54 inclusive as shown on the attached Appendix A-2.

(b) The maximum volume which may be discharged is 5800 m^3/min.

(c) The characteristics of the discharge shall not exceed:

These discharges are typical building ventilation, sanitation vents, compressor intake and exhaust vents, steam vents and ash pulverizer vents.

NOTE: All air and gaseous volumes specified in (b) and (c) above are at standard conditions which are:

Standard temperature = 293.15° K

Standard pressure = 101.325 KPa

Water Vapour zero unless otherwise stated

(d) The works authorized are fans, ducts, stacks, a baghouse associated with the ash pulveriser vent (No. 16) and related appurtenances, approximately located as shown on the attached Appendix A-2.

(e) The location of the facilities from which the emissions originate and to which Appendix 28 is appurtenant is Lot 1, Plan 4926, Kootenay District.

(f) The location of the points of discharge and to which Appendix 28 is appurtenant is Lot 1, Plan 4926, Kootenay District.

(g) This emission source is to be eliminated by December 31, 1996.

Date issued: September 9, 1975

Amendment date: (most recent) FEB 14 1992

R.J. Crozier, R.P. Bio.
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APPENDIX 29

PERMIT NUMBER PA-02691

(a) The discharge of contaminants to which Appendix 29 is applicable is from 15 miscellaneous lead smelter sources identified as numbers1 to 15 inclusive as shown on the attached Appendix A-1.

(b) The maximum volume which may be discharged is 1200 m^3/min.

(c) The characteristics of the discharge shall not exceed:

These sources are typical building ventilation, sanitation vents and laboratory fume hood ventilation.

NOTE: All air and gaseous volumes specified in (b) and (c) above are at standard conditions which are:

Standard temperature = 293.15° K

Standard pressure = 101.325 KPa

Water Vapour zero unless otherwise stated

(d) The works authorized are fans, ducts, stacks and related appurtenances, approximately located as shown on the attached Appendix A-1.

(e) The location of the facilities from which the emissions originate and to which Appendix 29 is appurtenant is Lot 1, Plan 4926, Kootenay District.

(f) The location of the point of discharges and to which Appendix 29 is appurtenant is Lot 1, Plan 4926, Kootenay District.

(g) This emission source is to be eliminated by December 31, 1996.

R.J. Crozier, R.P. Bio.
Assistant Regional Waste Manager

Date issued: September 9, 1975

Amendment date:
(most recent) FEB 14 1992

APPENDIX 30

PERMIT NUMBER PA-02691

(a) The discharge of contaminants to which Appendix 30 is applicable is from 78 miscellaneous sources from the lead refinery, silver refinery, and antimony plant numbered 1 to 78 inclusive as shown on the attached Appendix A-3.

(b) The maximum volume which may be discharged is 3200 m^3/min.

(c) The characteristics of the discharge shall not exceed:

These sources are typical building ventilation, sanitation ventilation, tank vents, fume hood vents, firebox vents, steam vents, pot vents and burner vents.

NOTE: All air and gaseous volumes specified in (b) and (c) above are at standard conditions which are:

Standard temperature = 293.15° K

Standard pressure = 101.325 KPa

Water Vapour zero unless otherwise stated

(d) The works authorized are fans, ducts, vents, stacks, baghouses on sources 25 and 26 and related appurtenances, approximately located as shown on the attached Appendix A-3.

(e) The location of the facilities from which the emissions originate and to which Appendix 30 is appurtenant is Lot 4, Plan 4926, Kootenay District.

(f) The location of the points of discharge and to which Appendix 30 is appurtenant is Lot 4, Plan 4926, Kootenay District.

Date issued: September 9, 1975

Amendment date: FEB 14 1992
(most recent)

R.J. Crozier, R.P. Bio.
Assistant Regional Waste Manager

APPENDIX 31

PERMIT NUMBER PA-02691

(a) The discharge of contaminants to which Appendix 31 is applicable is from 27 miscellaneous sources from the carpenter shop, paint shop, engineering building, and change room identified as numbers 1 to 27 inclusive as shown on the attached Appendix A-4.

(b) The maximum volume which may be discharged is 450 m^3/min.

(c) The characteristics of the discharge shall not exceed:

These sources are typical building ventilation, sanitation ventilation, sawdust burner ventilation and steam vents.

NOTE: All air and gaseous volumes specified in (b) and (c) above are at standard conditions which are:

Standard temperature = 293.15° K

Standard pressure = 101.325 KPa

Water Vapour zero unless otherwise stated

(d) The works authorized are fans, ducts, vents, cyclone on emission number 19 and related appurtenances, approximately located as shown on the attached Appendix A-4.

(e) The location of the facilities from which the emissions originate and to which Appendix 31 is appurtenant is Lot 1, Plan 4926, Kootenay District.

(f) The location of the points of discharge and to which Appendix 31 is appurtenant is Lot 1, Plan 4926, Kootenay District.

Date issued: September 9, 1975

Amendment date: FEB 14 1992
(most recent)

R.J. Crozier, R.P. Bio.
Assistant Regional Waste Manager

APPENDIX 32

PERMIT NUMBER PA-02691

(a) The discharge of contaminants to which Appendix 32 is applicable is from 55 miscellaneous sources from the research - library building and assay office identified as 1 to 55 inclusive as shown on the attached Appendix A-5.

(b) The maximum volume which may be discharged is 1200 m^3/min.

(c) The characteristics of the discharge shall not exceed:

These sources are typical building ventilation, laboratory fume hoods, steam vents and sanitation vents.

NOTE: All air and gaseous volumes specified in (b) and (c) above are at standard conditions which are:

Standard temperature = 293.15° K

Standard pressure = 101.325 KPa

Water Vapour zero unless otherwise stated

(d) The works authorized are fans, ducts, vents, stacks, and related appurtenances, approximately located as shown on the attached Appendix A-5.

(e) The location of the facilities from which the emissions originate and to which Appendix is appurtenant is Lots 1 and 4, Plan 4926, Kootenay District.

(f) The location of the points of discharge and to which Appendix 32 is appurtenant is Lots 1 and 4, Plan 4926, Kootenay District.

Date issued: September 9, 1975

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R.J. Crozier, R.P. Bio.
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APPENDIX 33

PERMIT NUMBER PA-02691

(a) The discharge of contaminants to which Appendix 33 is applicable is from 8 miscellaneous sources from the metal products fabrication plant identified as numbers 1 to 8 inclusive as shown on the attached Appendix A-6.

(b) The maximum volume which may be discharged is 60 m^3/min.

(c) The characteristics of the discharge shall not exceed:

These sources are typical melting pot vents, steam vents burner vents and sanitation vents.

NOTE: All air and gaseous volumes specified in (b) and (c) above are at standard conditions which are:

Standard temperature = 293.15° K

Standard pressure = 101.325 KPa

Water Vapour zero unless otherwise stated

(d) The works authorized are fans, ducts, vents, stacks, and related appurtenances, approximately located as shown on the attached Appendix A-6.

(e) The location of the facilities from which the emissions originates and to which Appendix is appurtenant is Lot 4, Plan 4926, Kootenay District.

(f) The location of the points of discharge and to which Appendix 33 is appurtenant is Lot 4, Plan 4926, Kootenay District.

Date issued: September 9, 1975

Amendment date: FEB 14 1992
(most recent)

R.J. Crozier, R.P. Bio.
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APPENDIX 34

PERMIT NUMBER PA-02691

(a) The discharge of contaminants to which Appendix 34 is applicable is from 87 miscellaneous sources from the manufacturing shops and warehouse identified as 18 to 104 inclusive as shown on the attached Appendix A-7.

(b) The maximum volume which may be discharged is 653 m^3/min.

(c) The characteristics of the discharge shall not exceed:

These sources are typical building ventilation, degreasing unit ventilation, sanitation vents, steam vents, foundry grinding area vents, furnace and oven vents and heat treatment vents.

NOTE: All air and gaseous volumes specified in (b) above are at standard conditions which are:

Standard temperature = 293.15° K

Standard pressure = 101.325 KPa

Water Vapour zero unless otherwise stated

(d) The works authorized are fans, ducts,vents, stacks, cyclones on numbers 81 and 82, baghouse on number 83 and related appurtenances, approximately located as shown on the attached Appendix A-7.

(e) The location of the facilities from which the emissions originates and to which Appendix 34 is appurtenant is Lot 1, Plan 4926, Kootenay District.

(f) The location of the points of discharge and to which Appendix 34 is appurtenant is Lot 1, Plan 4926, Kootenay District.

R.J. Crozier, R.P. Bio.
Assistant Regional Waste Manager

Date issued: September 9, 1975

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(most recent)

APPENDIX 36

PERMIT NUMBER PA-02691

(a) The discharge of contaminants to which Appendix 36 is applicable is from the lead refinery scrubber identified as R-1A as shown on the attached Appendices A-1 and A-6.

(b) The maximum volume which may be discharged is 4760 m^3/min.

(c) The characteristics of the discharge shall not exceed:

Particulate	100 mg/m^3
Total Arsenic	7 mg/m^3
Lead	7 mg/m^3
Gaseous Fluoride	7 ppm

NOTE: All air and gaseous volumes specified in (b) and (c) above are at standard conditions which are:

Standard temperature = 293.15° K

Standard pressure = 101.325 KPa

Water Vapour zero unless otherwise stated

(d) The works authorized are fans, ducts, lime scrubber, stack and related appurtenances, approximately located as shown on the attached Appendices A-1 and A-6.

(e) The location of the facilities from which the emission originates and to which Appendix 36 is appurtenant is Lot 4, Plan 4926, Kootenay District.

(f) The location of the point of discharge and to which Appendix 36 is appurtenant is Lot 4, Plan 4926, Kootenay District.

Date issued: September 9, 1975

Amendment date: FEB 14 1992
(most recent)

R.J. Crozier, R.P. Bio.
Assistant Regional Waste Manager

APPENDIX 37

PERMIT NUMBER PA-02691

(a) The discharge of contaminants to which Appendix 37 is applicable is from 8 miscellaneous stacks associated with the smelter feed plant identified as S-60 to S-67 inclusive as shown on the attached Appendix A-1.

(b) The maximum volume which may be discharged is 4320 m^3/min.

(c) The characteristics of the discharge shall not exceed:

Particulate 100 mg/m^3

NOTE: All air and gaseous volumes specified in (b) and (c) above are at standard conditions which are:

Standard temperature = 293.15^0 K

Standard pressure = 101.325 KPa

Water Vapour zero unless otherwise stated

(d) The works authorized are fans, ducts, stacks, wet scrubbers and related appurtenances, approximately located as shown on the attached Appendix A-1.

(e) The location of the facilities from which the emissions originate and to which Appendix 37 is appurtenant is Lot 1, Plan 4926, Kootenay District.

(f) The location of the points of discharge and to which Appendix 37 is appurtenant is Lot 1, Plan 4926, Kootenay District.

Date issued: September 9, 1975

Amendment date: FEB 14 1992
(most recent)

R.J. Crozier, R.P. Bio.
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APPENDIX 38

PERMIT PA-02691

(a) The discharge of contaminants to which Appendix 38 is applicable is from the short rotary furnace in the lead refinery alloy plant identified as R-2A as shown on the attached Appendix A-3.

(b) The maximum volume which may be discharged is 1100 m^3/min.

(c) The characteristics of the discharge shall not exceed:

Particulate	23 mg/m^3
Lead	7 mg/m^3
Total Arsenic	7 mg/m^3
Gaseous Fluoride	7 ppm

NOTE: All air and gaseous volumes specified in (b) and (c) above are at standard conditions which are:

Standard temperature = 293.15° K

Standard pressure = 101.325 KPa

Water Vapour zero unless otherwise stated

(d) The works authorized are fans, ducts, baghouse and related appurtenances, approximately located as shown on the attached Appendix A-3.

(e) The location of the facilities from which the emission originates and to which Appendix 38 is appurtenant is Lot 4, Plan 4926, Kootenay District.

(f) The location of the point of discharge and to which Appendix 38 is appurtenant is Lot 4, Plan 4926, Kootenay District.

R.J. Crozier, R.P. Bio.
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Date issued: September 9, 1975

Amendment date: (most recent) FEB 14 1992

APPENDIX 39

PERMIT NUMBER PA-02691

(a) The discharge of contaminants to which Appendix 39 is applicable is from ventilation associated with the lead operations crushing plant identified as CP-1 as shown on the attached Appendix A-1.

(b) The maximum volume which may be discharged is 200 m^3/min.

(c) The characteristics of the discharge shall not exceed:

Particulate	20 mg/m^3
Lead	7 mg/m^3

NOTE: All air and gaseous volumes specified in (b) and (c) above are at standard conditions which are:

Standard temperature = 293.15° K

Standard pressure = 101.325 KPa

Water Vapour zero unless otherwise stated

(d) The works authorized are fans, stack, baghouse and related appurtenances, approximately located as shown on the attached Appendix A-1.

(e) The location of the facilities from which the emission originates and to which Appendix 39 is appurtenant is Lot 1, Plan 4926, Kootenay District.

(f) The location of the point of discharge and to which Appendix 39 is appurtenant is Lot 1, Plan 4926, Kootenay District.

Date issued: September 9, 1975

Amendment date: FEB 14 1992
(most recent)

R.J. Crozier, R.P. Bio.
Assistant Regional Waste Manager

APPENDIX 40

PERMIT NUMBER PA-02691

(a) The discharge of contaminants to which Appendix 40 is applicable is from ventilation associated with the Copper Sulphate/Arsenate Plant identified as R-3A and R-4A as shown on the attached Appendix A- 9.

(b) The maximum volumes which may be discharged are:

from the flash tank crossflow scrubber 100 m^3/min.

from the production ventilation scrubber 200m^3/min.

(c) The characteristics of the discharges shall not exceed:

Arsenic	5 mg/m^3
Copper	2 mg/m^3

NOTE: All air and gaseous volumes specified in (b) and (c) above are at standard conditions which are:

Standard temperature = 293.15^0 K

Standard pressure = 101.325 KPa

Water Vapour zero unless otherwise stated

(d) The works authorized are fans, ducts, two packed bed scrubbers and related appurtenances, approximately located as shown on the attached Appendix A-9.

(e) The location of the facilities from which the emissions originate and to which Appendix 40 is appurtenant is Lot 4, Plan 4926, Kootenay District.

(f) The location of the points of discharge and to which Appendix 40 is appurtenant is Lot 4, Plan 4926, Kootenay District.

Date issued: September 9, 1975

Amendment date: FEB 14 1992
(most recent)

R.J. Crozier, R.P. Bio.
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APPENDIX 41

PERMIT NUMBER PA-02691

(a) The discharge of contaminants to which Appendix 41 is applicable is from ventilation associated with the Effluent Treatment Plant identified as numbers 1 to 4 inclusive shown on the attached Appendix A-8.

(b) The maximum volume may be discharged is 50 m^3/min.

(c) The characteristics of the discharge shall be air with traces of SO_2.

NOTE: All air and gaseous volumes specified in (b) and (c) above are at standard conditions which are:

Standard temperature = 293.15° K

Standard pressure = 101.325 KPa

Water Vapour zero unless otherwise stated

(d) The works authorized are fans ducts, vents scrubber on surge tank vent, baghouse on lime silo, and related appurtenances, approximately located as shown on the attached Appendix A-8.

(e) The location of the facilities from which the emissions originate and to which Appendix 41 is appurtenant is Lot 4, Plan 4926, Kootenay District.

(f) The location of the points of discharge and to which Appendix 41 is appurtenant is Lot 4, Plan 4926, Kootenay District.

Date issued: September 9, 1975

Amendment date: (most recent) FEB 14 1992

R.J. Crozier, R.P. Bio.
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APPENDIX 42

PERMIT NUMBER PA-02691

(a) The discharge of contaminants to which Appendix 42 is applicable is from ventilation associated with the new QSL smelter area identified as 68 to 72 inclusive as shown on the attached Appendix A-10.

(b) The maximum volume may be discharged is undefined for emergency bypass stacks but from the QSL Slag Granulation Stack is 1100 m^3/min, from the QSL Copper Matte Granulation Stack is 700 m^3/min and from the Smelter Feed Mix Plant Stack is 250 m^3/min.

(c) The characteristics of the discharge shall not exceed:

Smelter Feed Mix Plant Stack (No. 72) - Particulate- 36 mg/m^3

QSL Copper Matte Granulation Stack (No. 71) - Particulate - Trace

QSL Slag Granulation Stack (No. 70) - Particulate - Trace

NOTE: All air and gaseous volumes specified in (b) above are at standard conditions which are:

Standard temperature = 293.15° K

Standard pressure = 101.325 KPa

Water Vapour zero unless otherwise stated

(d) The works authorized are fans, stacks, vents, scrubbers and related appurtenances, approximately located as shown on the attached Appendix A-10.

(e) The location of the facilities from which the emission originates and to which Appendix 42 is appurtnant is Lot 1, Plan 4926, Kootenay District.

(f) The location of the point of discharge and to which Appendix 42 is appurtenant is Lot 1, Plan 4926, Kootenay District.

Date issued: September 9, 1975

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(most recent)

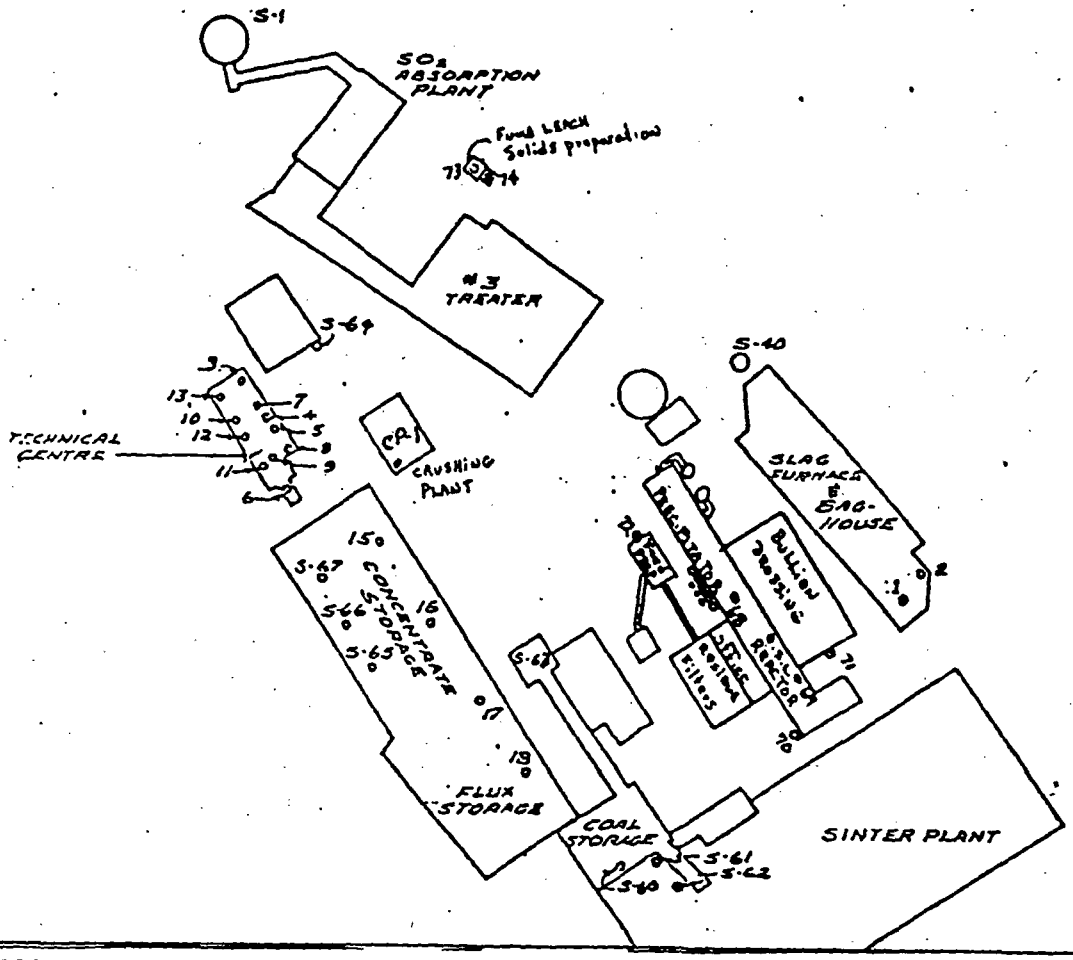
R.J. Crozier, R.P. Bio.
Assistant Regional Waste Manager

Province of British Columbia

Ministry of Environment

WATER MANAGEMENT BRANCH

SITE PLAN



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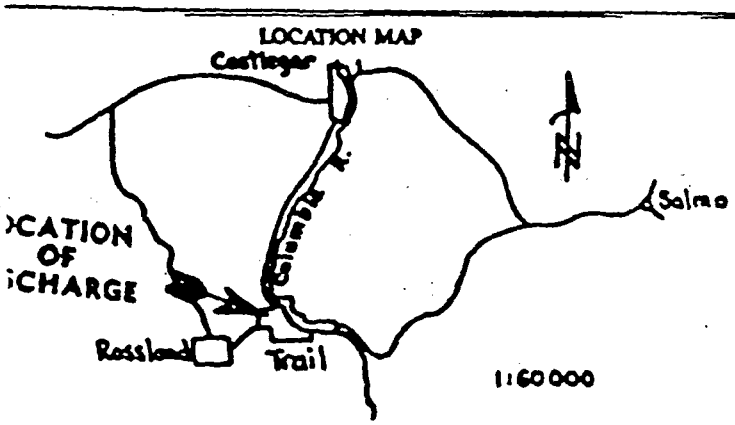


GRAHAM KENYON - COMINCO LTD.
(Name of applicant(s))

30 OCT 1990
(Date)

(Signature of applicant(s) or agent)

(FOR OFFICE USE ONLY)

Date Issued
FEB 12 1991

Date Amended
FEB 14 1992

Jim McLaren, P. Eng.
Regional Waste Manager

R.J. Crozier, R.P. Bio.
Assistant Regional Waste Manager

Appendix A-1 to Permit No. PE-02691

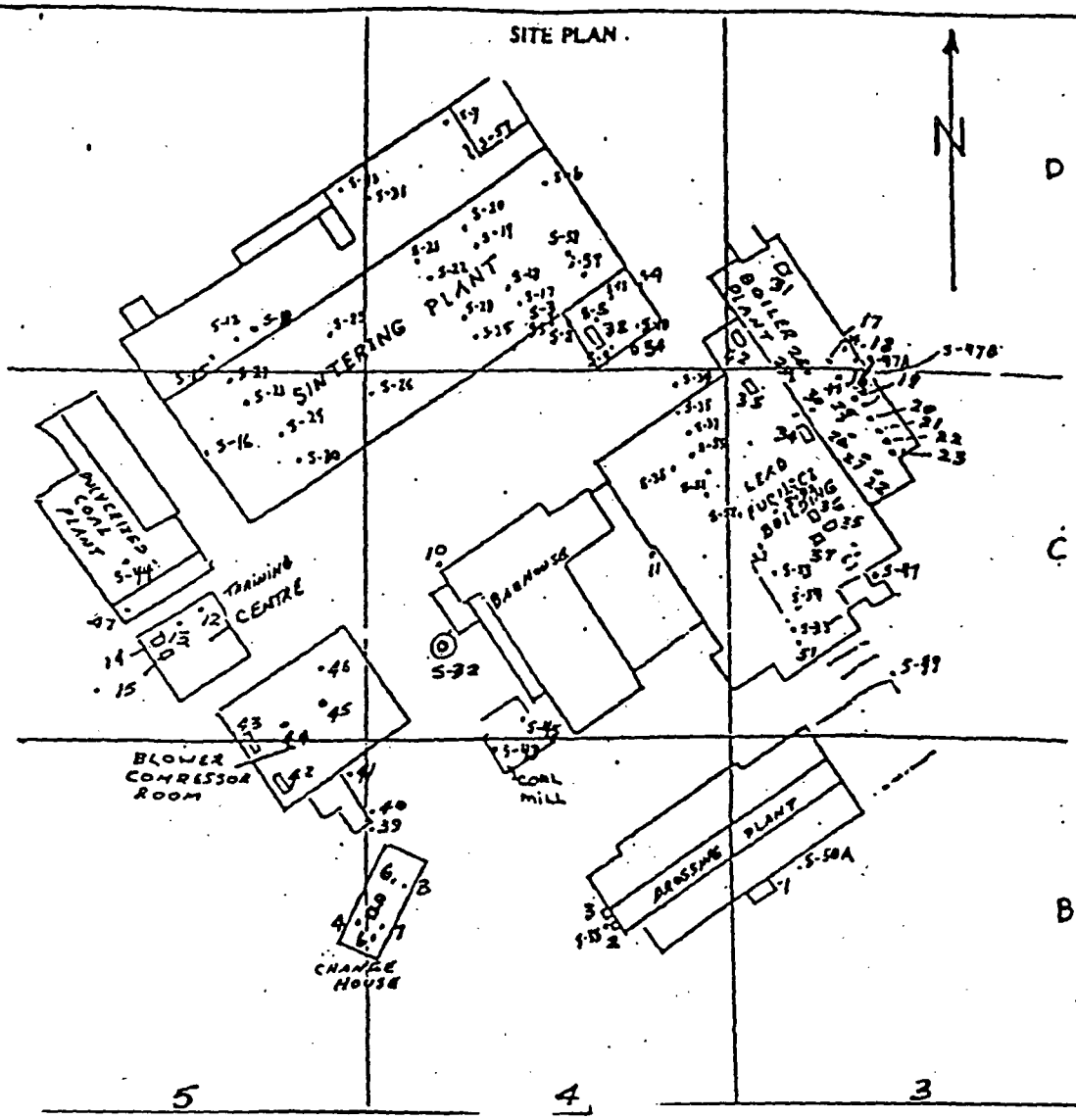
Approval No.

Province of British Columbia

Ministry of Environment

WA MANAGEMENT BRANCH

SITE PLAN



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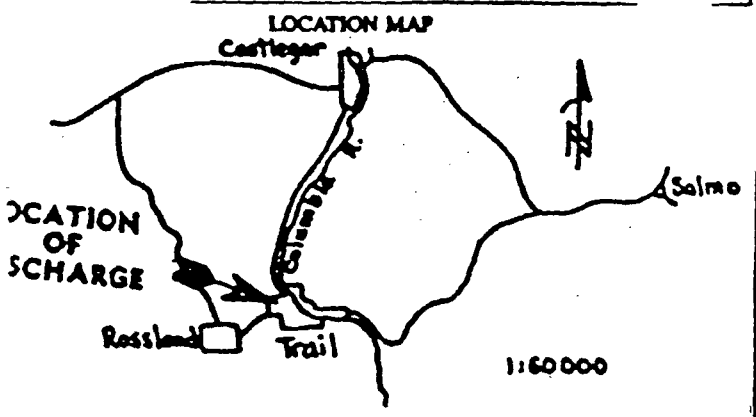

GRAHAM KENYON - COMINCO LTD.
(Name of applicant(s))

31 Oct 1990
(Date)

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(FOR OFFICE USE ONLY)

Date Issued FEB 12 1991

Date Amended

Jim McLaren, P. Eng.
Regional Waste Manager

FEB 14 1992

R.J. Crozier, R.P. Bio.
Assistant Regional Waste Manager

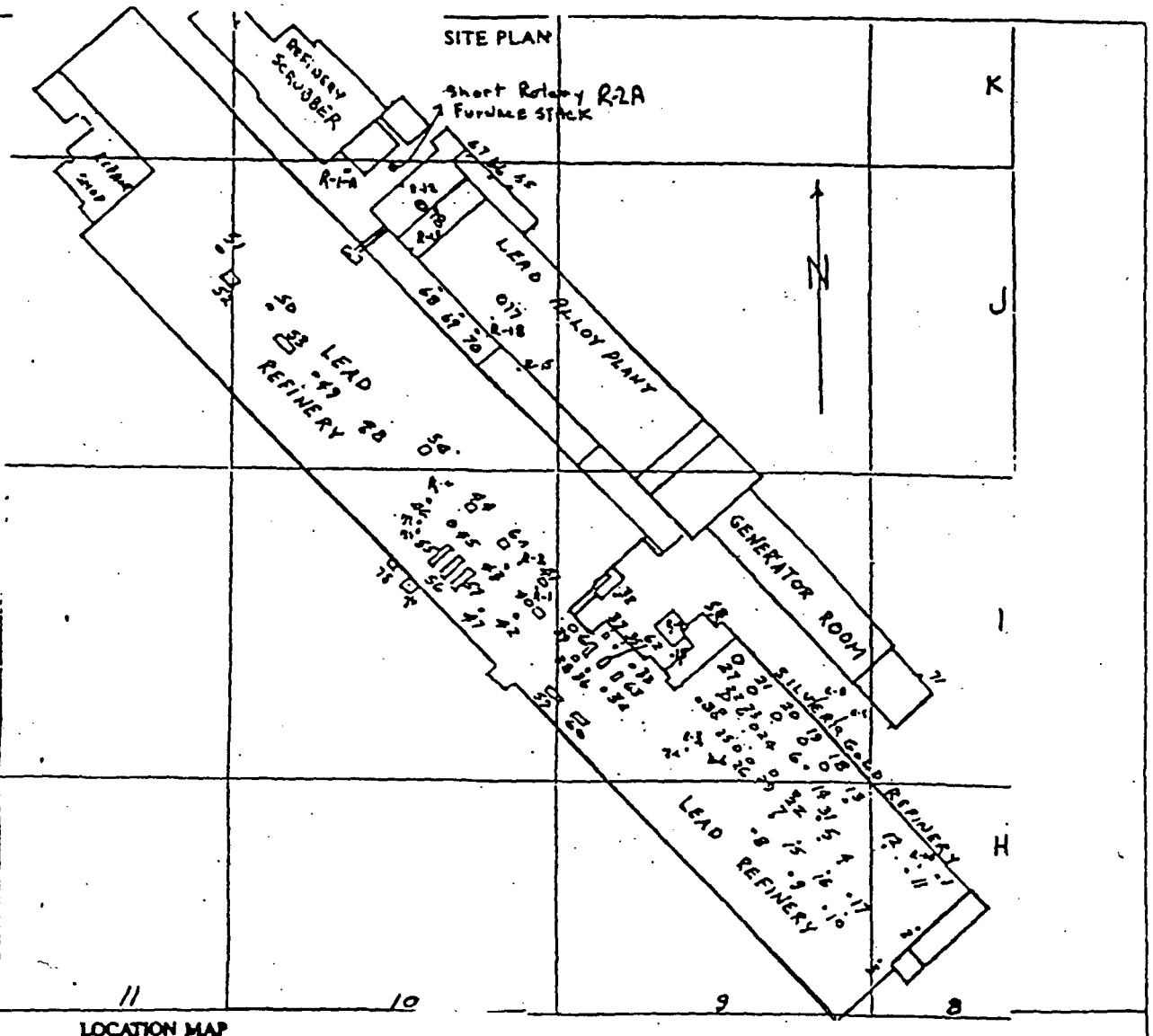
Appendix A-2 to Permit No. PA-02691

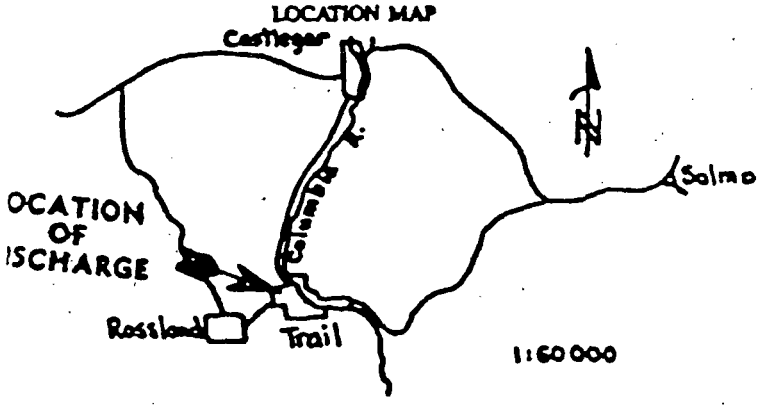
Approval No.

Province of British Columbia

Ministry of Environment

Y E MANAGEMENT BRANCH





COMINCO LTD. GRAHAM KENYON
(Name of applicant(s))

31 Oct 1990
(Date)

(Signature of applicant(s) or agent)

(FOR OFFICE USE ONLY)

Date Issued FEB 12 1991

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Jim McLaren, P. Eng.
Regional Waste Manager

FEB 14 1992

R.J. Crozier, R.P. Bio.
Assistant Regional Waste Manager

Appendix 2-3 to Permit No. PA-02691

Approval No.

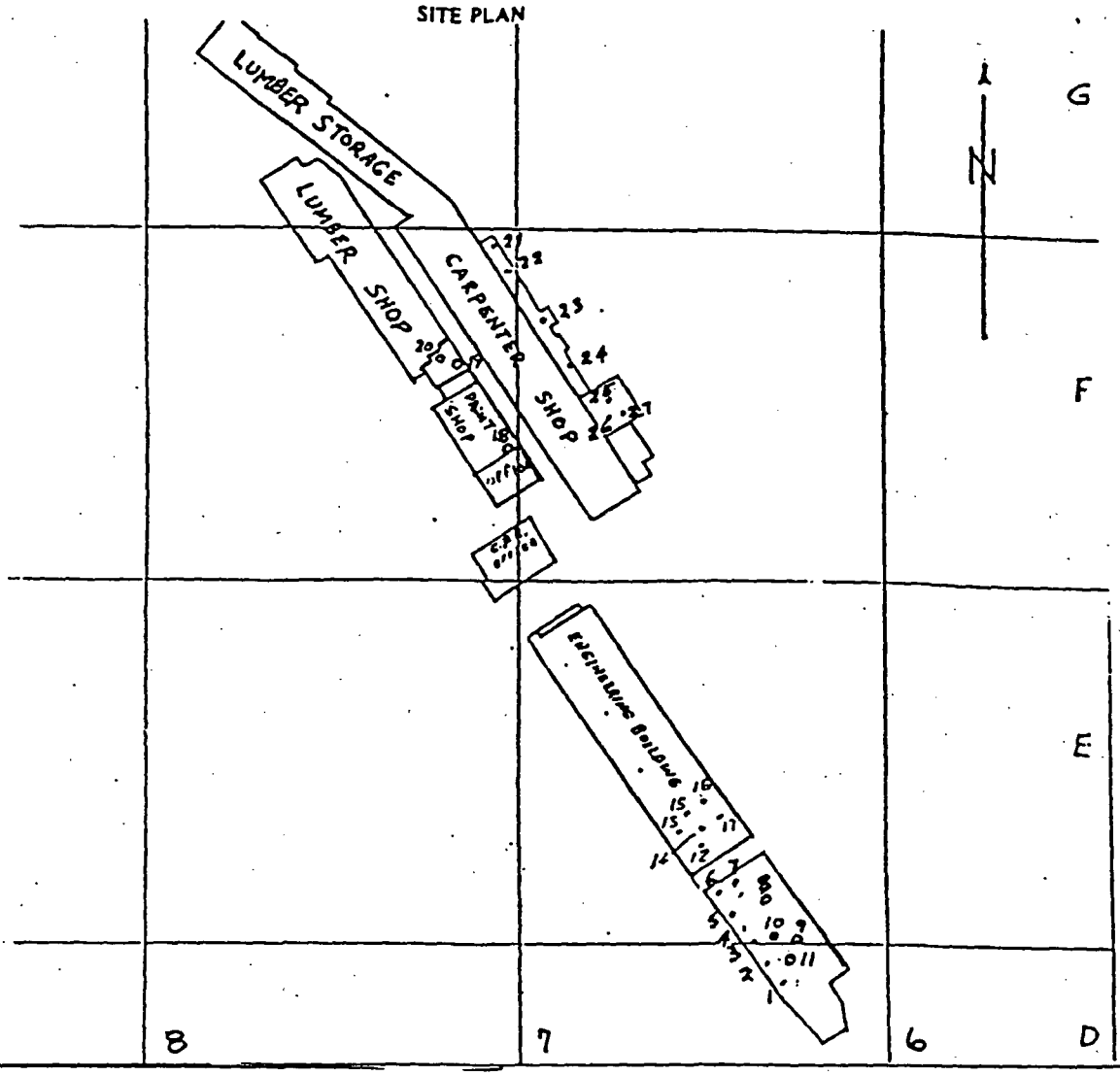
YV 1987

Province of British Columbia

Ministry of Environment

W E MANAGEMENT BRANCH

SITE PLAN



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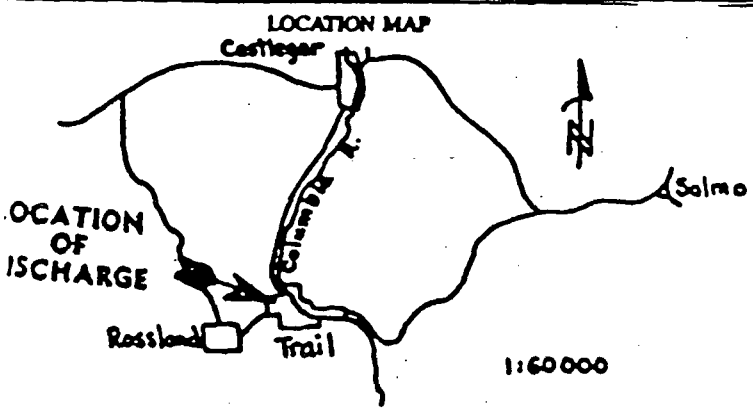

COMINCO LTD GRAHAM KENYON
(Name of applicant(s))

31 Oct 1990
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(FOR OFFICE USE ONLY)

Date Issued FEB 12 1991

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FEB 14 1992

R. L. Crozier, R.P. Bio.
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Appendix A-4 to Permit No. PA-02691

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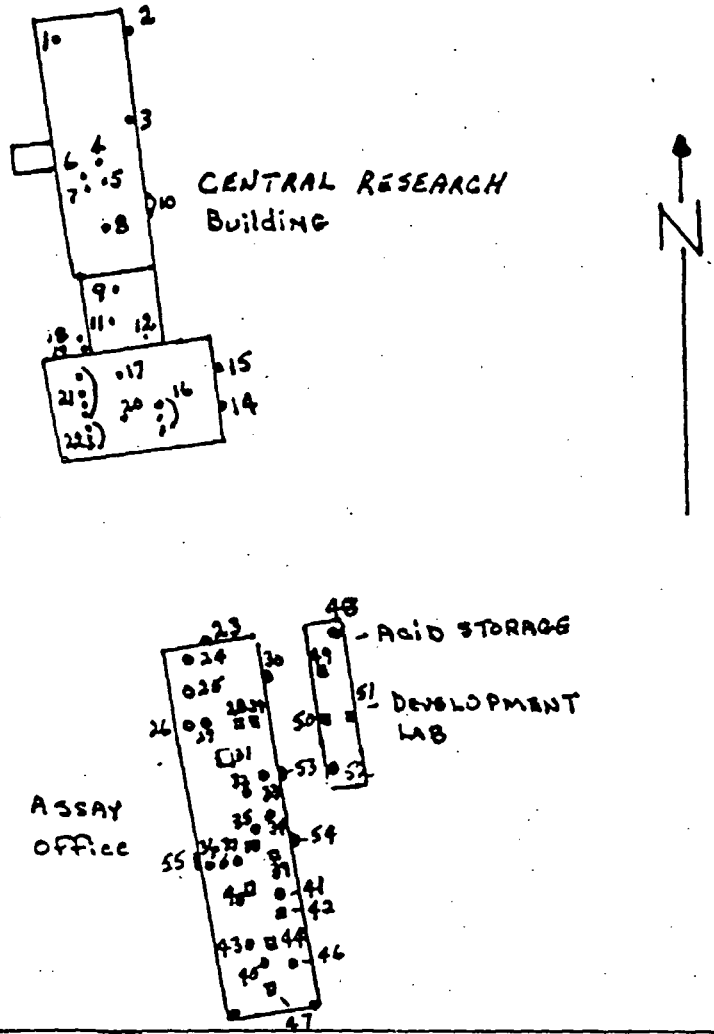
Province of British Columbia

Ministry of Environment

WASTE MANAGEMENT BRANCH

SITE PLAN



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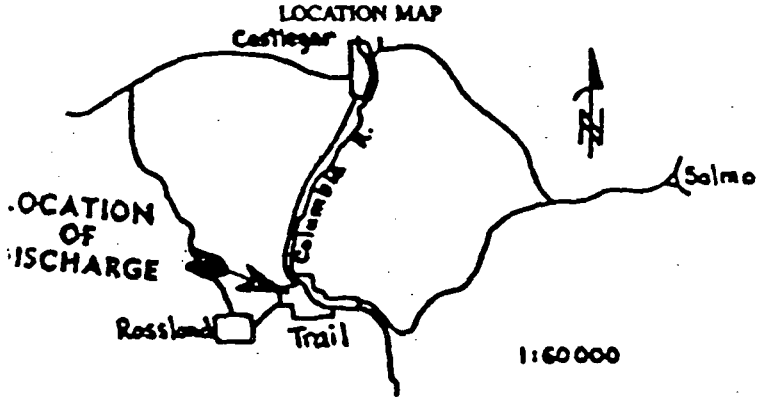

G.F. Kenyon - Cominco Ltd
(Name of applicant(s))

31 Oct 1990
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(Signature of applicant(s) or agent)

(FOR OFFICE USE ONLY)

Date Issued FEB 12 1991

Date Amended FEB 14 1992

Jim McLaren, P. Eng.
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R.J. Crozier, R.P. Bio.
Assistant Regional Waste Manager

Appendix A-5 to Permit No. PA-02691

Approval No.

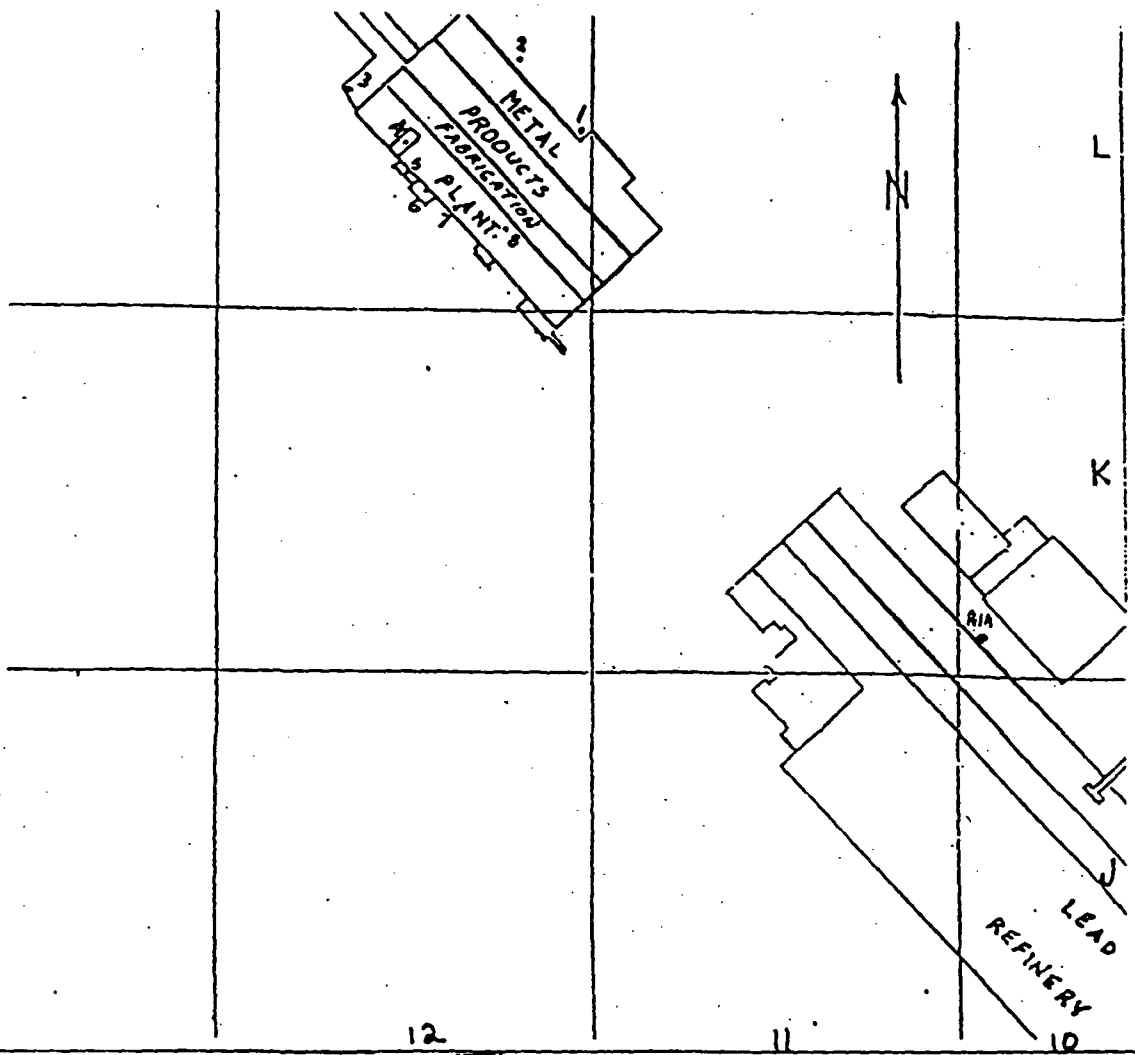
ENV 1987

Province of British Columbia

Ministry of Environment

W E MANAGEMENT BRANCH

SITE PLAN



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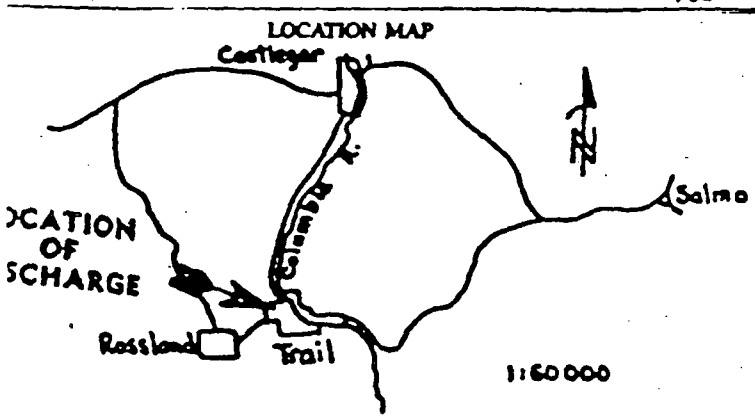

COMINCO LTD - GRAHAM KENYON
(Name of applicant(s))

31 Oct 1990
(Date)

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Date Issued
FEB 12 1991

Date Amended

Jim McLaren, P. Eng.
Regional Waste Manager

FEB 14 1992

R.J. Crozier, R.P. Bio.
Assistant Regional Waste Manager

Appendix A-6 to Permit No. PA-02691

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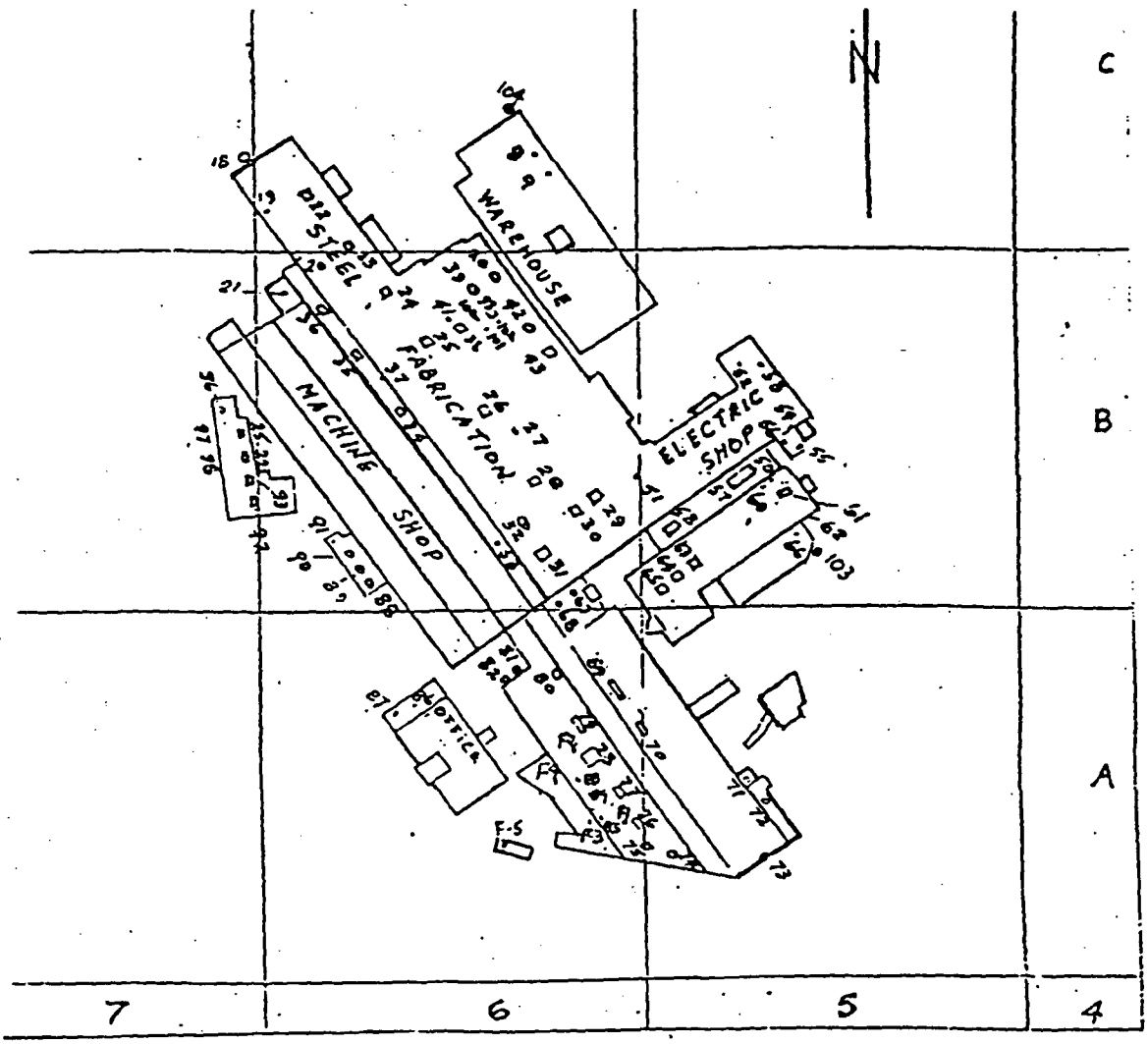
NV 1987

Province of British Columbia

Ministry of Environment

TE MANAGEMENT BRANCH

SITE PLAN



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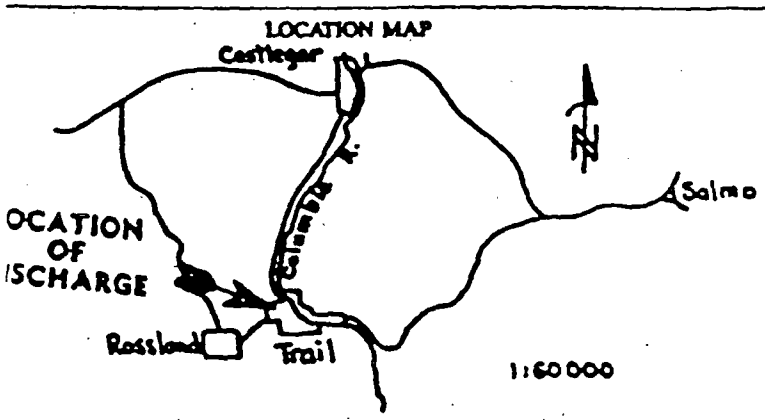

CONINCO LTD GRAHAM KENYON

(Name of applicant(s))

31 Oct 1990

(Date)

(Signature of applicant(s) or agent)

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Date Issued FEB 12 1991

Date Amended

Jim McLaren, P. Eng.
Regional Waste Manager

FEB 14 1992

R.J. Crozier, R.P. Bio.
Assistant Regional Waste Manage

Appendix A-7 to Permit No. PA-02691

Approval No.

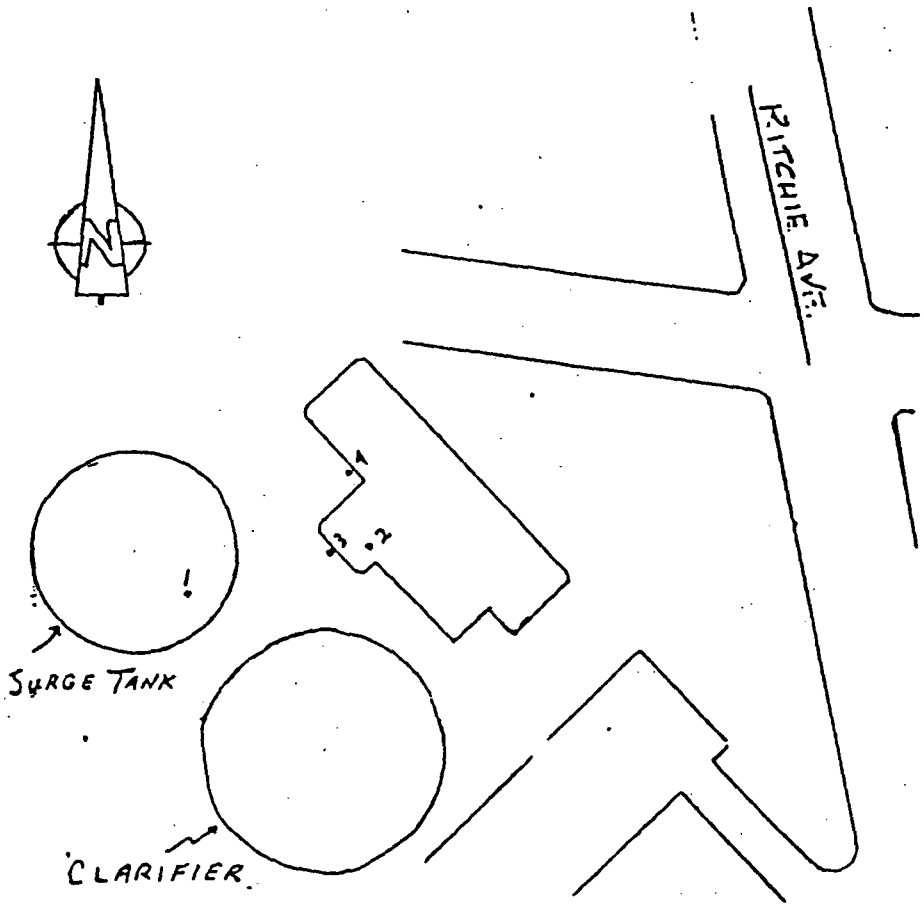
NV 1987

Province of British Columbia

Ministry of Environment

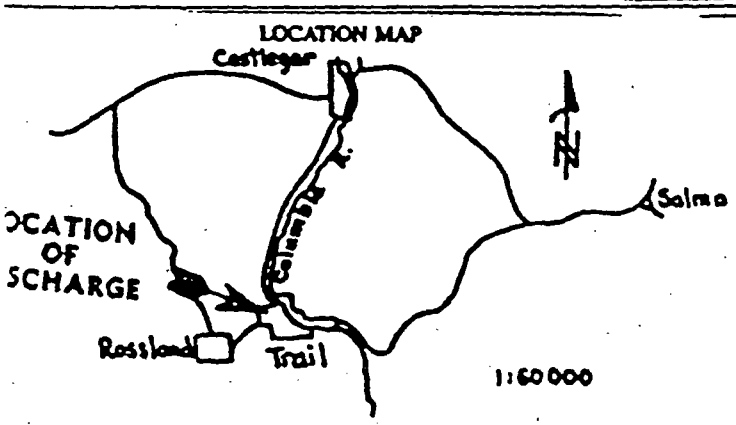
W E MANAGEMENT BRANCH

SITE PLAN



EFFLUENT TREATMENT PLANT

LOCATION MAP



COMINCO LTD. GRAHAM KANYON
(Name of applicant(s))

31 Oct 1990
(Date)

(Signature of applicant(s) or agent)

(FOR OFFICE USE ONLY)

Date Issued FEB 12 1991

Date Amended FEB 14 1992

Jim McLaren, P. Eng.
Regional Waste Manager

R.J. Crozier, R.P. Bio.
Assistant Regional Waste Manager

Appendix A-8 to Permit No. PA-02691

Approval No.

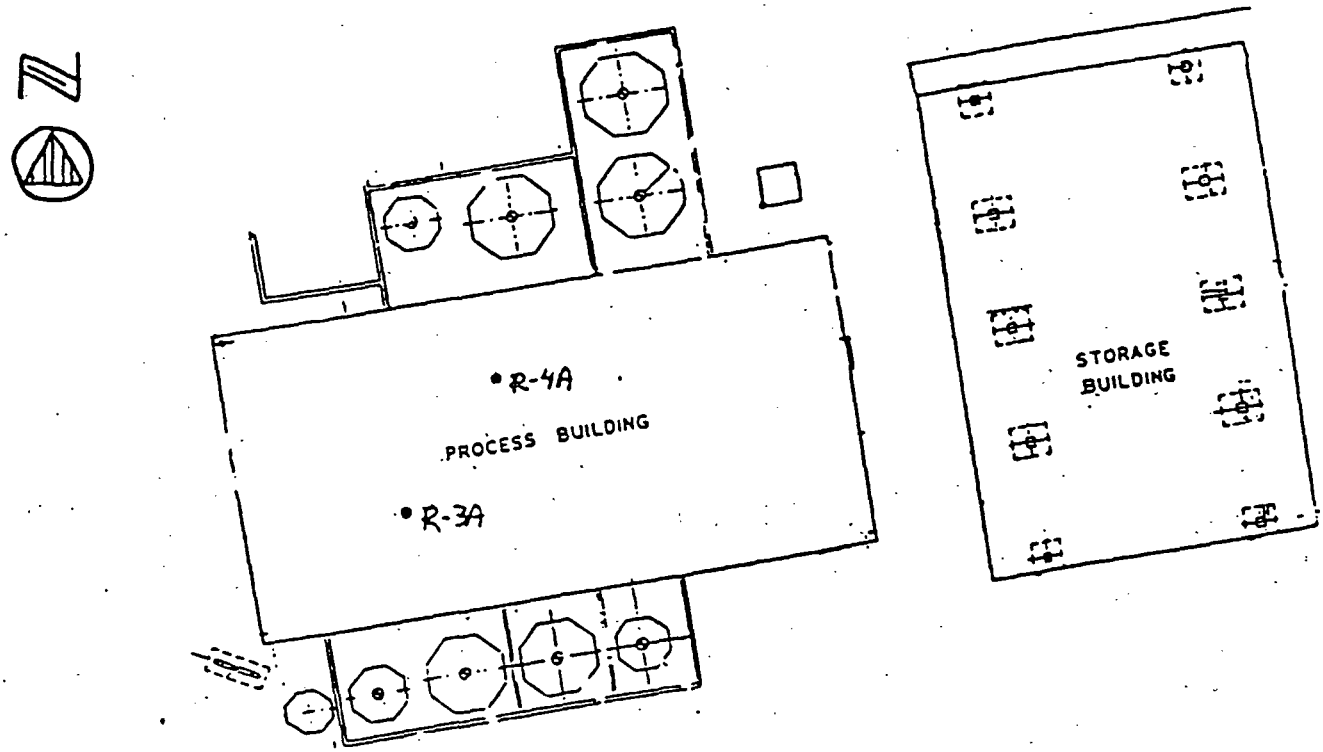
NOV 1987

Province of British Columbia

Ministry of Environment

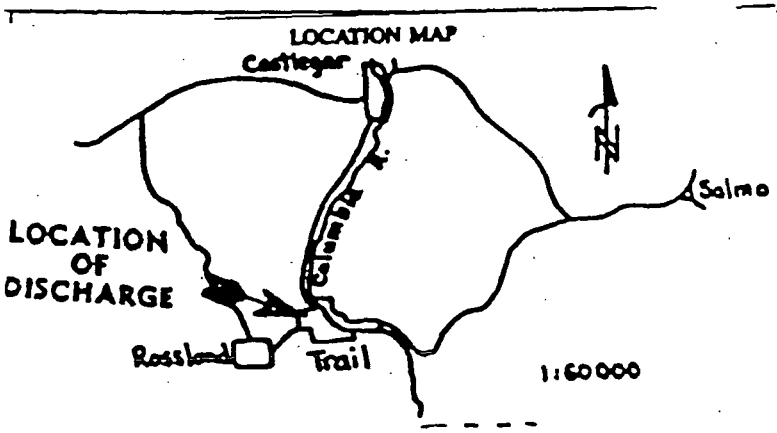
V E MANAGEMENT BRANCH

SITE PLAN



COPPER ARSENATE PLANT

LOCATION MAP



COMINCO LTD. - GRAHAM KENYON
(Name of applicant(s))

31 Oct 1990
(Date)

(Signature of applicant(s) or agent)

(FOR OFFICE USE ONLY)

Date Issued FEB 12 1991

Date Amended

Jim McLaren, P. Eng.
Regional Waste Manager

FEB 14 1992

R.J. Crozier, R.P.Bio.
Assistant Regional Waste Manager

Appendix A-9 to Permit No. PA-02691

Approval No.

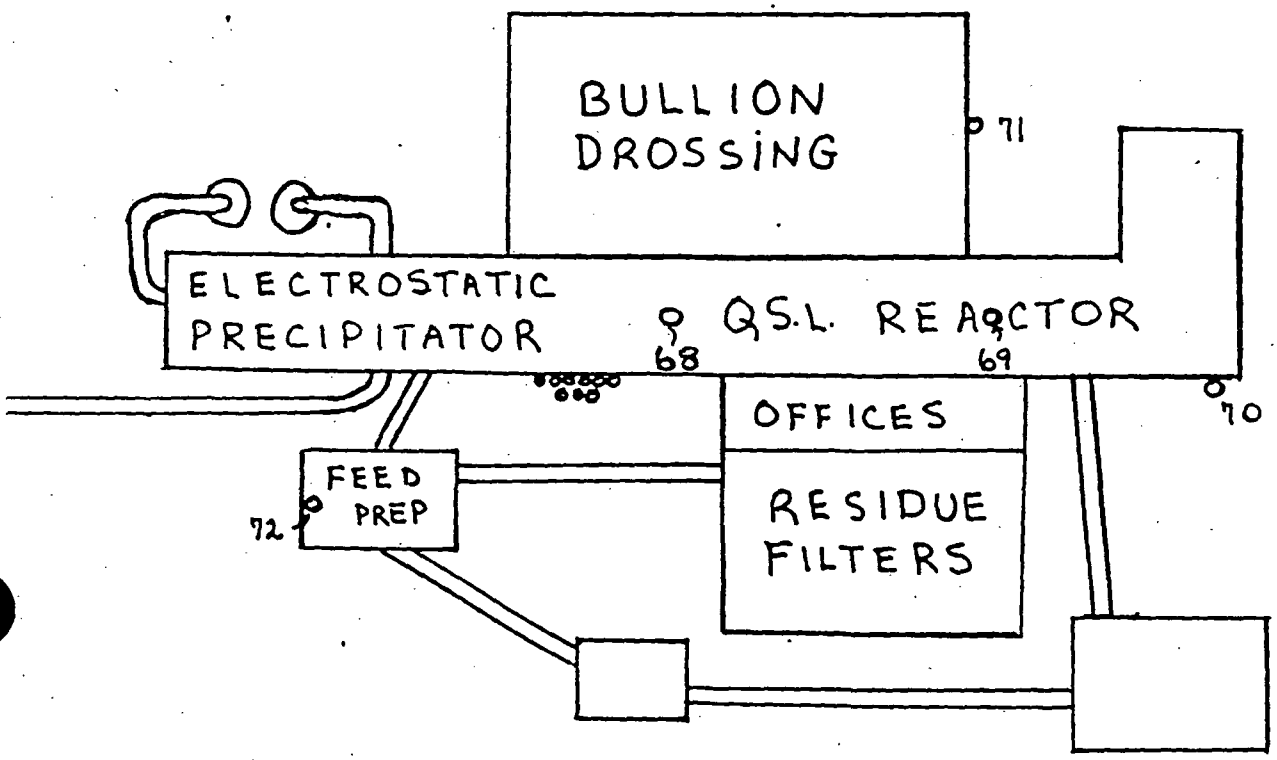
ENV 1967

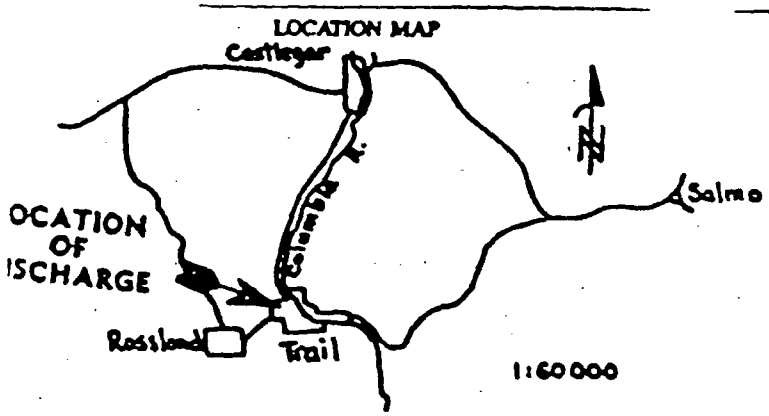
Province of British Columbia

Ministry of Environment

WASTE MANAGEMENT BRANCH

SITE PLAN





COMINCO LTD - GRAHAM KENYON
(Name of applicant(s))

31 Oct '90
(Date)

(Signature of applicant(s) or agent)

(FOR OFFICE USE ONLY)

Date Issued FEB 12 1991

Date Amended

Jim McLaren, P. Eng.
Regional Waste Manager

FEB 14 1992

R.J. Crozier, R.P. Bio.
Assistant Regional Waste Manager

Appendix A-10 to Permit No. PA-02691

Approval No.

V 1987

TABLE 1 - SOURCE MONITORING FOR PA-02691

Stack Description	Cominco No.	Appendix No	Volume	Particulate	Lead	Zinc	Cadmium	Mercury	Antimony	Total Arsenic	Total Fluoride	Copper	Sulphur Dioxide
Sinter Stack	S-1	App. 01	M	M	M	M	M	M	M	M			C
Lead Furnace	S-32	App. 02	M	M	M	M	M	M	M	M			C
Sinter Dryer	S-8	App. 03	M	M	M	M	M	M	M	M			M
Slag Fuming	S-40	App. 04	M	M	M	M	M	M	M	M	M		C
Refinery Scrubber	R-1A	App. 36	M	M	M				M	M	M		
Short Rotary Fce.	R-2A	App. 38	M	M	M				M	M	M		
Copper Arsenate 2 Stacks	R-3 & 4	App. 40	Q	Q	Q					Q		Q	
Foundry 2 Stacks	F-3,4	App. 27	A	A									
Arsenic Plant	R-14	App. 26	SA	SA						Q			
Smelter Feed Mix Plant Stack	72	App. 42	Q	Q	Q					Q			

FREQUENCY: C = Continuous, M = Monthly, Q = Quarterly, A = Annually, SA = Semi - Annually

Date issued: September 9, 1975

Amendment date: FEB 14 1992
(most recent)

R.J. Crozier, R.P. Bio.
Assistant Regional Waste Manager

Permit Number: PA-02691

TABLE 2 - AMBIENT AIR QUALITY MONITORING PROGRAM FOR PA-02691

LOCATION	PARAMETERS TO BE MEASURED AND FREQUENCY									
	SO2	SULPHATION PLATE	FLUORIDE PLATE	DUST FALL	SUSPENDED PARTICULATE TOTAL	LEAD	ZINC	CADMIUM	TOTAL FLUORIDE	TOTAL ARSENIC
W.K.P.L. Building	C	M	M	M	W	W	W	W	W-7	W-7
Oasis	C	M	M	M	W	W	W	W	W-7	W-7
Warfield Substation	C	M	M	M	W	W	W	W	W-7	W-7
Sunningdale		M	M	M						
Glenmerry		M	M	M						
Daniel St.		M	M	M						
Columbia Gardens		M	M	M						
Trail Hospital		M	M	M						
Birchbank		M	M	M						

FREQUENCY: C = Continuous, W = Weekly (Every 6 Days), W-7 = Weekly (Every 7 Days), M = Monthly (30 Days Duration)

Date issued: September 9, 1975

Amendment date: FEB 14 1992
(most recent)

R.J. Crozier, R.P. Bio.
Assistant Regional Waste Manager

Permit Number: PA-02691

COMINCO LTD.
TRAIL, B. C.
V1R 4L8

TELECOPIER COVER LETTER
XEROX TELECOPIER 7021

CJ
Discuss on Monday

Date: February 7, 1992

Fax Number:

Name: Carl Johnson/Rick Crozier

Firm:

City:

FROM: Graham F. Kenyon
Manager, Environment and Health
(604) 364-4238

Total number of pages 3 including this cover letter.

Telecopier Number: 364-4144
IF YOU DID NOT RECEIVE ALL PAGES, PLEASE CALL 364-4114

Message:

TAIL SLAG DISPOSAL

The Permittee shall submit to the Regional Waste Manager on or before June 30, 1993 an Application to construct a land disposal facility for tail slag. The Application shall be supported by an engineering feasibility study and environmental assessment of the preferred land disposal method and location.

To avoid the construction of redundant facilities, the Permittee may construct the collection and dewatering facilities necessary to implement the land disposal of slag in conjunction with the construction of the new slag treatment operation. However, by December 31, 1994 the Permittee shall provide firm evidence of funding to construct the works necessary to eliminate the discharge of tail slag to the Columbia River before December 31, 1996.

The authority to discharge tail slag to the Columbia River shall cease on December 31, 1996.

The report submitted by September 1, 1992 in accordance with Section .... shall include an evaluation of the practicability of constructing new slag treatment works in conjunction with the lead smelter. If determined to be practicable and economically supportable, then the termination of slag discharge shall be advanced to coincide with the completion of those works.

P.S. Suggest re-ordering sections so "Tail Slag Disposal" immediately follows "Lead Smelting Technology", e.g. L.S.T. = 1.7; T.S.D. = 1.8 etc., since the two are closely related.

February 7, 1992

G:R\permits\lang

6 Feb 92.

Carl/Ricki

'Tail Slag Disposal' alternative

This section so presently drafted has serious implications. On principle, we cannot accede to Permit conditions with which we may not be able to comply. The requirement that we proceed with coincident smelter and slag fuming construction based solely on technical feasibility and without regard for economic considerations is not a reasonable condition with which we can assure compliance.

"Technical feasibility" can never be neatly divorced from economics. Virtually anything is technically feasible if cost is not a consideration: pumping from the existing smelter for example.

The notion that we can be pressed into a commitment to proceed with a technically feasible option that might bankrupt us, simply because it exists, is unrealistic. While you may choose to interpret 'technically feasible' reasonably, others may insist on a literal interpretation that could force us to choose between non-compliance and economic suicide.

We have an agreement that it makes economic sense to build the slag collection and dewatering facilities in conjunction with construction of the new slag treatment operation. If it is feasible and economic ie. practicable, to build that operation earlier, in conjunction with rebuilding the new smelter, then it will likely be done. Considering the magnitude of the investment involved in that decision, we cannot provide more assurance than that.

We appreciate your difficulty, because we share it, and we shall do our best.

Graham Kenyon

PROVINCE OF
BRITISH COLUMBIA

BC ENVIRONMENT,
LANDS AND PARKS

Environmental Protection
617 Vernon Street
Nelson, BC, V1L 4E9
Telephone: (604) 354-6355
Fax: (604) 354-6367

PE-2753
January 28, 1992

COMINCO LTD.
TRAIL BC
VIR 4L8

FAXED
Jan 28
9:40

Attention: Graham Kenyon

RE: Your FAX of January 27, 1992 4:00 pm -Slag Commitment

Dear Sir:

At the present time we are not prepared to alter our dates in the permit draft sent to you yesterday. We believe that there is a need to eliminate the discharge of slag to the river as soon as practical. We also believe that this commitment is needed in order to minimize conflicts with the other agencies involved in the Columbia River.
We will be discussing this issue with our Minster next week in order to obtain further guidance.

Yours truly

Carl Johnson

Carl Johnson
Industrial Section Head

Environment Canada | Environnement Canada
Conservation and Protection | Conservation et Protection
Environmental Protection

224 West Esplanade
North Vancouver, BC V7M 3H7

WASTE MANAGEMENT
DEC 11 1991
NELSON, B.C.

CANADA'S GREEN PLAN
LE PLAN VERT DU CANADA

Your file Votre référence
PE-2753 & PA-2691

Our file Notre référence
4487-37/C685

December 6, 1991

Mr. J. McLaren
Regional Manager
Environmental Protection Division
Kootenay Region
Ministry of Environment, Lands & Parks
310 Ward Street
NELSON, BC
V2L 5S4

Dear Mr. McLaren:

Re: Applications for Amendment pursuant to the Waste Management Act on behalf of Cominco Ltd. dated September 6, 1991

The subject applications relate to air emissions and effluents from the lead-zinc smelter complex at Trail. The amendment application for PA-2691 proposes an extension from December 31, 1991 to December 31, 1995 to eliminate emission sources as described in Appendices 01, 03, 05 to 08, and 16. PE-2753 requests an extension of the authority to discharge effluent of specified quality until December 31, 1995.

The Company proposes to prepare annual reports, suitable for public release, describing the state of environmental controls and impact assessment at the integrated lead-zinc smelter. These extensions are requested because the new QSL lead smelter has, to date, failed to operate satisfactorily. Either significant modifications to the QSL smelter or entirely new lead smelter technology will be required.

The applications were referred to the Department of Fisheries and Oceans, and the enclosed documents incorporate the Department's comments. Due to the integrated nature of the pollution control works, both the air and effluent amendment applications are included.

Our comments are contained in the attached document and associated appendices.

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Although we expect our recommendations will be reflected in the amended permits, we would appreciate the opportunity to discuss any proposed variance with you as our response has been developed pursuant to the Fisheries Act and the Canadian Environmental Protection Act.

As our comments are rather extensive, and may require clarification, we would be pleased to meet with you and your staff or with the Company, as required. Please contact Mr. Keith Ferguson at 666-2399 for further discussion.

Thank you for giving us the opportunity to comment on these applications. Your continued cooperation is appreciated.

Yours truly,

M. Ito
Manager
Pollution Abatement Branch

Enclosure

cc: G. Ennis, DFO, Vancouver
P. Ricard-Desjardins, IST, Ottawa
J. Keating, EMR, Ottawa
G. Kenyon, Cominco Ltd., Trail

ENVIRONMENT CANADA AND THE DEPARTMENT OF FISHERIES AND OCEANS COMMENTS ON PERMIT AMENDMENT APPLICATIONS PE-2753 AND PA-2691 ON BEHALF OF COMINCO LTD.

All comments relate to matters under federal or concurrent jurisdiction. Specifically, the lead smelter is subject to the Secondary Lead Smelter Release Regulations (SLSRR) under the Canadian Environmental Protection Act (CEPA). These regulations limit the release of lead and particulate matter in stack emissions and fugitive dusts. The Fisheries Act also applies to the facility and prohibits the deposit of substances deleterious to fish in the Columbia River. The River is an international waterway, crossing the Canada-United States border near Waneta. Under the Boundary Waters Treaty, Canada must ensure that property (in this case, water quality) in the U.S. is not impacted by actions in Canada.

Our concerns, therefore, relate to the protection of air quality in and around Trail, the fishery resource of the Columbia River, and water quality at the international border.

The fishery resource of the Columbia River downstream of the discharges from Cominco has not been fully evaluated to date, but significant numbers of fish are known to frequent the stretch of the Columbia River immediately downstream of the Cominco discharges to the Canada-U.S. border. (See Appendix A.)

Background

Our agency has assessed and worked to improve the water quality in the Columbia River for many years. We have operated a water flow gauging station at Birchbank since the 1930s and water quality monitoring stations at Birchbank and Waneta since the late 1960s. We have conducted targeted receiving water studies, have sampled the effluents from the Cominco operations, and have provided comments to your agency on most of the permit amendment applications submitted by Cominco.

Cominco has operated a smelter at Trail since 1906. Environmental impacts have resulted, although the Company's leadership in the implementation of pollution control technologies is acknowledged. The modernization program initiated in 1977 allowed improvements in both production and environmental quality. Significant improvements have been realized, but further improvements are needed. Our approach has been to promote continuing reductions in air emissions and effluent discharges to the environment. We have consistently supported your agency in lowering discharge and emission limits and in setting other more stringent requirements for the facility. The new lead smelter is a key component of the environmental program, and we share in the disappointment at its apparent failure. In spite of this setback, it is essential to implement further environmental improvements.

In this regard, we acknowledge the pollution control initiatives taken by the Company in 1991, and we encourage the continued investigation and implementation of measures to control pollution from the site.

Basis of Comments

Our environmental concerns are based on consideration of ambient environmental monitoring, environmental legislation (as described above), and pollution control technology for the lead and zinc smelting industry.

1. Ambient Environmental Monitoring

Elevated levels of blood-lead have been observed in some children living in the Trail area. Your agency is working with the Company and local health officials to continue monitoring and to develop remediation plans. The potential for health impacts associated with current and historical air emissions is a major concern that has not yet been fully resolved.

According to recent data obtained by Environment Canada (see Appendix B), a number of water quality parameters at the federal-provincial monitoring site at Waneta (approximately 10 kilometres downstream of Cominco) are consistently higher than at the upstream Birchbank site. Moreover, according to these data, copper and lead do not meet the Canadian Council of Ministers of the Environment (CCME) guidelines for the protection of aquatic biota at the Waneta sampling site. In the absence of more detailed information, we consider CCME guidelines to be representative of conditions necessary to avoid chronic toxicity problems for biota.

To protect the fishery resource, we are also concerned about water quality between the smelter and the international boundary. In view of the high concentrations and loadings of some parameters, eg., lead, zinc and mercury, in some of the effluent discharges, poorer water quality may extend for a considerable distance downstream from the smelter. Although further studies are needed, we are concerned that conditions within this stretch of the River might be deleterious to fish.

Recent data obtained by Environment Canada (see Appendix C), indicate that levels of copper, lead, zinc, arsenic and mercury in bed and suspended sediments downstream of Cominco are more than ten times upstream concentrations. Depending on time of collection, downstream bottom sediments collected adjacent to Beaver Creek Park, contained high concentrations relative to upstream levels of copper, zinc and lead, with observed maximum concentrations of 0.25%, 1.1% and 0.046%, respectively. High concentrations relative to upstream levels of cadmium, arsenic and mercury have also been found in bottom sediments downstream of Cominco, depending upon location and time of collection.

The synergistic and/or additive effects of the metals on fish have not been adequately studied to date, however, the metallothionein levels measured in the livers of rainbow trout suggest that the trout are showing a sublethal response to metal toxicity.[1] Rainbow trout are described by the National Park Service, U.S. Department of the Interior as being the second most popular sports fish in the Coulee Dam National Recreational Area, and your Ministry describes rainbow trout as perhaps the most sought-after sport fish in the Canadian Columbia River recreational fishery.

Mercury levels in tissues of fish of the Columbia River are of concern. In 1988, due to elevated mercury in fish tissues, the local Provincial Medical Health Officer issued an advisory with respect to the consumption of walleye. He advised that, as a general guideline, there was no health risk in consuming walleye as long as consumption was limited to one meal per week. The concentration of mercury in fish increases as fish size increases; walleye less than 65.5 centimetres in length will usually be below the federal guideline. Assumed meal size is 230 grams (eight ounces). It is notable that a number of Cominco sewers discharge quantities of mercury.

Walleyes were introduced into the Roosevelt Reservoir in Washington State in the early 1970s and their numbers, as well as their popularity with anglers, have greatly increased. They are found in the stretch of the Columbia River from Hugh Keenleyside Dam to the Canada-U.S. boundary, the Kootenay River downstream from the Brilliant Dam, and the Pend d'Oreille River downstream of the Waneta Dam. They are described by the National Park Service, U.S. Department of the Interior as being the number one game fish in the Coulee Dam Recreation Area.

We have not conducted a thorough review and interpretation of the data provided in Appendices B and C. We may have additional comments for your office on these data following completion of our review.

2. Enviromental Legislation

The salient provisions of the SLSRR are as follows.

(a) Section 3 limits the release of particulate matter from smelter operations into the ambient air. The limits must be reduced in accordance with Section 5 where the lead content of the particulate matter exceeds 63 wt% Pb.

(b) Section 6 prohibits the release of particulate matter from the storage of lead-bearing scrap or lead-bearing material other than as a result of handling.

(c) Section 7 provides for the release limits to be exceeded for a limited period of time in the event of a malfunction or a breakdown.

(d) Section 8 provides a discretionary power for the Minister to request information and samples respecting the operation, malfunction or breakdown of the smelter.

The general provision of the Fisheries Act with respect to the deposit of deleterious substances was described above.

The Boundary Waters Treaty does not specify numerical requirements. Adherence to water quality objectives is generally considered to meet the intent of that legislation. In other areas of Canada, water quality objectives for the boundary reach of a river system have been developed jointly by federal and provincial agencies with input from U.S. federal and state agencies.

3. Pollution Control Technology

In many ways, the Cominco smelter is unique. The modernization program has created a mix of modern and old operations, and it is extremely difficult to determine technology for the smelter based upon smelters in other parts of North America.

We will forward information to you on other lead smelters in North America. In any case, we expect that Cominco's new lead smelter will utilize best available technology (BAT) for pollution control. We believe the QSL smelter would have met this requirement.

Overall Environmental Priorities

Environmental improvements at the Cominco smelter must be achieved on a broad front, but priorities for abatement must be defined so that achievements can be measured against specific objectives and priorities. We suggest the following overall priorities.

- Reduction of human exposure to lead dusts and fume
- Elimination of deleterious discharges to the Columbia River
- Reduction of total metal discharges to the Columbia River

Specific tasks to be undertaken by Cominco to meet our overall priorities follow.

- Complete the lead smelter modernization which reduces stack emissions and fugitive emissions and eliminates 07 Sewer and allows enhanced processing of residues
- Continue in the management of stockpiled materials to control fugitive emissions, control the generation and transport of contaminants and collect contaminated drainage for treatment
- Reduce soluble metal concentrations in Sewers II, III and IV
- Enhance spill security
- Remove mercury from fertilizer plant discharge
- Expand collection and treatment of contaminated drainage
- Eliminate tail slag discharge to river

Although lead smelter modernization is listed first, other items can and must be addressed in parallel. As new information becomes available, priorities may change. They should be reviewed annually to ensure that the abatement program is focused on needs.

Key Recommendations

Key recommendations for the permit amendments are summarized below. Specifics for each permit follow this section.

1. An accelerated data collection and assessment program should be initiated in order to set longer-term effluent limits, abatement plans and a compliance schedule for all effluents from the facility by December 31, 1992. Detailed study requirements will be outlined by April 15, 1992. In order to reach a conclusion that the fishery resource of the Columbia River is not impacted by the Cominco operation, as a minimum, all discharges from the sewers must be non-acutely lethal as determined by a standard 96-hour LC50 test, i.e., a 96-hr LC50 of 100%. Effluent quality must also be sufficient to obviate any chronic toxicity concerns to aquatic organisms.

To meet these requirements, a number of improvements to the quality of effluents must be made, and we recognize that a staged multi-year program will be needed. The discharge of metals to the Columbia River is not well understood, but known metal concentrations and loads are cause for concern. Our proposed assessment program would have several elements, including establishing a joint company/provincial/federal working group to assess the source of contaminants; increased monitoring for total metals; an effluent toxicity study; continued monitoring of non-point sources; additional studies on tail slag as required, and assessment of lead-zinc smelter environmental control technology. In addition, targeted receiving water monitoring would be initiated to better assess environmental impacts through a comprehensive examination of objectives and assignment of tasks through the Columbia River Integrated Environmental Monitoring Program (CRIEMP).

The recommendations for elements of the assessment program provided in the specific recommendations section of this document are to be considered as interim, applicable until the detailed study requirements are identified (by April 15, 1992). Terms of reference for studies to assess the metal levels in the discharges and any subsequent implementation schedules must be developed in cooperation with federal and provincial agencies.

2. A water and contaminant balance should be prepared for the complex by September 30, 1992. This should include the fertilizer operations at Warfield. As an initial step, by March 31, 1992, the Company should provide a trace metal balance for the metallurgical operations for the year 1991 and drawings showing the sources of effluents to the four sewers. The metal balance would detail receipts and analyses of feed materials, changes in inventories of sinter, zinc residues and other intermediate materials, outputs of products and byproducts, and air emissions and effluent discharges from point sources and fugitive emissions. The objective of the overall program is to identify opportunities for reducing the loading of contaminants (by flow and contaminant reduction, reuse and recycle) to the Columbia River and to the air. A comprehensive mass balance would provide a sound basis for ongoing discussions to reduce contaminant loadings. Terms of reference for the

water balance study, and any subsequent program that would reduce the use of water at the site or ensure treatment of contaminated waters prior to discharge should be developed with federal and provincial agencies. We recognize the initial balance to be prepared by September 1992 may be approximate, but it would be refined over future years to more accurately reflect actual conditions.

3. The Company should file a permit amendment application for on-land disposal of slag by December 31, 1992. Prior to that date, the Company needs to conduct engineering and environmental assessment of the preferred on-land disposal scheme. The schedule for implementation would be developed during the permit amendment review. The proposal by the Company to begin on-land slag disposal as part of the Phase II lead smelter modernization (four to five years from now) is not acceptable.

The discharge of slag to the Columbia River is considered to impact on fish for the following reasons.

(a) The presence of slag in the riverbed smothers what would otherwise be productive fish habitat.

(b) Suspended slag subjects fish to a man-made material that is likely to result in damage to fish tissue, in particular, to the gills.

(c) Fish habitat is exposed to metal levels associated with bed sediment downstream of Cominco's operations that are about ten times higher than sediment metal levels upstream from Cominco.

4. Based on current receiving water concerns, lower effluent limits should be established immediately for metals, particularly for lead and mercury, where possible. In addition, permit limits should be specified for dissolved copper. In the future, after sufficient data have been collected, we expect that total metal effluent limits will be established.

5. The air permit should be consistent with the particulate matter and lead emission requirements of the SLSRR.

6. The permits should apply for eighteen months (to June 30, 1993) to allow completion of the review outlined in No. 1 above, and to incorporate the Company's decision on its lead smelter technology.

7. We recognize the complexity of the problems facing the Company in making the lead smelter decision, and the need for detailed tests and thorough analysis. Nevertheless, we emphasize the need to arrive at a decision as soon as possible. The Company should prepare a report, suitable for public release, outlining the lead smelter modernization decision including a schedule for implementation and an explanation of environmental implications. This report should be submitted to government agencies within thirty days of the Company's decision. Semi-annual progress reports on the lead smelter modernization program, highlighting environmental matters, should also be submitted to agencies.

Specific Recommendations on Effluent Permit Amendment

We offer the following specific comments on the permit amendment applications. As noted above, these are to be considered interim comments until more detailed requirements have been developed by April 15, 1992 for studies, and by December 31, 1992 for abatement measures.

1. Lead Smelter Modernization and 07 Sewer

(a) The Company should submit operational and maintenance plans to reduce the concentration and loading of contaminants in 07 Sewer to the extent possible. There may also be short-term opportunities to reduce the discharges of soluble metals. Sinter plant off-gases vary considerably in SO_2 strength, with the highest concentrations evolved near the feed end of the sinter machines. Metal levels may result, in part, from incomplete scrubbing of particulates, but are probably due mainly to volatilization. This process is temperature-dependent and it is likely that a substantial fraction of the metals is also volatilized near the feed end of the sinter machines.

The Company intended to treat a much lower volume of stronger off-gases from the oxidation zone of the QSL reactor in the sulphuric acid plant, together with the roaster off-gases from the zinc plant. Of course, the gases were first to be cooled and cleaned by a wet electrostatic precipitator located in the QSL plant. The Company should examine the feasibility of reducing soluble metal discharges from the lead smelter absorption plant by directing a fraction of the sinter plant off-gases to the sulphuric acid plant. We recognize the feasibility of this option depends on a number of factors, including the configuration of the hoods and ducts on the sinter machines and gas cleaning requirements.

(b) If an alternate lead smelter technology is selected, we wish to discuss with your office how independent information on environmental aspects of the new technology could be obtained. This may require a visit to a site using the proposed smelter technology.

(c) The actual flow of the 07 Sewer has been lower than the permit maximum. The permit flow criterion should be reduced.

2. Effluent Limits

(a) A permit limit for copper should be established based on elevated receiving water levels. For your information, effluent samples collected by Environment Canada (EC) in June 1991 included copper data. You should note that Sewer I contained the highest dissolved copper of any sewers (0.127 mg/L). Other sewers contained lower levels (<0.05 mg/L). Sewer I also contained the highest total copper value but, as this was a decanted sample, it does not reflect the much larger contribution from slag particles.

(b) We understand your office will conduct a detailed analysis of daily monitoring results provided by the Company with the objective of lowering effluent limits. We support this work and request an opportunity to review proposed limits.

Based on the maximum concentration of contaminants found in the first six months of 1991, dissolved zinc concentration of 0.6 and 0.5 mg/L might be appropriate as achievable interim permit levels for Sewers I and 07, respectively.

(c) In addition to the 24-hour composite sample levels given in the permit, maximum limits for grab samples should be established in the future. Sufficient data are not currently available to set these limits.

(d) The CCME criteria and, likely, the proposed lower Columbia River water quality objectives will be expressed as total metals and the current permit specifies dissolved metal effluent limits. We recommend that in a future amendment, after sufficient data have been collected, the permit limits be expressed as total metals (possibly, in addition to dissolved metals). It may also be appropriate to establish limits for the loading of contaminants discharged to the River from the facility.

3. Effluent Management and Spill Control

(a) Progress reports on removing mercury from the fertilizer plant discharge should be submitted to agencies.

(b) Immediate opportunities for reducing the loading of contaminants should be examined. Cominco is concentrating on increasing its cooling tower capacity to improve the zinc circuit plant water balance. To operate the phosphoric acid plant using the dihydrate process, dilution water is required. About twenty percent of this requirement is met by stripped electrolyte. The source of the remaining 900 L/min of water is not clear. Is there an opportunity for further substitution to reduce water consumption and effluent discharges?

(c) Removal of the zinc electrolyte purge discharge to the Columbia River was an important step in pollution control as this was an extremely contaminated effluent stream. Cominco now diverts this effluent stream to the fertilizer plant. We recommend the permit stipulates that no electrolyte may be released to the sewers. Although of much less concern than the original direct discharge of zinc electrolyte to the River, the diversion of the electrolyte to the fertilizer plant has resulted in elevated concentrations of dissolved zinc in Sewer IV. The Company should consider means to reduce this concentration and report its findings.

(d) The HAZOPS evaluation, currently being conducted, will identify opportunities to reduce spills. We note that sulphuric and phosphoric acids have been the most frequently spilled substances over the last three years. The Company needs to identify how the frequency and severity of these spills will be reduced. An annual report on improvements in spill control should be submitted.

(e) We strongly support the Company's efforts to control spills around the zinc leach operations. Sewer II, which drains this area, contains elevated levels of zinc. We hope these measures will result in improved effluent quality.

(f) The effuent treatment plant (ETP) will likely have to be expanded to accommodate additional non-point sources of contaminants and, possibly, additional process streams. Plans and a schedule for expansion of the ETP and estimates of expected inflows should be provided by November 30, 1992.

(g) We have not reviewed the area runoff control study identified in Clause 1.5 of the permit. We understand that elevated levels of contaminants have been found in the runoff. The Company should submit a comprehensive plan by September 30, 1992 indicating how contaminated runoff will be collected and treated.

(h) Apparently, there has been some confusion in reporting spills for the facility. We recommend that your agency compile a list of spills that occur at Cominco from January to July 1992, the criteria used for reporting, and a spill contingency plan for review by all relevant agencies. A revised reporting scheme may be required following the review of this information.

4. Residue Handling

(a) All residues produced by the facility should be reprocessed with as little delay as possible.

(b) No new wet residues should be stored in unlined ponds after a specified date. If temporary storage is required, lined ponds should be constructed. Existing ponds should be drained and the solid material processed or placed in secure locations as soon as possible. Compliance dates for these requirements should be negotiated with agencies.

(c) All current stockpiled residues, excluding materials currently in unlined ponds, should be removed, covered, or drainage contained by September 30, 1992.

(d) As a baseline for future assessments of residue storage, an inventory should be prepared of source, characteristics and amounts of all stored residues on the property as of January 15, 1992.

5. Monitoring

(a) The discharge of phosphates to the Columbia River from the Cominco fertilizer complex is not well understood but known to have a potential impact on aquatic biota.[2] A study of the phosphate discharge and impacts on the aquatic biota in the Columbia River needs to be completed so that the significance of the discharge can be assessed. Terms of reference for the study designed to assess the impacts of the phosphate loads on the aquatic biota should be developed in cooperation with federal and provincial agencies.

(b) Bioassays (96-hour LC50) on 24-hour composite samples should be conducted on all discharges, and results reported to agencies by February 28, 1992. Full chemical analyses of the samples also need to be conducted to identify any constituents contributing to toxicity. A schedule for additional bioassays will be developed by April 15, 1992. Depending on the results, identification of toxic components by literature reviews and laboratory studies may be needed.

(c) All effluent monitoring of total and dissolved metals should be increased from monthly to weekly except for total zinc, which should be done daily, and total mercury, which is already done daily. Copper should be added to the list of parameters to be tested weekly; ammonia and aluminum should be done monthly. These samples would all be 24-hour composites. All results should be reported quarterly.

(d) To determine the variation in effluent concentrations, hourly samples should be collected over a 24-hour period on three occasions during the year and analyzed separately for total metals. These times should correspond to a dry period, to a large precipitation event preceded by a dry period, and to the spring freshet. The operating conditions of the smelter should be fully documented and reported for each period.

(e) We understand that the area runoff control study identified in Clause 1.5 of the permit was conducted during an unusually dry period. This study should be continued to include precipitation and snowmelt periods.

(f) A complete contaminant scan including a wide range of metals, e.g., ICP scan, should be conducted on the sewer discharges semi-annually. Specifics of this monitoring program will be developed in cooperation with federal and provincial agencies. To assist in developing a list of parameters, the Company should provide a complete scan of trace metal constituents of the concentrate feedstocks to the smelter. The trace metal balance to be provided by March 31, 1992 will also assist in identifying parameters. Based on the results of the effluent scan, other monitoring programs may need to be modified.

At this time, we are interested in the thallium content. If the Company already has data on thallium levels in the concentrates, effluents or air emissions, we would appreciate receiving the results.

(g) We have received a one-year summary of the effluent data. Please send us a copy of the quarterly and annual reports on the sewer and receiving water sampling programs.

Comments on Air Emission Permit Amendment

As battery pastes are processed through the sinter plant, and battery plates are processed by the blast furnace, the SLSRR apply to the entire lead smelter, including associated material storage, slag fuming, drossing, and refining operations.

The emissions of particulate matter and lead from sources of the Cominco lead plant must comply with the requirements of the federal Regulations. For your information, the applicable emission levels for the identified sources are listed in Appendix D. Based on the most recent test data, the sinter plant, blast furnace and lead refinery stacks were in compliance with the lead emission requirements. However, particulates in the sinter and lead refinery stacks exceeded requirements. The Company should prepare a plan showing how they will comply with the particulate limits for these two stacks. The sinter stack will be eliminated with the smelter modernization program. Therefore, control of particulate emissions from the refinery stack should be the main short-term objective of the abatement plan.

Cominco has made important improvements to the control of fugitive dust from their material stockpiles over the last year. Additional work is planned for next year. Based on current information, we believe the Company is substantially in compliance with the SLSRR requirements for control of fugitive emissions. However, we plan to conduct an audit early next year to confirm this conclusion and, based on this audit, additional abatement measures may be required.

We will be developing a compliance test program for Cominco pursuant to Section 8 of the SLSRR and will seek advice from your office in this matter in order to harmonize the federally and provincially required testing programs.

Other comments, also applicable to air emissions, such as the handling of materials and gases from the sinter machines, were made above in the effluent section.

<u>Coordination of Future Work</u>

The Company will be filing a report by December 31, 1991 on the cost, feasibility and environmental acceptability of on-land disposal of slag. We would appreciate a copy.

Because of the proximity of the smelter to the U.S. border, it is important to keep U.S. agencies and citizens aware of developments at Cominco. We support the work of the Lake Roosevelt Water Quality Council and look forward to participating on both the Management and Technical Committees as observers. We also encourage Cominco to make periodic presentations to the Council. This is an excellent opportunity for the Company to explain current developments to its U.S. neighbours.

Your letter of October 22, 1991 to attendees of the October workshop, indicated that similar annual one- to two-day workshops would be considered to track Cominco's progress. We strongly support this recommendation and would be pleased to participate in such annual meetings.

Finally, we support the open and constructive approach your office and the Company have taken to bring all stakeholders into the permit amendment review process. The open houses and workshops were particularly useful. The smelter facility and associated environmental issues are complex. Your approach fostered constructive decision making and an improved understanding.

REFERENCES

1. Smith, A.A. January 1987. Levels of metals and metallothionien in the fish of the Columbia River near the international boundary. This report was prepared under contract under the terms of the Canada-British Columbia Water Quality Monitoring Agreement for B.C. Environment and Environment Canada. pp 63-65.

2. Tuominen, T.M., G.L. Ennis, S.W. Sheehan. March 1987. An algal assay study of the effects of metals and nutrient discharges on the algal growth potential in the Columbia River, British Columbia. Water Quality Branch, Environment Canada. pp 34-35.

APPENDIX

APPENDIX A - FISH RESOURCE INFORMATION FOR THE COLUMBIA RIVER BELOW TRAIL

APPENDIX B - CONCENTRATIONS OF METALS IN WATER COLLECTED FROM ARROW LAKE AND THE COLUMBIA RIVER

APPENDIX C - CONCENTRATIONS OF METALS IN BED SEDIMENTS FROM ARROW LAKE AND THE COLUMBIA RIVER

APPENDIX D - APPLICATION OF SLSRR TO COMINCO LEAD SMELTER OPERATIONS

APPENDIX A

FISH RESOURCE INFORMATION FOR THE COLUMBIA RIVER BELOW TRAIL

APPENDIX

FISHERIES RESOURCE INFORMATION FOR THE COLUMBIA RIVER BELOW TRAIL

FISH SPECIES DISTRIBUTION:

The best information on species distribution, abundance and movements available for the reach of the Columbia River from Trail to the U.S. border has been generated by R.L.& L. Consultants and is presented in the draft 1990 Columbia River Fisheries Inventory Study Report.

Fish species known to utilize the mainstem Columbia River between Trail and the international border include: sportfish species such as walleye, kokanee, rainbow trout, brown trout, mountain whitefish, lake whitefish, bull trout, and white sturgeon; coarse or forage fish species reported from this area such as longnose sucker, largescale suckers, bridgelip sucker, northern squawfish, sculpins, peamouth chub and redside shiner. Habitat utilization by these species has not been clearly delineated as yet, however, some general comments on distribution and presence in the area between Trail and the U.S. border can be provided.

The most abundant sportfish species in the area is mountain whitefish. There is not presently any information to suggest that spawning occurs in this reach of the river, however, substantial spawning occurs in the mainstem Columbia immediately below Genelle, and distribution of both adults and juveniles into the lower reaches of the Columbia is extensive.

Rainbow trout are the second most abundant sportfish species in Lower Columbia. In summer and fall, the highest catch rates for rainbow trout reported by R.L.& L. Consultants were from the area below Trail.

Walleye are known to inhabit this reach of the Columbia and their numbers in the Canadian portion of the Columbia River have increased substantially since the early 1980's. This is likely a result of increased numbers in Roosevelt Reservoir. Walleye are now the third most abundant sportfish species in the system. There is considerable seasonal distribution of walleye, which includes migration through the area of interest into upper reaches of the river during spring and summer to forage and downstream migration in late fall and winter to overwintering locations in the United States.

Kokanee have been reported in the area of interest, however, their numbers in the Columbia River are substantially reduced from historic pre-regulation (dam)levels. Kokanee tend to be tributary spawners and are not known to spawn in the mainstem Columbia below Trail. Very little is known presently about juvenile utilization in the area of interest.

Lake whitefish which are also reported from this area are not abundant and are sporadically distributed. The lake whitefish reported in the vicinity of Trail are believed to originate from either Roosevelt Reservoir or the Arrow Lakes.

Brown trout are extremely limited in abundance but have been reported from the Fort Shepherd area. These fish are believed to originate from Roosevelt Reservoir.

Bull trout have also been encountered in very low numbers in the lower reaches of the Columbia River in summer. These fish are believed to originate from Arrow Lakes.

White sturgeon have been reported in deep free-flowing areas below Trail, specifically at the Fort Shepherd Eddy and at the confluence of the Columbia and Pend d'Oreille Rivers. This species is known to be longlived and the limited information available indicates that sturgeon from these areas undergo very limited migrations (generally less than 10 km). The abundance of juvenile white sturgeon in the Lower Columbia has steadily decreased since the early 1980's and appears to be the result of very low recruitment of juveniles into the population. This species has been designated a "Vulnerable" species by COSEWIC (Committee on the Status of Endangered Species in Canada).

While there have been occasional reports of chinook salmon from the Canadian portion of the Columbia River, R.L.& L. Consultants did not report any salmon catches during intensive sampling of the Columbia River in 1990.

All of the coarse or forage fish identified above have been reported below Trail, however, very little is known at this time about their habitat utilization and life history stage distribution.

FISHERIES IN THE VICINITY:

The Lower Columbia presently supports recreational fisheries for sturgeon (limited catch and release), walleye, rainbow trout, kokanee and mountain whitefish.

Recent creel survey information suggests that there has been a shift in focus of the fall fishery from rainbow trout to sturgeon and walleye which is coincident with an increase in popularity of boat fishing.

Walleye are a very popular sport fish and the fishery in the Lower Columbia below Trail is concentrated near Waneta Dam at the confluence of the Pend d'Oreille and Columbia Rivers.

Similarly, sturgeon fishing is concentrated in the mainstem Columbia from Trail to the Pend d'Oreille confluence and the most popular area for mountain whitefish angling is also concentrated at the Pend d'Oreille confluence.

According to B.C. Environment - Lands and Parks staff, the fishery potential of the Lower Columbia has not been realized and is presently underutilized. Recent creel survey and telephone survey information would, however, suggest that health advisories on the system are contributing to reduced fishing pressure.

APPENDIX B

CONCENTRATIONS OF METALS IN WATER COLLECTED FROM ARROW LAKE AND THE COLUMBIA RIVER

CONCENTRATIONS OF METALS IN WATER COLLECTED FROM ARROW LAKE AND THE COLUMBIA RIVER (October, 1990)

2

METAL CONCENTR/TION (mg/L)

SAMPLE NUMBER	SITE LOCATION	SAMPLING LOCATION	SAMPLING DATE	TIME (hr.)	Total Al	Total Ba	Total Be	Total Cd	Total Co	Total Cr	Total Cu	Total Fe	Total Li	Total Mn	Total Mo	Total Ni	Total Pb	Total Sr	Total V	Total Zn	Total As	Total Se	Total Hg	Total Ag
ARR-101W	Arrow Lake, just downstream of Cayuse Creek.	4 m from left bank, at the tip of Weststar's log sorting operation, at 8 m depth Reservoir elevation 439.42 m	03/10/90	1840	0.033	0.014	-0.00005	-0.0001	-0.0001	0.0004	0.0006	0.0157	0.001	0.0012	0.0006	0.0007	0.0012	0.0944	0.0002	0.0011	0.0002	0.0001	-0.00001	-0.0001
					0.03	0.0154	-0.00005	-0.0001	-0.0001	0.0027	0.0005	0.015	0.0009	0.0012	0.0005	0.0011	0.0003	0.097	0.0002	0.0015	0.0001	0.0002	-0.00001	-0.0001
					0.037	0.014	-0.00005	-0.0001	-0.0001	0.0003	-0.0002	0.0191	0.0009	0.0011	0.0003	0.0004	-0.0002	0.093	-0.0001	0.0008	0.0002	0.0001	-0.00001	-0.0001
ARR-102W	Arrow Lake, just downstream of Cayuse Creek.	4 m from left bank, at the tip of Weststar's log sorting operation, at 5 m depth Reservoir elevation 439.34 m	04/10/90	1845	0.055	0.0142	-0.00005	-0.0001	-0.0001	0.0002	0.0006	0.0256	0.0009	0.0013	0.0005	0.0005	0.0004	0.0958	0.0003	0.0006	0.0002	0.0001	-0.00001	-0.0001
					0.071	0.0148	-0.00005	-0.0001	-0.0001	0.0003	0.0005	0.0322	0.0009	0.0015	0.0004	0.0006	0.0004	0.0959	0.0003	0.0008	-0.0001	0.0001	-0.00001	-0.0001
					0.058	0.0145	-0.00005	-0.0001	-0.0001	0.0004	0.0007	0.0249	0.001	0.0013	0.0005	0.0018	0.001	0.0962	0.0002	0.0011	0.0002	0.0002	-0.00001	-0.0001
R-103W	Arrow Lake, just downstream of Cayuse Creek.	4 m from left bank, at the tip of Weststar's log sorting operation, at 3 m depth Reservoir elevation 439.35 m	05/10/90	1815	0.067	0.0143	-0.00005	-0.0001	-0.0001	0.0006	0.0006	0.0215	0.0009	0.001	0.0006	0.0005	0.0006	0.0986	0.0003	0.0007	0.0002	0.0001	-0.00001	-0.0001
					0.021	0.0141	-0.00005	-0.0001	-0.0001	-0.0002	0.0004	0.011	0.0009	0.0009	0.0005	-0.0002	-0.0002	0.0959	0.0002	0.0003	0.0001	0.0001	-0.00001	-0.0001
					0.025	0.014	-0.00005	-0.0001	-0.0001	0.0006	0.0009	0.0128	0.001	0.0009	0.0005	0.0006	0.0006	0.0978	0.0003	0.0003	0.0002	0.0001	-0.00001	-0.0001
ARR-201W	Arrow Lake, just downstream of Cayuse Creek.	4 m from left bank, at the tip of Weststar's log sorting operation, at 1 m depth Reservoir elevation 439.35 m	06/10/90	1830	0.025	0.0143	-0.00005	-0.0001	-0.0001	0.0014	0.0003	0.0112	0.0009	0.0009	0.0004	0.0003	-0.0002	0.0991	0.0001	0.0003	0.0002	0.0002	-0.00001	-0.0001
					0.026	0.0142	-0.00005	-0.0001	0.0001	0.0009	0.0005	0.0124	0.001	0.001	0.0005	0.0007	0.0007	0.0978	0.0002	0.0009	0.0002	0.0001	-0.00001	-0.0001
					0.021	0.0142	-0.00005	-0.0001	-0.0001	0.0003	0.0005	0.0101	0.001	0.0009	0.0005	0.0005	0.0008	0.099	0.0002	0.0012	0.0002	0.0001	-0.00001	-0.0001
ARR-202W	Arrow Lake, just downstream of Cayuse Creek.	4 m from left bank, at the tip of Weststar's log sorting operation, at 3 m depth Reservoir elevation 439.36 m	07/10/90	1830	0.024	0.0138	-0.00005	-0.0001	-0.0001	0.0003	0.0005	0.0115	0.001	0.0009	0.0005	0.0006	0.0007	0.097	0.0002	0.0004	0.0002	0.0001	-0.00001	-0.0001
					0.046	0.0141	-0.00005	-0.0001	-0.0001	0.0002	0.0004	0.015	0.001	0.001	0.0005	0.0012	0.0003	0.0972	0.0002	0.0008	0.0002	0.0001	-0.00001	-0.0001
					0.025	0.0141	-0.00005	-0.0001	-0.0001	0.0003	0.0009	0.0128	0.0009	0.001	0.0005	0.0011	0.0006	0.0991	0.0003	0.0013	0.0002	0.0001	-0.00001	-0.0001
ARR-203W	Arrow Lake, just downstream of Cayuse Creek.	4 m from left bank, at the tip of Weststar's log sorting operation, at 1 m depth Reservoir elevation 439.42 m	08/10/90	1700	0.026	0.014	-0.00005	-0.0001	-0.0001	-0.0002	0.0002	0.0126	0.0008	0.0009	0.0004	0.0002	-0.0002	0.0979	-0.0001	0.0004	0.0002	0.0001	-0.00001	-0.0001
					0.021	0.0143	-0.00005	-0.0001	-0.0001	-0.0002	0.0003	0.0099	0.0009	0.0009	0.0004	0.0002	-0.0002	0.0987	-0.0001	0.0003	0.0002	0.0002	-0.00001	-0.0001
					0.024	0.0141	-0.00005	-0.0001	-0.0001	0.0013	0.0003	0.0327	0.0008	0.001	0.0004	-0.0002	-0.0002	0.0984	-0.0001	0.0004	0.0002	0.0002	-0.00001	-0.0001
CEL-101W	Columbia River, downstream of Celgar.	3.9 km downstream of the pulp mill discharge, 5 m from the right bank, at a depth of 1 m	14/10/90	1917	0.024	0.0152	-0.00005	-0.0001	-0.0001	0.0012	0.0004	0.018	0.0009	0.005	0.0004	-0.0002	-0.0002	0.103	-0.0001	0.0009	0.0002	0.0001	-0.00001	-0.0001
					0.023	0.015	-0.00005	-0.0001	0.0001	0.0011	0.0003	0.0187	0.0009	0.005	0.0004	0.0004	0.0006	0.101	-0.0001	0.0006	0.0002	0.0001	-0.00001	-0.0001
					0.058	0.0155	-0.00005	-0.0001	-0.0001	0.0013	0.0004	0.0436	0.0008	0.0053	0.0004	0.0004	-0.0002	0.102	0.0002	0.0006	0.0002	0.0001	-0.00001	-0.0001
CEL-102W	Columbia River, downstream of Celgar.	3.9 km downstream of the pulp mill discharge, 5 m from the right bank, at a depth of 2 m	15/10/90	1320	0.025	0.0149	-0.00005	-0.0001	-0.0001	0.0009	0.0005	0.0169	0.0008	0.005	0.0004	0.0006	0.0004	0.101	0.0002	0.0008	0.0002	0.0002	-0.00001	-0.0001
					0.027	0.0149	-0.00005	-0.0001	-0.0001	0.0009	0.0004	0.0162	0.0011	0.0048	0.0005	0.0002	0.0004	0.101	0.0002	0.0007	0.0002	0.0001	-0.00001	-0.0001
					0.072	0.015	-0.00005	-0.0001	-0.0001	0.0009	0.0004	0.0495	0.0009	0.0051	0.0004	0.0003	0.0002	0.1	0.0002	0.0007	0.0002	0.0001	-0.00001	-0.0001
CEL-103W	Columbia River, downstream of Celgar.	3.9 km downstream of the pulp mill discharge, 5 m from the right bank, at a depth of 2 m	16/10/90	0700	0.041	0.0152	-0.00005	-0.0001	-0.0001	0.0017	0.0005	0.0224	0.001	0.0044	0.0005	0.0003	0.0011	0.102	0.0001	0.0045	0.0002	0.0002	-0.00001	-0.0001
					0.057	0.015	-0.00005	-0.0001	-0.0001	0.001	0.0004	0.032	0.001	0.0043	0.0004	0.0004	-0.0002	0.101	0.0001	0.0013	0.0002	0.0001	-0.00001	-0.0001
					0.04	0.015	-0.00005	-0.0001	-0.0001	0.0011	0.0005	0.0205	0.0009	0.0043	0.0004	0.0005	0.0005	0.101	0.0002	0.0008	0.0002	0.0001	-0.00001	-0.0001
CEL-201W	Columbia River, downstream of Celgar.	3.9 km downstream of the pulp mill discharge, 5 m from the right bank, at a depth of 2 m	16/10/90	0900	0.024	0.0147	-0.00005	-0.0001	-0.0001	0.0009	0.0004	0.0182	0.0008	0.0035	0.0004	0.0004	-0.0002	0.101	0.0001	0.0013	0.0001	0.0002	-0.00001	-0.0001
					0.051	0.0151	-0.00005	-0.0001	-0.0001	0.001	0.0004	0.0187	0.0009	0.0036	0.0005	0.0003	0.0005	0.102	0.0001	0.0009	0.0002	0.0001	-0.00001	-0.0001
					0.082	0.0154	-0.00005	-0.0001	-0.0001	0.0013	0.0003	0.0258	0.001	0.0036	0.0005	-0.0002	-0.0002	0.103	0.0001	0.0007	0.0002	0.0001	-0.00001	-0.0001
CEL-202W	Columbia River, downstream of Celgar.	3.9 km downstream of the pulp mill discharge, 5 m from the right bank, at a depth of 4 m	16/10/90	2215	0.028	0.0147	-0.00005	-0.0001	-0.0001	0.0011	0.0004	0.0183	0.001	0.0029	0.0005	0.0003	0.0004	0.102	-0.0001	0.0007	0.0001	0.0002	-0.00001	-0.0001
					0.035	0.0145	-0.00005	-0.0001	-0.0001	0.0007	0.0005	0.0167	0.0009	0.0028	0.0007	0.0004	0.001	0.0997	0.0002	0.0006	0.0002	0.0001	-0.00001	-0.0001
					0.05	0.0146	-0.00005	-0.0001	0.0001	0.0017	0.0005	0.0246	0.0011	0.0028	0.0004	0.0005	0.0006	0.1	0.0003	0.0008	0.0001	0.0001	-0.00001	-0.0001

CONCENTRATIONS OF METALS IN WATER COLLECTED FROM ARROW LAKE AND THE COLUMBIA RIVER (October, 1990)

METAL CONCENTRATION (mg/L)

SAMPLE NUMBER	SITE LOCATION	SAMPLING LOCATION	SAMPLING DATE	TIME (hr.)	Total Al	Total Ba	Total Be	Total Cd	Total Co	Total Cr	Total Cu	Total Fe	Total Li	Total Mn	Total Mo	Total Ni	Total Pb	Total Sr	Total V	Total Zn	Total As	Total Se	Total Hg	Total Ag
CEL-203W	Columbia River, downstream of Celgar.	3.9 km downstream of the pulp mill discharge, 5 m from the right bank, at a depth of 4 m	17/10/90	N/A	0.025	0.0143	-0.00005	-0.0001	-0.0001	0.0008	0.0007	0.0141	0.0011	0.0024	0.0008	0.0014	0.001	0.0994	0.0003	0.0011	0.0001	0.0002	-0.00001	-0.0001
					0.035	0.0148	-0.00005	-0.0001	-0.0001	0.0006	0.0005	0.0159	0.0009	0.0023	0.0004	0.003	0.0004	0.101	0.0002	0.0005	0.0002	0.0001	-0.00001	-0.0001
					0.03	0.0146	-0.00005	-0.0001	-0.0001	0.0007	0.0005	0.0153	0.0009	0.0024	0.0004	0.0017	0.0004	0.101	0.0001	0.0008	0.0001	0.0001	-0.00001	-0.0001
WAN-101W	Columbia River, at Waneta.	1.66 km upstream of the International Boundary, 4 m from left bank, at a depth of 3 m	10/10/90	1833	0.031	0.0222	-0.00005	0.0002	-0.0001	0.0006	0.0029	0.0271	0.0014	0.0046	0.0005	-0.0002	0.0025	0.105	0.0003	0.0115	0.0005	0.0002	-0.00001	-0.0001
					0.024	0.022	-0.00005	0.0001	-0.0001	0.0005	0.0025	0.0252	0.0013	0.0045	0.0005	-0.0002	0.0023	0.105	0.0002	0.0102	0.0005	0.0002	0.00002	-0.0001
					0.024	0.0217	-0.00005	0.0001	0.0001	0.0007	0.0026	0.0244	0.0013	0.0045	0.0005	0.0006	0.0021	0.105	0.0002	0.0099	0.0006	0.0003	-0.00001	-0.0001
WAN-102W	Columbia River, at Waneta.	1.66 km upstream of the International Boundary, 4 m from left bank, at a depth of 3 m	11/10/90	0800	0.044	0.0222	-0.00005	0.0001	-0.0001	0.0005	0.0024	0.0306	0.0012	0.0043	0.0005	0.0007	0.0019	0.105	0.0003	0.0085	0.0004	0.0002	0.00001	-0.0001
					0.041	0.0226	-0.00005	0.0002	-0.0001	0.0005	0.0022	0.0354	0.0012	0.0044	0.0005	0.0008	0.0015	0.105	0.0002	0.0089	0.0005	0.0002	0.00002	-0.0001
					0.027	0.0222	-0.00005	0.0001	0.0001	0.0027	0.0033	0.0236	0.0013	0.0042	0.0006	0.0006	0.0018	0.105	0.0002	0.0089	0.0005	0.0002	0.00002	-0.0001
WAN-103W	Columbia River, at Waneta.	1.66 km upstream of the International Boundary, 4 m from left bank, at a depth of 1 m	11/10/90	1830	0.034	0.0221	-0.00005	0.0001	-0.0001	0.0006	0.0025	0.031	0.0012	0.0043	0.0007	0.0006	0.0023	0.105	0.0004	0.0097	0.0005	0.0002	0.00001	-0.0001
					0.033	0.0218	-0.00005	-0.0001	-0.0001	0.0007	0.0024	0.0253	0.0013	0.0043	0.0006	0.0006	0.0018	0.105	0.0002	0.01	0.0005	0.0002	0.00001	-0.0001
					0.071	0.0225	-0.00005	-0.0001	-0.0001	0.0006	0.0023	0.102	0.0012	0.0046	0.0006	0.0013	0.002	0.106	0.0003	0.0095	0.0004	0.0001	0.00002	-0.0001
WAN-104W	Columbia River, at Waneta.	1.66 km upstream of the International Boundary, 4 m from left bank, at a depth of 1 m	12/10/90	0630	0.035	0.0218	-0.00005	0.0002	-0.0001	0.0007	0.0024	0.0308	0.0013	0.0045	0.0006	-0.0002	0.0028	0.105	0.0002	0.0112	0.0005	0.0002	-0.00001	-0.0001
					0.028	0.0219	-0.00005	0.0002	-0.0001	0.0013	0.0023	0.029	0.0012	0.0044	0.0006	0.0006	0.0025	0.106	0.0002	0.0111	0.0005	0.0002	0.00001	-0.0001
					0.025	0.0215	-0.00005	0.0002	-0.0001	0.0006	0.0025	0.0271	0.0012	0.0044	0.0005	0.0006	0.0029	0.105	0.0003	0.0123	0.0005	0.0002	-0.00001	-0.0001
WAN-201W	Columbia River, at Waneta.	1.66 km upstream of the International Boundary, 4 m from left bank, at a depth of 1 m	12/10/90	1215	0.022	0.02	-0.00005	0.0002	0.0002	0.0004	0.0024	0.0232	0.0012	0.004	0.0005	0.0005	0.0028	0.103	0.0002	0.0064	0.0005	0.0002	-0.00001	-0.0001
					0.024	0.0199	-0.00005	0.0002	-0.0001	0.008	0.0024	0.0509	0.0012	0.0044	0.0007	0.0027	0.0033	0.103	0.0003	0.0066	0.0005	0.0002	0.00001	-0.0001
					0.067	0.0203	-0.00005	0.0001	-0.0001	0.0004	0.0023	0.0325	0.0013	0.0041	0.0006	-0.0002	0.0028	0.104	0.0002	0.0065	0.0005	0.0002	-0.00001	-0.0001
WAN-202W	Columbia River, at Waneta.	1.66 km upstream of the International Boundary, 4 m from left bank, at a depth of 1 m	12/10/90	2053	0.026	0.0206	-0.00005	0.0001	-0.0001	0.0004	0.0024	0.028	0.0012	0.0043	0.0006	-0.0002	0.0036	0.105	0.0002	0.012	0.0008	0.0002	-0.00001	-0.0001
					0.028	0.0207	-0.00005	0.0002	-0.0001	0.0004	0.0025	0.03	0.0013	0.0044	0.0005	0.0006	0.0043	0.105	0.0003	0.0124	0.0006	0.0002	0.00001	-0.0001
					0.058	0.0205	-0.00005	0.0002	0.0001	0.0003	0.0024	0.038	0.0013	0.0043	0.0005	0.0002	0.0037	0.103	0.0002	0.0121	0.0006	0.0002	-0.00001	-0.0001
WAN-203W	Columbia River, at Waneta.	1.66 km upstream of the International Boundary, 4 m from left bank, at a depth of 1 m	13/10/90	0745	0.109	0.0234	-0.00005	0.0001	0.0001	0.0006	0.0022	0.043	0.0014	0.0041	0.0005	0.0004	0.0024	0.103	0.0004	0.0074	0.0005	-0.0001	0.00002	-0.0001
					0.043	0.023	-0.00005	0.0001	-0.0001	0.0006	0.0024	0.0311	0.0012	0.004	0.0006	-0.0002	0.0026	0.106	0.0003	0.0085	0.0006	0.0002	0.00002	-0.0001
					0.037	0.0232	-0.00005	-0.0001	-0.0001	0.0007	0.0025	0.0391	0.0012	0.004	0.0005	-0.0002	0.0023	0.106	0.0003	0.0081	0.0006	0.0002	0.00001	-0.0001

N/A denotes not available

\- denotes less than specified detection limit.

CONCENTRATIONS OF METALS IN WATER COLLECTED FROM ARROW LAKE AND THE COLUMBIA RIVER (March, 1991)

METAL CONCENTRATION (mg/L)

SAMPLE NUMBER	SITE LOCATION	SAMPLING LOCATION	SAMPLING DATE (DD/MM/YY)	TIME (hr.)	Total Al	Total Ba	Total Be	Total Cd	Total Co	Total Cr	Total Cu	Total Fe	Total Li	Total Mn	Total Mo	Total Ni	Total Pb	Total Sr	Total V	Total Zn	Total As	Total Se	Total Hg	Total Ag
ARR-111W	Arrow Lake,	400 m upstream of Syringa	12/03/91	1530	0.04	0.0167	-0.00005	-0.0001	-0.0001	-0.0002	0.0005	0.0346	0.0011	0.0019	0.0007	-0.0002	-0.0002	0.127	0.0001	0.0006	0.0001	0.0001	-0.00001	0.0001
ARR-112W	at Syringa Creek	Creek, 5 m from left bank,			0.033	0.0169	-0.00005	-0.0001	-0.0001	0.0018	0.0005	0.0344	0.0011	0.0019	0.0004	0.0002	-0.0002	0.129	0.0001	0.0007	0.0001	0.0002	-0.00001	0.0001
ARR-113W	Provincial Park.	at 1 m depth			0.042	0.0166	-0.00005	-0.0001	-0.0001	0.0002	0.0005	0.0319	0.0012	0.0019	0.0004	0.0003	-0.0002	0.126	0.0001	0.0008	0.0002	0.0002	-0.00001	-0.0001
		Reservoir elevation 427.46 m																						
ARR-114W	Arrow Lake,	400 m upstream of Syringa	13/03/91	0300	0.046	0.0163	-0.00005	-0.0001	-0.0001	0.0004	0.0003	0.034	0.0011	0.0019	0.0004	-0.0002	-0.0002	0.125	0.0001	0.0003	0.0002	0.0002	-0.00001	-0.0001
ARR-115W	at Syringa Creek	Creek, 5 m from left bank,			0.07	0.0167	-0.00005	-0.0001	-0.0001	0.0013	0.0004	0.0421	0.0012	0.002	0.0005	0.0003	-0.0002	0.127	0.0002	0.0003	0.0001	0.0002	-0.00001	-0.0001
ARR-116W	Provincial Park.	at 1 m depth			0.055	0.0167	-0.00005	-0.0001	-0.0001	-0.0002	0.0003	0.0313	0.0012	0.0019	0.0004	0.0003	-0.0002	0.127	0.0002	-0.0002	0.0001	0.0001	-0.00001	0.0001
		Reservoir elevation 427.26 m																						
AR[illegible]17W	Arrow Lake,	400 m upstream of Syringa	13/03/91	1615	0.073	0.0167	-0.00005	-0.0001	-0.0001	-0.0002	0.0004	0.0383	0.0012	0.0021	0.0004	-0.0002	-0.0002	0.127	0.0002	0.0003	0.0001	0.0002	-0.00001	0.0001
A[illegible]18W	at Syringa Creek	Creek, 5 m from left bank,			0.075	0.0163	-0.00005	-0.0001	-0.0001	-0.0002	0.0003	0.0532	0.0011	0.0023	0.0003	0.0002	-0.0002	0.124	0.0001	0.0002	0.0001	0.0002	-0.00001	-0.0001
ARR-119W	Provincial Park.	at 1 m depth			0.032	0.0165	-0.00005	-0.0001	-0.0001	-0.0002	0.0003	0.0364	0.0011	0.0022	0.0004	-0.0002	-0.0002	0.127	0.0001	0.0002	0.0001	0.0002	-0.00001	0.0001
		Reservoir elevation 427.26 m																						
ARR-120W	Arrow Lake,	400 m upstream of Syringa	14/03/91	0330	0.041	0.0162	-0.00005	-0.0001	-0.0001	-0.0002	0.0004	0.0455	0.0012	0.002	0.0004	0.0003	-0.0002	0.124	0.0002	0.0006	0.0001	0.0002	-0.00001	0.0001
ARR-121W	at Syringa Creek	Creek, 5 m from left bank,			0.04	0.0164	-0.00005	-0.0001	-0.0001	-0.0002	0.0003	0.0286	0.0011	0.0019	0.0004	0.0003	0.0003	0.125	0.0001	0.0007	0.0001	0.0002	0.00006	0.0001
ARR-122W	Provincial Park.	at 2.4 m depth			0.041	0.0165	-0.00005	-0.0001	-0.0001	-0.0002	0.0004	0.0279	0.0012	0.0019	0.0003	0.0003	-0.0002	0.125	0.0001	0.0005	0.0001	0.0002	-0.00001	0.0001
		Reservoir elevation 427.08 m																						
ARR-123W	Arrow Lake,	400 m upstream of Syringa	14/03/91	1600	0.034	0.0166	-0.00005	-0.0001	-0.0001	-0.0002	0.0004	0.033	0.0012	0.0023	0.0004	0.0002	-0.0002	0.126	0.0001	0.0002	0.0002	0.0002	-0.00001	-0.0001
ARR-124W	at Syringa Creek	Creek, 5 m from left bank,			0.05	0.0162	-0.00005	-0.0001	-0.0001	-0.0002	0.0004	0.0349	0.0011	0.0022	0.0004	0.0003	-0.0002	0.123	0.0001	0.0006	0.0001	0.0001	-0.00001	0.0001
ARR-125W	Provincial Park.	at 1.5 m depth			0.047	0.0166	-0.00005	-0.0001	0.0001	-0.0002	0.0004	0.0388	0.0012	0.0024	0.0006	0.0003	-0.0002	0.126	0.0002	-0.0002	0.0001	0.0002	-0.00001	-0.0001
		Reservoir elevation 427.08 m																						
ARR-214W	Arrow Lake,	400 m upstream of Syringa	15/03/91	0400	0.207	0.0173	-0.00005	0.0001	-0.0001	0.0002	0.0004	0.0602	0.0013	0.0022	0.0004	0.0003	0.0002	0.128	0.0004	0.0005	0.0001	0.0002	-0.00001	-0.0001
ARR-215W	at Syringa Creek	Creek, 5 m from left bank,			0.328	0.0174	-0.00005	-0.0001	0.0001	0.0003	0.0004	0.0912	0.0014	0.0024	0.0003	0.0003	-0.0002	0.125	0.0005	0.0006	0.0001	0.0001	-0.00001	-0.0001
ARR-216W	Provincial Park.	at 1.5 m depth			0.061	0.0167	-0.00005	-0.0001	-0.0001	0.0002	0.0004	0.0354	0.0012	0.0022	0.0004	0.0002	-0.0002	0.128	0.0002	0.0004	0.0001	0.0002	-0.00001	-0.0001
		Reservoir elevation 426.91 m																						
ARR-217W	Arrow Lake,	400 m upstream of Syringa	15/03/91	1600	0.168	0.0165	-0.00005	-0.0001	-0.0001	-0.0002	0.0003	0.0618	0.0012	0.0023	0.0003	0.0002	-0.0002	0.123	0.0003	0.0003	0.0001	0.0001	-0.00001	-0.0001
ARR-218W	at Syringa Creek	Creek, 5 m from left bank,			0.058	0.0164	-0.00005	-0.0001	-0.0001	-0.0002	0.0004	0.0374	0.0012	0.0022	0.0004	0.0003	0.0003	0.126	0.0002	0.0005	0.0002	0.0002	-0.00001	-0.0001
ARR-219W	Provincial Park.	at 1.5 m depth			0.038	0.0168	-0.00005	-0.0001	-0.0001	0.0005	0.0004	0.0354	0.0012	0.0022	0.0004	0.0004	-0.0002	0.128	0.0001	0.0007	0.0001	0.0001	-0.00001	-0.0001
		Reservoir elevation 426.91 m																						
AR[illegible]20W	Arrow Lake,	400 m upstream of Syringa	16/03/91	0400	0.034	0.0165	-0.00005	-0.0001	-0.0001	0.0002	0.0004	0.0268	0.0011	0.0019	0.0003	-0.0002	-0.0002	0.126	0.0001	0.0004	0.0001	0.0001	-0.00001	-0.0001
ARR-221W	at Syringa Creek	Creek, 5 m from left bank,			0.038	0.0165	-0.00005	-0.0001	0.0001	-0.0002	0.0004	0.0273	0.0011	0.0019	0.0004	0.0002	-0.0002	0.125	0.0001	-0.0002	0.0001	0.0001	-0.00001	-0.0001
ARR-222W	Provincial Park.	at 1.5 m depth			0.042	0.0166	-0.00005	-0.0001	-0.0001	-0.0002	0.0003	0.0322	0.0012	0.0019	0.0004	0.0002	-0.0002	0.127	0.0001	0.0003	0.0001	0.0002	-0.00001	-0.0001
		Reservoir elevation 426.68 m																						
ARR-223W	Arrow Lake,	400 m upstream of Syringa	16/03/91	1605	0.029	0.0169	-0.00005	-0.0001	0.0001	-0.0002	0.0004	0.0274	0.0012	0.002	0.0004	0.0003	-0.0002	0.129	0.0002	0.0003	0.0001	0.0001	-0.00001	-0.0001
ARR-224W	at Syringa Creek	Creek, 5 m from left bank,			0.031	0.0165	-0.00005	-0.0001	-0.0001	-0.0002	0.0004	0.0278	0.0011	0.002	0.0003	0.0003	-0.0002	0.126	0.0001	0.0009	0.0001	0.0001	-0.00001	-0.0001
ARR-225W	Provincial Park.	at 1.5 m depth			0.029	0.0165	-0.00005	-0.0001	-0.0001	-0.0002	0.0004	0.0264	0.0011	0.0019	0.0004	-0.0002	-0.0002	0.127	0.0001	0.0003	0.0002	0.0002	-0.00001	-0.0001
		Reservoir elevation 426.68 m																						
CEL-111W	Columbia River,	3.9 km downstream of the	22/03/91	1904	0.032	0.0169	-0.00005	-0.0001	-0.0001	0.0003	0.0004	0.031	0.0012	0.0027	0.0004	-0.0002	-0.0002	0.129	0.0001	0.0003	0.0001	0.0001	-0.00001	-0.0001
CEL-112W	downstream	pulp mill discharge, 5 m from			0.033	0.0164	-0.00005	-0.0001	0.0001	0.0003	0.0004	0.0293	0.0012	0.0026	0.0004	0.0003	-0.0002	0.124	0.0001	0.0003	0.0001	0.0001	-0.00001	-0.0001
CEL-113W	of Celgar.	the right bank, at 2 m depth			0.034	0.0164	-0.00005	-0.0001	-0.0001	0.0004	0.0003	0.15	0.0011	0.0031	0.0004	0.0003	-0.0002	0.125	0.0001	0.0002	0.0001	0.0001	-0.00001	-0.0001
CEL-114W	Columbia River,	3.9 km downstream of the	23/03/91	0710	0.036	0.0165	-0.00005	-0.0001	0.0001	0.0005	0.0004	0.0298	0.0011	0.003	0.0004	0.0002	-0.0002	0.124	0.0001	0.0002	0.0005	0.0001	0.00003	-0.0001
CEL-115W	downstream	pulp mill discharge, 5 m from			0.032	0.0168	-0.00005	-0.0001	-0.0001	0.0005	0.0005	0.0295	0.0011	0.0031	0.0004	0.0003	-0.0002	0.128	0.0001	0.0004	0.0002	0.0002	-0.00001	0.0001
CEL-116W	of Celgar.	the right bank, at 2 m depth			0.035	0.0169	-0.00005	-0.0001	-0.0001	0.0006	0.0004	0.0342	0.0011	0.0031	0.0004	0.0002	-0.0002	0.128	0.0001	0.0005	0.0001	0.0001	-0.00001	0.0001

CONCENTRATIONS OF METALS IN WATER COLLECTED FROM ARROW LAKE AND THE COLUMBIA RIVER (March, 1991)

METAL CONCENTRATION (mg/L)

SAMPLE NUMBER	SITE LOCATION	SAMPLING LOCATION	SAMPLING DATE (DD/MM/YY)	TIME (hr.)	Total Al	Total Ba	Total Be	Total Cd	Total Co	Total Cr	Total Cu	Total Fe	Total Li	Total Mo	Total Mo	Total Ni	Total Pb	Total Sr	Total V	Total Zn	Total As	Total Se	Total Hg	Total Ag
CEL-117W	Columbia River,	3.9 km downstream of the	23/03/91	1858	0.029	0.0165	-0.00005	-0.0001	0.0001	0.0004	0.0003	0.0306	0.0011	0.0024	0.0004	0.0002	-0.0002	0.126	0.0001	0.0003	0.0002	0.0001	-0.00001	0.0001
CEL-118W	downstream	pulp mill discharge, 5 m from			0.032	0.0165	-0.00005	-0.0001	-0.0001	0.0003	0.0004	0.0302	0.0011	0.0024	0.0004	0.0002	-0.0002	0.126	0.0002	0.0004	0.0001	0.0001	-0.00001	-0.0001
CEL-119W	of Celgar.	the right bank, at 2 m depth			0.046	0.0164	-0.00005	-0.0001	-0.0001	0.0003	0.0005	0.0362	0.0011	0.0024	0.0004	0.0003	-0.0002	0.124	0.0001	0.0005	0.0002	0.0002	-0.00001	0.0001
CEL-120W	Columbia River,	3.9 km downstream of the	24/03/91	0647	0.052	0.0165	-0.00005	-0.0001	-0.0001	0.0003	0.0005	0.0375	0.0011	0.0025	0.0003	-0.0002	-0.0002	0.125	0.0001	0.0003	0.0002	0.0001	-0.00001	-0.0001
CEL-121W	downstream	pulp mill discharge, 5 m from			0.028	0.0163	-0.00005	-0.0001	-0.0001	0.0013	0.0003	0.0393	0.001	0.0025	0.0003	0.0002	-0.0002	0.123	0.0001	0.0002	0.0002	0.0002	-0.00001	-0.0001
CEL-122W	of Celgar.	the right bank, at 2 m depth			0.031	0.0166	-0.00005	-0.0001	-0.0001	0.0003	0.0005	0.0308	0.0011	0.0025	0.0003	0.0002	0.0002	0.126	0.0001	0.0002	0.0002	0.0001	-0.00001	-0.0001
CEL N	Columbia River,	3.9 km downstream of the	24/03/91	1850	0.052	0.0166	-0.00005	-0.0001	-0.0001	0.0003	0.0004	0.041	0.0012	0.0027	0.0003	0.0002	-0.0002	0.125	0.0002	0.0002	0.0002	0.0001	-0.00001	0.0001
CEL-215W	downstream	pulp mill discharge, 5 m from			0.045	0.0167	-0.00005	-0.0001	-0.0001	0.0004	0.0004	0.0387	0.0011	0.0028	0.0003	0.0002	-0.0002	0.124	0.0001	0.0002	0.0002	0.0001	-0.00001	-0.0001
CEL-216W	of Celgar.	the right bank, at 2 m depth			0.129	0.0169	-0.00005	-0.0001	0.0001	0.0005	0.0004	0.0686	0.0013	0.0028	0.0005	0.0002	-0.0002	0.126	0.0003	0.0003	0.0001	0.0001	-0.00001	0.0001
WAN-111W	Columbia River,	1.66 km upstream of the	18/03/91	1930	0.026	0.0217	-0.00005	0.0001	0.0001	-0.0002	0.0017	0.0451	0.0014	0.0028	0.0004	0.0003	0.0014	0.124	0.0002	0.0053	0.0003	0.0002	-0.00001	-0.0001
WAN-112W	at Waneta.	International Boundary,			0.039	0.0213	-0.00005	0.0001	0.0001	-0.0002	0.0017	0.04	0.0014	0.0026	0.0004	-0.0002	0.0016	0.123	0.0001	0.0053	0.0003	0.0002	-0.00001	-0.0001
WAN-113W		4 m from left bank, at			0.055	0.021	-0.00005	0.0001	-0.0001	-0.0002	0.0015	0.0403	0.0014	0.0027	0.0004	-0.0002	0.0013	0.122	0.0002	0.0041	0.0003	0.0002	-0.00001	-0.0001
		1.5 m depth																						
WAN-114W	Columbia River,	1.66 km upstream of the	19/03/91	N/A	0.028	0.0203	-0.00005	0.0001	-0.0001	0.0002	0.0015	0.0492	0.0013	0.0029	0.0004	-0.0002	0.0019	0.122	0.0001	0.0056	0.0003	0.0002	-0.00001	-0.0001
WAN-115W	at Waneta.	International Boundary,			0.03	0.0203	-0.00005	0.0001	-0.0001	0.0002	0.0018	0.0496	0.0013	0.0031	0.0004	0.0002	0.0019	0.122	0.0002	0.006	0.0003	0.0002	0.00001	-0.0001
WAN-116W		4 m from left bank, at			0.034	0.0203	-0.00005	0.0001	-0.0001	-0.0002	0.0015	0.0416	0.0013	0.0028	0.0004	0.0002	0.0015	0.12	0.0001	0.0054	0.0003	0.0002	-0.00001	-0.0001
		1.5 m depth																						
WAN-117W	Columbia River,	1.66 km upstream of the	19/03/91	1910	0.035	0.0196	-0.00005	0.0001	-0.0001	0.0002	0.0016	0.0357	0.0013	0.0027	0.0004	-0.0002	0.0017	0.122	0.0001	0.004	0.0002	0.0002	-0.00001	-0.0001
WAN-118W	at Waneta.	International Boundary,			0.036	0.02	-0.00005	0.0001	-0.0001	0.0002	0.0016	0.035	0.0013	0.0027	0.0005	0.0002	0.0018	0.123	0.0002	0.0037	0.0002	0.0001	-0.00001	-0.0001
WAN-119W		4 m from left bank, at			0.038	0.0203	-0.00005	0.0001	-0.0001	0.0002	0.0018	0.0486	0.0014	0.003	0.0004	-0.0002	0.0015	0.124	0.0001	0.0054	0.0003	0.0001	-0.00001	-0.0001
		1 m depth																						
WAN-120W	Columbia River,	1.66 km upstream of the	20/03/91	N/A	0.038	0.0212	-0.00005	0.0002	-0.0001	0.0002	0.0017	0.0567	0.0014	0.0031	0.0004	0.0002	0.0032	0.122	0.0002	0.0075	0.0003	0.0002	0.00001	-0.0001
WAN-121W	at Waneta.	International Boundary,			0.044	0.0214	-0.00005	0.0002	-0.0001	0.0015	0.0016	0.055	0.0013	0.003	0.0004	0.0003	0.0034	0.121	0.0002	0.0067	0.0003	0.0002	0.00001	-0.0001
WAN-122W		4 m from left bank, at			0.037	0.0212	-0.00005	0.0002	-0.0001	0.0002	0.0023	0.0928	0.0013	0.0041	0.0004	0.0002	0.003	0.119	0.0002	0.0107	0.0003	0.0001	0.00002	0.0001
		1 m depth																						
WAN-214W	Columbia River,	1.66 km upstream of the	20/03/91	1930	0.07	0.0203	-0.00005	0.0001	-0.0001	-0.0002	0.0016	0.0464	0.0014	0.0028	0.0004	-0.0002	0.0019	0.125	0.0002	0.0044	0.0003	0.0002	0.00007	-0.0001
WAN-215W	at Waneta.	International Boundary,			0.072	0.0203	-0.00005	0.0002	-0.0001	0.0002	0.0017	0.0772	0.0014	0.0031	0.0004	0.0002	0.0018	0.123	0.0002	0.0056	0.0003	0.0002	-0.00001	-0.0001
WAN-216W		4 m from left bank, at			0.071	0.0206	-0.00005	0.0001	-0.0001	0.0002	0.0017	0.0488	0.0014	0.0028	0.0003	-0.0002	0.002	0.125	0.0002	0.0045	0.0005	0.0002	-0.00001	-0.0001
		1 m depth																						
WAN-217W	Columbia River,	1.66 km upstream of the	21/03/91	0730	0.06	0.0205	-0.00005	0.0001	0.0001	0.0003	0.0015	0.057	0.0014	0.0029	0.0005	0.0002	0.0022	0.122	0.0002	0.0047	0.0003	0.0002	-0.00001	-0.0001
WAN-218W	at Waneta.	International Boundary,			0.071	0.0209	-0.00005	0.0002	-0.0001	0.0002	0.0015	0.0536	0.0013	0.0029	0.0004	0.0002	0.002	0.121	0.0002	0.0048	0.0002	0.0001	0.00001	-0.0001
WAN-219W		4 m from left bank, at			0.041	0.0206	-0.00005	0.0001	-0.0001	0.0009	0.0016	0.0482	0.0014	0.0028	0.0004	-0.0002	0.0019	0.123	0.0002	0.0049	0.0003	0.0002	-0.00001	-0.0001
		1 m depth																						
WAN-220W	Columbia River,	1.66 km upstream of the	21/03/91	1935	0.062	0.0208	-0.00005	0.0002	-0.0001	0.0003	0.0017	0.0508	0.0013	0.0031	0.0004	0.0002	0.0012	0.121	0.0002	0.0082	0.0003	0.0002	0.00001	-0.0001
WAN-221W	at Waneta.	International Boundary,			0.043	0.0207	-0.00005	0.0002	-0.0001	0.0002	0.0015	0.0396	0.0013	0.0028	0.0004	-0.0002	0.0017	0.122	0.0001	0.0064	0.0002	0.0001	0.00001	-0.0001
WAN-222W		4 m from left bank, at			0.03	0.021	-0.00005	0.0002	-0.0001	0.0002	0.0017	0.0467	0.0014	0.0031	0.0004	0.0003	0.0012	0.122	0.0001	0.0064	0.0003	0.0001	0.00003	-0.0001
		1 m depth																						

N/A denotes not available

\- denotes less than specified detection limit.

CONCENTRATIONS OF METALS IN WATER COLLECTED FROM ARROW LAKE AND THE COLUMBIA RIVER (June, 1991)

METAL CONCENTRATION (mg/L)

MPLE MBER	SITE LOCATION	SAMPLING LOCATION	SAMPLING DATE (DD/MM/YY)	TIME (hr.)	Total Al	Total Ba	Total Be	Total Cd	Total Co	Total Cr	Total Cu	Total Fe	Total Li	Total Mn	Total Mo	Total Ni	Total Pb	Total Sr	Total V	Total Zn	Total As	Total Se	Total Hg	Total Ag
L-132W	Columbia River,	3.9 km downstream of the	16/06/91	0515	0.032	0.0173	-0.00005	-0.0001	0.0001	0.0008	0.0003	0.0325	0.0011	0.0054	0.0005	-0.0002	-0.0002	0.13	0.0002	-0.0002	0.0001	0.0001	-0.00001	-0.0001
L-133W	downstream	pulp mill discharge, 5 m from			0.034	0.0173	-0.00005	0.0001	0.0001	0.0008	0.0003	0.0307	0.0011	0.0053	0.0005	0.0003	-0.0002	0.129	0.0002	-0.0002	0.0001	0.0001	-0.00001	-0.0001
L-134W	of Celgar.	the right bank, at 2 m depth			0.032	0.0172	-0.00005	-0.0001	0.0001	0.0008	0.0003	0.0316	0.0012	0.0053	0.0006	0.0004	0.0002	0.128	0.0002	-0.0002	0.0001	0.0001	-0.00001	-0.0001
L-232W	Columbia River,	3.9 km downstream of the	16/06/91	0515	0.034	0.0169	-0.00005	-0.0001	0.0001	0.0007	0.0003	0.029	0.0011	0.0051	0.0005	0.0002	0.0002	0.128	0.0002	0.0007	0.0001	0.0001	-0.00001	-0.0001
L-233W	downstream	pulp mill discharge, 5 m from			0.033	0.017	-0.00005	-0.0001	-0.0001	0.0008	0.0003	0.0324	0.0011	0.0053	0.0005	0.0002	-0.0002	0.128	0.0002	-0.0002	0.0002	0.0002	-0.00001	-0.0001
L-234W	of Celgar.	the right bank, at 2 m depth			0.029	0.0171	-0.00005	0.0001	0.0001	0.0008	0.0003	0.0226	0.0011	0.0051	0.0005	0.0004	-0.0002	0.128	0.0002	-0.0002	0.0001	0.0002	-0.00001	-0.0001
L-135W	Columbia River,	3.9 km downstream of the	16/06/91	1715	0.047	0.0173	-0.00005	-0.0001	0.0001	0.001	0.0004	0.0427	0.0011	0.0059	0.0005	0.001	-0.0002	0.129	0.0002	-0.0002	0.0001	0.0001	-0.00001	-0.0001
L-136W	downstream	pulp mill discharge, 5 m from			0.038	0.0173	-0.00005	0.0001	0.0002	0.0018	0.0003	0.0482	0.0011	0.0059	0.0005	0.0003	-0.0002	0.128	0.0002	-0.0002	0.0002	-0.0001	-0.00001	-0.0001
L-137W	of Celgar.	the right bank, at 2 m depth			0.039	0.0172	-0.00005	-0.0001	0.0001	0.0013	0.0003	0.0425	0.0011	0.0059	0.0005	-0.0002	0.0002	0.13	0.0002	-0.0002	0.0002	0.0001	-0.00001	-0.0001
-235W	Columbia River,	3.9 km downstream of the	16/06/91	1715	0.041	0.0174	-0.00005	-0.0001	0.0001	0.001	0.0003	0.0401	0.0011	0.0057	0.0005	0.0002	-0.0002	0.129	0.0002	-0.0002	0.0002	0.0001	-0.00001	-0.0001
-236W	downstream	pulp mill discharge, 5 m from			0.037	0.0175	-0.00005	-0.0001	0.0001	0.0011	0.0004	0.0424	0.0011	0.0058	0.0005	0.0002	-0.0002	0.13	0.0002	-0.0002	0.0002	0.0001	-0.00001	-0.0001
-237W	of Celgar.	the right bank, at 2 m depth			0.038	0.0175	-0.00005	0.0001	0.0002	0.0009	0.0003	0.0381	0.0011	0.0057	0.0005	0.0002	-0.0002	0.129	0.0002	-0.0002	0.0002	0.0001	-0.00001	-0.0001
-238W	Columbia River,	3.9 km downstream of the	17/06/91	0515	0.036	0.0172	-0.00005	0.0001	0.0001	0.0011	0.0012	0.0399	0.0011	0.0048	0.0005	0.0003	-0.0002	0.128	0.0002	0.0046	0.0002	0.0002	0.00001	-0.0001
-239W	downstream	pulp mill discharge, 5 m from			0.051	0.0175	-0.00005	-0.0001	0.0001	0.0009	0.0006	0.0405	0.0011	0.0051	0.0006	-0.0002	-0.0002	0.13	0.0002	-0.0002	0.0002	0.0002	0.00001	-0.0001
-240W	of Celgar.	the right bank, at 2 m depth			0.036	0.0175	-0.00005	0.0001	0.0002	0.0038	0.0007	0.0375	0.001	0.0051	0.0005	0.0005	-0.0002	0.129	0.0002	0.0221	0.0002	0.0002	-0.00001	-0.0001
-238W	Columbia River,	3.9 km downstream of the	17/06/91	0515	0.036	0.0173	-0.00005	-0.0001	0.0001	0.0009	0.0005	0.0322	0.0011	0.0046	0.0006	0.0002	-0.0002	0.129	0.0002	-0.0002	0.0002	0.0002	0.00001	-0.0001
-239W	downstream	pulp mill discharge, 5 m from			0.037	0.0174	-0.00005	0.0001	0.0002	0.0009	0.0007	0.0326	0.0012	0.0048	0.0005	0.0006	-0.0002	0.129	0.0002	-0.0002	0.0001	0.0002	0.00001	-0.0001
-240W	of Celgar.	the right bank, at 2 m depth			0.04	0.0178	-0.00005	0.0001	0.0001	0.0022	0.0007	0.0424	0.0011	0.0051	0.0005	0.0004	-0.0002	0.132	0.0002	-0.0002	0.0001	0.0002	0.00001	-0.0001
-141W	Columbia River,	3.9 km downstream of the	17/06/91	1710	0.045	0.0169	-0.00005	0.0001	0.0001	0.0007	0.0031	0.0407	0.0011	0.0039	0.0005	0.0052	-0.0002	0.127	0.0002	-0.0002	0.0001	0.0001	0.00001	-0.0001
-142W	downstream	pulp mill discharge, 5 m from			0.044	0.0174	-0.00005	0.0001	0.0002	0.0015	0.0005	0.0442	0.0011	0.0042	0.0005	0.0007	-0.0002	0.128	0.0002	0.0033	0.0002	0.0002	-0.00001	-0.0001
-14[illegible]	of Celgar.	the right bank, at 2 m depth			0.033	0.0173	-0.00005	-0.0001	0.0001	0.0008	0.0002	0.0351	0.001	0.004	0.0005	0.0002	-0.0002	0.129	0.0002	-0.0002	0.0001	0.0002	-0.00001	-0.0001
-241W	Columbia River,	3.9 km downstream of the	17/06/91	1710	0.038	0.0173	-0.00005	0.0001	0.0002	0.0005	0.0002	0.0348	0.0011	0.004	0.0005	0.0003	-0.0002	0.129	0.0002	-0.0002	0.0002	0.0002	0.00001	-0.0001
-242W	downstream	pulp mill discharge, 5 m from			0.045	0.0172	-0.00005	-0.0001	0.0002	0.0013	0.0005	0.0411	0.0012	0.0042	0.0005	0.0002	-0.0002	0.129	0.0002	0.0011	0.0001	0.0001	-0.00001	-0.0001
-243W	of Celgar.	the right bank, at 2 m depth			0.061	0.0176	-0.00005	0.0001	0.0002	0.0005	0.0004	0.0448	0.0011	0.0042	0.0005	0.0003	-0.0002	0.129	0.0002	-0.0002	0.0002	0.0001	0.00001	-0.0001
-144W	Columbia River,	3.9 km downstream of the	18/06/91	0515	0.035	0.0174	-0.00005	-0.0001	0.0001	0.0007	0.0003	0.0323	0.0011	0.005	0.0006	0.0003	0.0002	0.13	0.0002	-0.0002	0.0002	0.0002	0.00001	-0.0001
-145W	downstream	pulp mill discharge, 5 m from			0.032	0.0171	-0.00005	0.0001	0.0002	0.0007	0.0003	0.0329	0.0012	0.0052	0.0005	0.0003	-0.0002	0.126	0.0002	-0.0002	0.0001	0.0002	-0.00001	-0.0001
-146W	of Celgar.	the right bank, at 2 m depth			0.033	0.0175	-0.00005	0.0001	0.0001	0.0007	0.0004	0.0311	0.0011	0.0052	0.0005	0.0013	-0.0002	0.13	0.0002	-0.0002	0.0001	0.0002	-0.00001	-0.0001
-244W	Columbia River,	3.9 km downstream of the	18/06/91	0515	0.034	0.0173	-0.00005	-0.0001	0.0001	0.0007	0.0004	0.0298	0.001	0.0049	0.0005	0.0003	-0.0002	0.127	0.0002	-0.0002	0.0002	0.0002	0.00001	-0.0001
-245W	downstream	pulp mill discharge, 5 m from			0.029	0.0175	-0.00005	0.0001	0.0002	0.0006	0.0005	0.0316	0.0012	0.0049	0.0006	0.0005	-0.0002	0.129	0.0002	0.0009	0.0002	0.0002	0.00001	-0.0001
-246W	of Celgar.	the right bank, at 2 m depth			0.03	0.0182	-0.00005	-0.0001	0.0001	0.0007	0.0004	0.0243	0.0012	0.0046	0.0005	0.0004	-0.0002	0.135	0.0002	0.0013	0.0001	0.0002	0.00001	0.0001
I-123W	Columbia River,	2.16 km upstream of the	10/06/91	1935	0.064	0.0249	-0.00005	0.0002	0.0002	0.0005	0.0027	0.0755	0.0014	0.004	0.0006	0.0011	0.0014	0.108	0.0003	0.0101	0.0004	0.0002	0.00001	-0.0001
I-124W	at Waneta.	International Boundary,			0.064	0.0242	-0.00005	0.0001	0.0001	0.0004	0.0022	0.0796	0.0015	0.0041	0.0006	0.0006	0.001	0.111	0.0003	0.0116	0.0003	0.0002	0.00003	-0.0001
I-125W		4 m from left bank, at 1 - 1.5 m depth			0.068	0.0241	-0.00005	0.0002	0.0002	0.0004	0.0023	0.0757	0.0015	0.0041	0.0006	0.0007	0.0006	0.111	0.0003	0.0081	0.0003	0.0002	0.00001	-0.0001

CONCENTRATIONS OF METALS IN WATER COLLECTED FROM ARROW LAKE AND THE COLUMBIA RIVER (June, 1991)

METAL CONCENTRATION (mg/L)

SAMPLE NUMBER	SITE LOCATION	SAMPLING LOCATION	SAMPLING DATE (DD/MM/YY)	TIME (hr.)	Total Al	Total Ba	Total Be	Total Cd	Total Co	Total Cr	Total Cu	Total Fe	Total Li	Total Mn	Total Mo	Total Ni	Total Pb	Total Sr	Total V	Total Zn	Total As	Total Se	Total Hg	Total Ag
ARR-126W	Arrow Lake,	400 m upstream of Syringa	04/06/91	1500	0.036	0.017	-0.00005	-0.0001	-0.0001	-0.0002	0.0004	0.0235	0.0012	0.0026	0.0006	-0.0002	-0.0002	0.127	0.0002	-0.0002	0.0001	0.0001	-0.00001	-0.0001
ARR-127W	at Syringa Creek	Creek, 5 m from left bank,			0.034	0.017	-0.00005	-0.0001	-0.0001	-0.0002	0.0006	0.0248	0.001	0.0026	0.0004	-0.0002	-0.0002	0.126	0.0002	0.0003	0.0001	0.0001	0.00001	-0.0001
ARR-128W	Provincial Park.	at 1 m depth			0.035	0.0174	-0.00005	-0.0001	0.0001	-0.0002	0.0005	0.024	0.0012	0.0026	0.0005	0.0002	-0.0002	0.129	0.0002	-0.0002	0.0001	0.0001	0.00001	-0.0001
ARR-226W	Arrow Lake,	400 m upstream of Syringa	04/06/91	1500	0.041	0.0175	-0.00005	-0.0001	0.0001	-0.0002	0.0004	0.0321	0.0011	0.0027	0.0005	-0.0002	-0.0002	0.129	0.0002	-0.0002	0.0001	0.0001	-0.00001	-0.0001
ARR-227W	at Syringa Creek	Creek, 5 m from left bank,			0.036	0.0176	-0.00005	-0.0001	0.0001	-0.0002	0.0004	0.0254	0.0012	0.0027	0.0006	0.0002	-0.0002	0.13	0.0002	-0.0002	0.0001	0.0001	-0.00001	-0.0001
ARR-228W	Provincial Park.	at 1 m depth			0.034	0.0173	-0.00005	-0.0001	-0.0001	-0.0002	0.0004	0.0239	0.001	0.0026	0.0005	0.0003	-0.0001	0.127	0.0002	0.0003	0.0001	0.0001	0.00001	-0.0001
ARR- W	Arrow Lake,	400 m upstream of Syringa	05/06/91	0300	0.033	0.0171	-0.00005	-0.0001	-0.0001	-0.0002	0.0003	0.0226	0.0011	0.0026	0.0005	-0.0002	-0.0002	0.129	0.0001	0.0002	0.0001	0.0001	0.00002	-0.0001
ARR-130W	at Syringa Creek	Creek, 5 m from left bank,			0.035	0.0173	-0.00005	-0.0001	0.0001	-0.0002	0.0004	0.0244	0.0012	0.0026	0.0005	0.0002	-0.0002	0.13	0.0002	-0.0002	0.0001	0.0001	0.00001	-0.0001
ARR-131W	Provincial Park.	at 1 m depth			0.034	0.0173	-0.00005	-0.0001	-0.0001	-0.0002	0.0004	0.0237	0.0011	0.0026	0.0005	0.0002	-0.0002	0.13	0.0002	0.0002	0.0001	0.0001	-0.00001	-0.0001
ARR-229W	Arrow Lake,	400 m upstream of Syringa	05/06/91	0300	0.034	0.0172	-0.00005	-0.0001	-0.0001	-0.0002	0.0004	0.0261	0.0011	0.0026	0.0005	0.0002	-0.0002	0.129	0.0002	-0.0002	0.0001	0.0001	0.00001	-0.0001
ARR-230W	at Syringa Creek	Creek, 5 m from left bank,			0.033	0.0171	-0.00005	-0.0001	-0.0001	-0.0002	0.0003	0.024	0.0011	0.0026	0.0005	-0.0002	0.0002	0.13	0.0001	-0.0002	0.0001	0.0001	0.00001	-0.0001
ARR-231W	Provincial Park.	at 1 m depth			0.034	0.0174	-0.00005	-0.0001	0.0001	-0.0002	0.0004	0.0239	0.0012	0.0026	0.0005	0.0002	-0.0002	0.131	0.0002	0.0002	0.0002	0.0001	0.00001	-0.0001
ARR-132W	Arrow Lake,	400 m upstream of Syringa	05/06/91	1500	0.033	0.0169	-0.00005	-0.0001	-0.0001	-0.0002	0.0004	0.0242	0.0011	0.0027	0.0004	-0.0002	0.0002	0.129	0.0002	-0.0002	0.0002	0.0002	0.00001	-0.0001
ARR-133W	at Syringa Creek	Creek, 5 m from left bank,			0.033	0.0174	-0.00005	-0.0001	0.0001	-0.0002	0.0004	0.0239	0.0011	0.0027	0.0004	-0.0002	-0.0002	0.131	0.0002	0.0002	0.0002	0.0001	0.00001	-0.0001
ARR-134W	Provincial Park.	at 1 m depth			0.034	0.0173	-0.00005	-0.0001	0.0001	-0.0002	0.0005	0.0227	0.0011	0.0027	0.0005	0.0003	-0.0002	0.13	0.0002	0.0004	0.0001	0.0001	0.00001	-0.0001
ARR-232W	Arrow Lake,	400 m upstream of Syringa	05/06/91	1500	0.04	0.0171	-0.00005	-0.0001	0.0001	-0.0002	0.0105	0.0258	0.0012	0.0027	0.0005	0.0071	0.0004	0.129	0.0002	0.0055	0.0002	0.0001	-0.00001	-0.0001
ARR-233W	at Syringa Creek	Creek, 5 m from left bank,			0.033	0.0171	-0.00005	-0.0001	0.0001	-0.0002	0.0005	0.0254	0.0011	0.0027	0.0005	0.0002	-0.0002	0.13	0.0002	0.0002	0.0001	0.0001	0.00001	-0.0001
2-234W	Provincial Park.	at 1 m depth			0.021	0.0168	-0.00005	-0.0001	0.0001	-0.0002	0.0003	0.0123	0.0011	0.0011	0.0005	-0.0002	-0.0002	0.129	0.0002	-0.0002	0.0001	0.0001	0.00001	-0.0001
ARR-135W	Arrow Lake,	400 m upstream of Syringa	06/06/91	0300	0.037	0.0172	-0.00005	-0.0001	-0.0001	-0.0002	0.0003	0.0239	0.001	0.0027	0.0004	-0.0002	-0.0002	0.129	0.0001	-0.0002	0.0002	0.0001	0.00001	-0.0001
ARR-136W	at Syringa Creek	Creek, 5 m from left bank,			0.042	0.0172	-0.00005	-0.0001	0.0001	-0.0002	0.0004	0.0272	0.0011	0.0028	0.0005	-0.0002	-0.0002	0.132	0.0002	0.0002	0.0001	0.0001	-0.00001	-0.0001
ARR-137W	Provincial Park.	at 1 m depth			0.032	0.0169	-0.00005	-0.0001	0.0001	-0.0002	0.0004	0.0236	0.0011	0.0027	0.0003	0.0002	-0.0002	0.129	0.0002	0.0004	0.0001	0.0001	-0.00001	-0.0001
ARR-235W	Arrow Lake,	400 m upstream of Syringa	06/06/91	0300	0.035	0.0174	-0.00005	-0.0001	-0.0001	-0.0002	0.0004	0.027	[illegible]	0.0028	0.0005	-0.0002	-0.0002	0.132	0.0002	-0.0002	0.0001	0.0001	-0.00001	-0.0001
ARR-236W	at Syringa Creek	Creek, 5 m from left bank,			0.032	0.0171	-0.00005	-0.0001	0.0001	-0.0002	0.0003	0.0238	0.0011	0.0027	0.0004	0.0002	-0.0002	0.129	0.0001	0.0002	0.0002	0.0002	-0.00001	-0.0001
ARR-237W	Provincial Park.	at 1 m depth			0.033	0.0169	-0.00005	-0.0001	-0.0001	-0.0002	0.0004	0.0238	0.0011	0.0027	0.0005	0.0002	-0.0002	0.13	0.0002	0.0007	0.0001	0.0001	0.00014	-0.0001
ARR-138W	Arrow Lake,	400 m upstream of Syringa	06/06/91	1500	0.046	0.0175	-0.00005	-0.0001	0.0001	-0.0002	0.0005	0.0306	0.0012	0.0028	0.0005	0.0003	-0.0002	0.131	0.0002	0.0006	0.0003	0.0001	-0.00001	-0.0001
ARR-139W	at Syringa Creek	Creek, 5 m from left bank,			0.034	0.0166	-0.00005	-0.0001	-0.0001	-0.0002	0.0004	0.026	0.0011	0.0026	0.0004	0.0002	0.0002	0.127	0.0002	-0.0002	0.0003	0.0002	-0.00001	-0.0001
ARR-140W	Provincial Park.	at 1 m depth			0.056	0.0171	-0.00005	-0.0001	0.0001	0.0003	0.0004	0.0306	0.0011	0.0027	0.0005	0.0003	-0.0002	0.129	0.0002	-0.0002	0.0002	0.0002	-0.00001	-0.0001
ARR-238W	Arrow Lake,	400 m upstream of Syringa	06/06/91	1500	0.038	0.0169	-0.00005	-0.0001	-0.0001	-0.0002	0.0003	0.0273	0.0012	0.0027	0.0004	0.0002	-0.0002	0.13	0.0001	0.0002	0.0002	0.0001	-0.00001	-0.0001
ARR-239W	at Syringa Creek	Creek, 5 m from left bank,			0.042	0.0173	-0.00005	-0.0001	0.0001	-0.0002	0.0004	0.0292	0.0012	0.0028	0.0005	0.0003	-0.0002	0.131	0.0003	-0.0002	0.0002	0.0001	-0.00001	-0.0001
ARR-240W	Provincial Park.	at 1 m depth			0.041	0.017	-0.00005	-0.0001	-0.0001	-0.0002	0.0004	0.0279	0.0011	0.0027	0.0005	0.0002	0.0003	0.13	0.0002	0.0003	0.0002	0.0001	0.00001	-0.0001
ARR-141W	Arrow Lake,	400 m upstream of Syringa	07/06/91	0340	0.049	0.017	-0.00005	-0.0001	0.0001	-0.0002	0.0004	0.0286	0.0012	0.0027	0.0005	0.0003	-0.0002	0.128	0.0003	0.0002	0.0002	0.0002	-0.00001	-0.0001
ARR-142W	at Syringa Creek	Creek, 5 m from left bank,			0.063	0.017	-0.00005	-0.0001	-0.0001	-0.0002	0.0004	0.0326	0.0011	0.0027	0.0005	0.0002	0.0002	0.128	0.0002	-0.0002	0.0002	0.0001	-0.00001	-0.0001
ARR-143W	Provincial Park.	at 1 m depth			0.055	0.0172	-0.00005	-0.0001	0.0001	0.0006	0.0005	0.0349	0.0011	0.0029	0.0005	0.0004	0.0002	0.13	0.0003	0.0004	0.0002	0.0001	-0.00001	-0.0001

CONCENTRATIONS OF METALS IN WATER COLLECTED FROM ARROW LAKE AND THE COLUMBIA RIVER (June, 1991)

METAL CONCENTRATION (mg/L)

MPLE MBER	SITE LOCATION	SAMPLING LOCATION	SAMPLING DATE (DD/MM/YY)	TIME (hr.)	Total Al	Total Ba	Total Be	Total Cd	Total Co	Total Cr	Total Cu	Total Fe	Total Li	Total Mn	Total Mo	Total Ni	Total Pb	Total Sr	Total V	Total Zn	Total As	Total Se	Total Hg	Total Ag
N-223W	Columbia River,	2.16 km upstream of the	10/06/91	1935	0.06	0.0241	-0.00005	0.0002	0.0001	0.0004	0.003	0.0762	0.0014	0.0041	0.0006	0.0007	0.001	0.111	0.0002	0.0063	0.0003	0.0002	0.00001	-0.0001
N-224W	at Waneta.	International Boundary,			0.064	0.0246	-0.00005	0.0002	0.0002	0.0004	0.0022	0.0971	0.0015	0.0042	0.0007	0.0007	0.0008	0.111	0.0003	0.007	0.0003	0.0002	0.00001	-0.0001
N-225W		4 m from left bank, at			0.069	0.0243	-0.00005	0.0001	0.0001	0.0004	0.002	0.0926	0.0015	0.0043	0.0007	0.0004	0.0007	0.111	0.0003	0.0079	0.0003	0.0002	0.00001	-0.0001
		1 - 1.5 m depth																						
N-126W	Columbia River,	2.16 km upstream of the	11/06/91	0700	0.086	0.0231	-0.00005	0.0001	0.0002	0.0004	0.0019	0.0954	0.0013	0.0044	0.0006	0.0003	0.0005	0.111	0.0003	0.009	0.0003	0.0002	-0.00001	-0.0001
N-127W	at Waneta.	International Boundary,			0.067	0.0234	-0.00005	0.0001	0.0001	0.0004	0.0017	0.0766	0.0016	0.0042	0.0007	0.0002	0.001	0.111	0.0003	0.0069	0.0003	0.0002	0.00001	-0.0001
N-128W		4 m from left bank, at			0.077	0.0234	-0.00005	0.0001	0.0001	0.0003	0.0015	0.0778	0.0016	0.0041	0.0006	0.0002	0.0005	0.112	0.0002	0.008	0.0003	0.0002	0.00001	-0.0001
		1 - 1.5 m depth																						
N-226W	Columbia River,	2.16 km upstream of the	11/06/91	0700	0.063	0.0232	-0.00005	0.0001	0.0001	0.0006	0.002	0.0878	0.0016	0.0042	0.0006	0.0005	0.0007	0.113	0.0003	0.0069	0.0003	0.0002	0.00001	-0.0001
N-227W	at Waneta.	International Boundary,			0.065	0.0232	-0.00005	0.0001	0.0001	0.0009	0.0037	0.131	0.0015	0.0053	0.0007	0.0002	0.0007	0.11	0.0002	0.0141	0.0003	0.0002	0.00001	-0.0001
N-228W		4 m from left bank, at			0.059	0.0226	-0.00005	0.0001	0.0001	0.0005	0.0018	0.0783	0.0014	0.0041	0.0006	0.0004	0.0007	0.11	0.0002	0.0093	0.0003	0.0002	-0.00001	-0.0001
		1 - 1.5 m depth																						
N-129W	Columbia River,	2.16 km upstream of the	11/06/91	1900	0.089	0.0226	-0.00005	0.0002	0.0001	0.0007	0.0018	0.114	0.0015	0.0047	0.0007	0.0002	0.0033	0.111	0.0003	0.0077	0.0003	0.0002	0.00002	-0.0001
N-130W	at Waneta.	International Boundary,			0.09	0.0227	-0.00005	0.0002	0.0002	0.0004	0.0017	0.108	0.0014	0.0049	0.0005	0.0004	0.0025	0.111	0.0003	0.009	0.0003	0.0001	0.00002	-0.0001
N-131W		4 m from left bank, at			0.085	0.0225	-0.00005	0.0002	0.0001	0.0012	0.0018	0.105	0.0015	0.0048	0.0006	0.0004	0.0025	0.111	0.0003	0.01	0.0005	0.0001	0.00002	-0.0001
		1 - 1.5 m depth																						
N-229W	Columbia River,	2.16 km upstream of the	11/06/91	1900	0.083	0.0226	-0.00005	0.0002	0.0002	0.0004	0.0017	0.104	0.0015	0.0047	0.0006	-0.0002	0.0023	0.11	0.0003	0.0064	0.0003	0.0002	0.00002	-0.0001
N-230W	at Waneta.	International Boundary,			0.085	0.0224	-0.00005	0.0002	0.0001	0.0005	0.0018	0.107	0.0015	0.0048	0.0005	0.0002	0.002	0.111	0.0003	0.0068	0.0004	0.0002	-0.00001	-0.0001
N-231W		4 m from left bank, at			0.084	0.0229	-0.00005	0.0002	0.0002	0.0004	0.0019	0.104	0.0015	0.0046	0.0005	0.0003	0.0022	0.111	0.0003	0.0078	0.0004	0.0002	-0.00001	-0.0001
		1 - 1.5 m depth																						
N-132W	Columbia River,	2.16 km upstream of the	12/06/91	0700	0.091	0.0236	-0.00005	0.0002	0.0002	0.0014	0.0016	0.107	0.0015	0.005	0.0006	0.0003	0.0014	0.111	0.0003	0.0063	0.0003	0.0002	-0.00001	-0.0001
N-133W	at Waneta.	International Boundary,			0.094	0.0256	-0.00005	0.0002	0.0002	0.0004	0.0016	0.112	0.0014	0.0049	0.0005	0.0003	0.0012	0.11	0.0003	0.0056	0.0003	0.0002	-0.00001	-0.0001
N-134W		4 m from left bank, at			0.087	0.0239	-0.00005	0.0002	0.0001	0.0004	0.0016	0.103	0.0015	0.0052	0.0006	0.0009	0.0014	0.11	0.0003	0.0072	0.0003	0.0002	-0.00001	-0.0001
		1 - 1.5 m depth																						
N-232W	Columbia River,	2.16 km upstream of the	12/06/91	0700	0.086	0.0241	-0.00005	0.0002	0.0001	0.0004	0.0018	0.112	0.0015	0.005	0.0006	0.0004	0.0013	0.112	0.0003	0.0095	0.0003	0.0002	-0.00001	-0.0001
N-233W	at Waneta.	International Boundary,			0.092	0.0248	-0.00005	0.0002	0.0002	0.0004	0.0015	0.104	0.0015	0.0048	0.0005	0.0004	0.0012	0.112	0.0003	0.0064	0.0003	0.0002	-0.00001	-0.0001
N-234W		4 m from left bank, at			0.085	0.0239	-0.00005	0.0002	0.0001	0.0004	0.0024	0.101	0.0014	0.0049	0.0005	0.0003	0.0023	0.113	0.0003	0.0069	0.0003	0.0002	-0.00001	-0.0001
		1 - 1.5 m depth																						
N-135W	Columbia River,	2.16 km upstream of the	12/06/91	1900	0.084	0.0237	-0.00005	0.0001	0.0002	0.0004	0.0015	0.105	0.0015	0.0049	0.0006	0.0002	0.0009	0.11	0.0003	0.0059	0.0003	0.0002	-0.00001	-0.0001
N-136W	at Waneta.	International Boundary,			0.085	0.0238	-0.00005	0.0001	0.0001	0.0007	0.0013	0.113	0.0015	0.0049	0.0006	0.0002	0.0012	0.11	0.0003	0.0052	0.0003	0.0002	0.00012	-0.0001
N-137W		4 m from left bank, at			0.089	0.0235	-0.00005	0.0002	0.0002	0.0003	0.0018	0.115	0.0016	0.0051	0.0007	0.0005	0.0025	0.109	0.0003	0.0067	0.0003	0.0002	-0.00001	-0.0001
		1 - 1.5 m depth																						
N-235W	Columbia River,	2.16 km upstream of the	12/06/91	1900	0.086	0.0234	-0.00005	0.0001	0.0002	0.0003	0.0016	0.103	0.0016	0.0048	0.0006	0.0004	0.0015	0.109	0.0003	0.0085	0.0004	0.0002	-0.00001	-0.0001
N-236W	at Waneta.	International Boundary,			0.091	0.0237	-0.00005	0.0001	0.0001	0.0003	0.0017	0.114	0.0015	0.0051	0.0006	0.0003	0.0013	0.111	0.0003	0.0074	0.0004	0.0002	-0.00001	-0.0001
N-237W		4 m from left bank, at			0.09	0.0238	-0.00005	0.0001	0.0002	0.0004	0.0018	0.125	0.0015	0.0054	0.0006	0.0003	0.001	0.109	0.0003	0.008	0.0003	0.0002	0.00002	-0.0001
		1 - 1.5 m depth																						
N-138W	Columbia River,	2.16 km upstream of the	13/06/91	0630	0.08	0.0244	-0.00005	0.0001	0.0001	0.0004	0.0023	0.102	0.0015	0.0048	0.0006	0.0004	0.0012	0.112	0.0003	0.0071	0.0003	0.0002	-0.00001	-0.0001
N-139W	at Waneta.	International Boundary,			0.073	0.0243	-0.00005	0.0001	0.0001	0.0004	0.0013	0.0986	0.0015	0.0047	0.0006	0.0004	0.0009	0.111	0.0003	0.0063	0.0004	0.0002	-0.00001	-0.0001
N-140W		4 m from left bank, at			0.083	0.0241	-0.00005	0.0001	0.0001	0.0003	0.0016	0.101	0.0015	0.0047	0.0005	0.0018	0.0007	0.109	0.0003	0.0071	0.0004	0.0002	-0.00001	-0.0001
		1 - 1.5 m depth																						
N-238W	Columbia River,	2.16 km upstream of the	13/06/91	0630	0.078	0.024	-0.00005	0.0002	0.0002	0.0009	0.0023	0.123	0.0014	0.0051	0.0006	0.0003	0.0013	0.11	0.0003	0.0074	0.0004	0.0002	0.00001	-0.0001
N-239W	at Waneta.	International Boundary,			0.076	0.0239	-0.00005	0.0001	0.0001	0.0005	0.0016	0.0977	0.0015	0.0045	0.0006	0.0002	0.0008	0.11	0.0003	0.0057	0.0003	0.0002	-0.00001	-0.0001
N-240W		4 m from left bank, at			0.084	0.0238	-0.00005	0.0002	0.0002	0.0004	0.0016	0.0877	0.0015	0.0044	0.0003	0.0002	0.0009	0.11	0.0003	0.0055	0.0003	0.0002	-0.00001	-0.0001
		1 - 1.5 m depth																						

- denotes less than the specified detection limit

CONCENTRATIONS OF METALS IN WATER COLLECTED FROM ARROW LAKE AND THE COLUMBIA RIVER (June, 1991)

METAL CONCENTRATION (mg/L)

MPLE JMBER	SITE LOCATION	SAMPLING LOCATION	SAMPLING DATE (DD/MM/YY)	TIME (hr.)	Total Al	Total Ba	Total Be	Total Cd	Total Co	Total Cr	Total Cu	Total Fe	Total Li	Total Mn	Total Mo	Total Ni	Total Pb	Total Sr	Total V	Total Zn	Total As	Total Se	Total Hg	Total Ag
RR-241W	Arrow Lake,	400 m upstream of Syringa	07/06/91	0340	0.042	0.0171	-0.00005	-0.0001	0.0001	-0.0002	0.0004	0.0285	0.0012	0.0028	0.0005	0.0002	-0.0002	0.13	0.0002	0.0002	0.0003	0.0001	0.00001	-0.0001
RR-242W	at Syringa Creek	Creek, 5 m from left bank,			0.052	0.017	-0.00005	-0.0001	0.0001	0.0002	0.0005	0.034	0.0012	0.0028	0.0006	0.0003	0.0004	0.129	0.0003	0.0002	0.0002	0.0002	-0.00001	-0.0001
RR-243W	Provincial Park.	at 1 m depth			0.044	0.017	-0.00005	-0.0001	0.0001	-0.0002	0.0005	0.0289	0.0012	0.0028	0.0006	0.0003	-0.0002	0.13	0.0003	0.0003	0.0003	0.0002	-0.00001	-0.0001
RR-244W	Arrow Lake,	400 m upstream of Syringa	07/06/91	1645	0.036	0.017	-0.00005	-0.0001	-0.0001	-0.0002	0.0003	0.0276	0.0011	0.0029	0.0005	-0.0002	-0.0002	0.13	0.0002	0.0003	0.0002	0.0001	0.00001	-0.0001
RR-245W	at Syringa Creek	Creek, 5 m from left bank,			0.04	0.0173	-0.00005	-0.0001	0.0001	-0.0002	0.0004	0.0292	0.0011	0.0029	0.0005	0.0002	-0.0002	0.131	0.0001	0.0002	0.0002	0.0002	-0.00001	-0.0001
RR-246W	Provincial Park.	at 1 m depth			0.034	0.017	-0.00005	-0.0001	-0.0001	-0.0002	0.0003	0.0269	0.0011	0.0029	0.0004	-0.0002	-0.0002	0.13	0.0001	-0.0002	0.0003	0.0002	-0.00001	-0.0001
RR-244W	Arrow Lake,	400 m upstream of Syringa	07/06/91	1645	0.038	0.017	-0.00005	-0.0001	-0.0001	-0.0002	0.0004	0.0295	0.0011	0.0029	0.0005	0.0003	-0.0002	0.129	0.0002	0.0003	0.0003	0.0001	-0.00001	-0.0001
RR-245W	at Syringa Creek	Creek, 5 m from left bank,			0.038	0.0168	-0.00005	-0.0001	0.0001	-0.0002	0.0005	0.0291	0.0011	0.0029	0.0005	0.0002	-0.0002	0.129	0.0002	0.0003	0.0003	0.0002	-0.00001	-0.0001
RR-246W	Provincial Park.	at 1 m depth			0.041	0.0173	-0.00005	-0.0001	0.0001	0.0002	0.0004	0.0289	0.0012	0.0029	0.0005	0.0003	-0.0002	0.13	0.0002	-0.0002	0.0002	0.0002	-0.00001	-0.0001
RR-147W	Arrow Lake,	400 m upstream of Syringa	08/06/91	0500	0.036	0.0173	-0.00005	-0.0001	-0.0001	0.0008	0.0004	0.0307	0.0011	0.0029	0.0005	0.0002	-0.0002	0.132	0.0002	-0.0002	0.0003	0.0002	-0.00001	-0.0001
RR-148W	at Syringa Creek	Creek, 5 m from left bank,			0.043	0.0172	-0.00005	-0.0001	0.0001	-0.0002	0.0004	0.0312	0.0011	0.0028	0.0004	0.0002	-0.0002	0.13	0.0002	0.0002	0.0003	0.0002	-0.00001	-0.0001
RR-149W	Provincial Park.	at 1 m depth			0.039	0.0172	-0.00005	-0.0001	0.0001	-0.0002	0.0006	0.0295	0.0012	0.003	0.0006	0.0003	0.0002	0.13	0.0003	0.001	0.0003	0.0002	-0.00001	-0.0001
RR-247W	Arrow Lake,	400 m upstream of Syringa	08/06/91	0500	0.049	0.0169	-0.00005	-0.0001	0.0001	-0.0002	0.0005	0.0312	0.0011	0.0028	0.0005	0.0002	0.0002	0.129	0.0002	0.0002	0.0003	0.0002	-0.00001	-0.0001
RR-248W	at Syringa Creek	Creek, 5 m from left bank,			0.042	0.0172	-0.00005	-0.0001	0.0001	-0.0002	0.0005	0.0286	0.0011	0.0028	0.0005	0.0002	-0.0002	0.13	0.0001	0.0006	0.0003	0.0002	-0.00001	-0.0001
RR-249W	Provincial Park.	at 1 m depth			0.039	0.0169	-0.00005	-0.0001	0.0001	-0.0002	0.0005	0.0288	0.0011	0.0028	0.0005	0.0002	-0.0002	0.128	0.0002	0.0002	0.0002	0.0002	-0.00001	-0.0001
EL-123W	Columbia River,	3.9 km downstream of the	14/06/91	1715	0.035	0.0167	-0.00005	-0.0001	0.0002	0.0046	0.0003	0.0575	0.0011	0.0035	0.0005	0.0006	-0.0002	0.125	0.0002	0.0005	0.0001	0.0001	-0.00001	-0.0001
EL-124W	downstream	pulp mill discharge, 5 m from			0.036	0.0168	-0.00005	-0.0001	0.0001	0.0005	0.0004	0.0329	0.0011	0.0035	0.0005	0.0005	0.0005	0.128	0.0002	0.0013	0.0002	0.0002	-0.00001	-0.0001
EL-125W	of Celgar.	the right bank, at 2 m depth			0.039	0.017	-0.00005	-0.0001	0.0002	0.0006	0.0009	0.0316	0.0011	0.0035	0.0005	0.0004	-0.0002	0.129	0.0002	-0.0002	0.0001	0.0001	-0.00001	-0.0001
EL-223W	Columbia River,	3.9 km downstream of the	14/06/91	1713	0.036	0.017	-0.00005	-0.0001	0.0001	0.0004	0.0003	0.0311	0.0011	0.0035	0.0005	-0.0002	-0.0002	0.129	0.0002	-0.0002	0.0004	0.0001	-0.00001	-0.0001
EL-224W	downstream	pulp mill discharge, 5 m from			0.036	0.0171	-0.00005	-0.0001	0.0001	0.0003	0.0004	0.0312	0.0011	0.0034	0.0005	0.0004	-0.0002	0.129	0.0002	-0.0002	0.0001	0.0001	-0.00001	-0.0001
EL-2	of Celgar.	the right bank, at 2 m depth			0.034	0.0168	-0.00005	-0.0001	0.0002	0.0004	0.0003	0.0295	0.0011	0.0034	0.0005	0.0003	-0.0002	0.128	0.0002	-0.0002	0.0001	0.0001	0.00001	-0.0001
EL-126W	Columbia River,	3.9 km downstream of the	15/06/91	0515	0.034	0.0169	-0.00005	0.0001	0.0002	0.0003	0.0003	0.0373	0.0011	0.0043	0.0005	0.0003	-0.0002	0.128	0.0002	-0.0002	0.0001	0.0001	-0.00001	-0.0001
EL-127W	downstream	pulp mill discharge, 5 m from			0.039	0.0172	-0.00005	-0.0001	0.0001	0.0004	0.0003	0.0355	0.0011	0.0044	0.0006	0.0002	-0.0002	0.13	0.0002	-0.0002	0.0001	0.0001	-0.00001	-0.0001
EL-128W	of Celgar.	the right bank, at 2 m depth			0.045	0.0176	-0.00005	-0.0001	0.0001	0.0006	0.0003	0.0357	0.0011	0.0042	0.0005	0.0003	-0.0002	0.13	0.0002	-0.0002	0.0001	0.0001	-0.00001	-0.0001
EL-226W	Columbia River,	3.9 km downstream of the	15/06/91	0515	0.046	0.0171	-0.00005	-0.0001	0.0001	0.0004	0.0005	0.0411	0.0012	0.0043	0.0005	0.0002	-0.0002	0.13	0.0003	-0.0002	0.0001	0.0001	0.00001	-0.0001
EL-227W	downstream	pulp mill discharge, 5 m from			0.039	0.0171	-0.00005	-0.0001	0.0001	0.0003	0.0003	0.04	0.0011	0.0044	0.0005	0.0002	-0.0002	0.129	0.0002	0.0002	0.0001	0.0001	-0.00001	-0.0001
EL-228W	of Celgar.	the right bank, at 2 m depth			0.035	0.0172	-0.00005	-0.0001	0.0001	0.0004	0.0004	0.0335	0.0011	0.0041	0.0005	0.0004	-0.0002	0.129	0.0002	0.0012	0.0001	0.0001	-0.00001	-0.0001
EL-129W	Columbia River,	3.9 km downstream of the	15/06/91	1745	0.032	0.0173	-0.00005	-0.0001	0.0001	0.0005	0.0003	0.03	0.0011	0.0043	0.0005	0.0003	-0.0002	0.129	0.0002	-0.0002	0.0001	0.0001	0.00001	-0.0001
EL-130W	downstream	pulp mill discharge, 5 m from			0.036	0.0171	-0.00005	-0.0001	0.0002	0.0005	0.0005	0.0312	0.0011	0.0044	0.0005	0.0003	-0.0002	0.129	0.0002	-0.0002	0.0001	0.0001	-0.00001	-0.0001
EL-131W	of Celgar.	the right bank, at 2 m depth			0.033	0.017	-0.00005	-0.0001	0.0001	0.0013	0.0003	0.0305	0.0011	0.0044	0.0005	0.0002	0.0003	0.13	0.0002	-0.0002	0.0002	0.0001	0.00034	-0.0001
EL-229W	Columbia River,	3.9 km downstream of the	15/06/91	1745	0.036	0.0171	-0.00005	-0.0001	0.0001	0.0005	0.0002	0.0296	0.0011	0.0043	0.0005	0.0003	-0.0002	0.128	0.0002	-0.0002	0.0001	0.0001	-0.00001	-0.0001
EL-230W	downstream	pulp mill discharge, 5 m from			0.035	0.0171	-0.00005	-0.0001	0.0002	0.0007	0.0003	0.0355	0.0011	0.0043	0.0006	0.0002	-0.0002	0.129	0.0002	-0.0002	0.0001	0.0001	-0.00001	-0.0001
EL-231W	of Celgar.	the right bank, at 2 m depth			0.035	0.0171	-0.00005	0.0001	0.0002	0.0006	0.0003	0.0313	0.001	0.0043	0.0005	0.0003	-0.0002	0.128	0.0002	-0.0002	0.0001	0.0001	-0.00001	-0.0001

Cominco Documents Obtained from BC Ministry of the Environment under FOIPPA, January, 2002

Vol 3 of 5: Exceedences and Variances by Year, 1993 - 2001

EXCEEDENCES and VARIANCES by year

Review C-II status of CA's related to Incidents (Garry/Operations)

December 26th 1998 cd incident – cd solution entered manhole in purification area
Sealed manhole
Reviewed alarm limits, reset alarm to 500µs

September 22nd, October 7th, and October 11th 1999 Cd incident - resulting from a cracked Purification manhole cover - *CA 749*
Seal problem manhole with 16 inches of cement
Reviewed PM procedure for all manholes

October 4th 2000 zn incident - Sperry Filter solution overflowed primary containment area. - *CA 1490*
Improved primary containment area within Sulphide Leach plant
Modified Sperry filter piping to redirect solution into primary containment area
Develop and implement primary and secondary sealing of Chocolate Alley manhole covers

February 9th 2000 cd incident- Spiral Heat exchanger problems – *CA 1727*
Conductivity probe to redirect contaminated solution back to process

February 18th 2000 zn/cd incident – resulting from cadmium solution entering a crackled condensate line within the Cadmium plant - *CA 1498*
Emergency communications plan required between Analytical services and Environmental monitoring group
Install conductivity instrument in C-II
If incident is on-going, ensure sample is taken from old bridge.

January 27th 2001 zn incident - the flanges on the new residue filtrate line were improperly installed, resulting in a leak and filtrate solution going to ground then to a redundant drain line from the demolished old Zinc melting offices. – *CA 2815*
Flanges reviewed, problems identified, then flange connections redone.
Contaminated soil, including tunnel floor vacuumed, taken to ETP plant.
Floor covered with limestone.

January 31st 2001 zn incident – while performing maintenance on transformer cooling effluent line, operational problems resulted in process solution entering an open line that went to O6Z – *CA 2839*
Review excavation permits with operations focusing on environmental aspects.
Review plant containment areas noting high-risk areas within the SLP plant

Effluent Improvements to Date:

2001

PE-2753

To File PE-2753 June 5, 2001

Acid spill at Cominco
-site was inspected by C Johnson and Garry Gawryletz on May 31
-spill occurred on hill side pipeline from Tadanac acid plants to Warfield
-failure at new expansion joint
-acid flowed down hill on sandy soil but did not penetrate very far into the soil
-collected in sump at base of hill
-alarm system worked to shut off flow and alert operators
-in area where there was equipment access lime rock was spread to absorb acid, in areas where no equipment access is available due to steepness of hill and overhead power lines a solution of caustic will be sprayed to neutralize the acid
-no physical removal of soil is practical at this site
-the major risk to the environment and the public is in the hairpin turn area on the Warfield hill where the pipeline is at risk of a run away truck taking out the lines
-group of high pressure steam, sulphate solution, stripped electrolyte, acid and natural gas could be a major problem in the event of a truck accident.
Garry G indicated that he would forward this concern to Walter Rosner who is working on risk assessment and reduction
No further enforcement action is required by MOE

Carl

To File PE-2753 May 25, 01

Phone discussion with Garry Gawryletz of Cominco regarding the mercury loss reported to MOE previously
-loss on May 7-8
-1.4 kg – all samples confirm that this was a valid sample result and loss was real
-samples taken of upstream sources do not help to determine source
-best guess is that mercury that is in the sludge at the ETP lagoon was somehow transformed into a form that went through the ETP – likely an organic form
-only out of the ordinary activity that has been identified is that an acetic acid based degreaser was being used at the Roaster to clean up oil and grease around a piece of equipment
-about 6-7 gallons was used
-Cominco research is evaluating this possibility
-samples are being sent to outside labs to try to identify any organic compounds that might have resulted in increased mercury losses that day.

Carl

Julia FYI

Memo to file PE-2753 May 11, 01

Report of loss of mercury to Columbia River via Outfall III on May 8 2001

Reported by G Gawryletz on May 10. On May 7 a slight increase of Hg was noticed in the Outfall III sample from the recent norm of about .03 kg/d to .1 kg/day.
This is still well below the permit limit of .55 kg/d but still triggered some interest by Cominco to start to question why there was a rise in Hg
-on May 8 it appears that a larger quantity of Hg entered the ETP system that was not treatable
-loss for May 8 was 1.4 kg
-upstream sources were checked and not found to be above the recent averages for Hg inputs to the system
-based on analysis all the Hg in ETP overflow as in dissolved form
-may have been in an organic form of mercury which would not have been treatable in ETP process
-samples have been sent to an outside lab for speciation of Hg in an attempt to try to find the source.
-loss was 2.5 times the permit limit
-A report will be sent to MOE for consideration.

Carl Johnson

cc. P. Stel

PE-2753

Cominco

RESOURCEFUL-WORLDWIDE

Mr. Carl Johnson
Industrial Sectionhead
Ministry of Environment, Lands & Parks
#401 - 333 Victoria Street
Nelson, B.C.
V1L 4K3

June 29, 2001

Re: Permit exceedance of January 31st, 2001

Dear Sir:

On January 31st 2001, return acid and calcine entered our Combined II outfall system through a breach in a containment area within the sulphide leaching plant. The 24–hour composite sample for that day indicated a total discharge of 529.7 kg of dissolved zinc (against a permit limit of 75 kg/day) and an average concentration of 6.6 mg/l (against a permit limit of 1.4 mg/l). No other parameters in the permit were exceeded. You subsequently attended the in-plant investigation held February 7th, and Cominco was subsequently issued a warning letter regarding this incident. As you are well aware of the circumstances leading up to this event, they will not be repeated in this letter – rather, this letter is to inform you of the follow-up actions that either have already occurred or continue to be ongoing.

The follow-up activities to this incident are being managed within our corrective action system under CAR2839. To date the following actions have been taken:

- the breach in the containment through which the spill occurred has been repaired;
- a directive has been communicated throughout the operation that under no circumstances may containment be breached for maintenance unless the equivalent degree of protection is afforded through temporary measures (e.g. sandbagging);
- a crew talk has been developed and is currently being rolled out. This crew talk uses this incident as an example of the need for field-level risk assessment at the commencement of jobs, or whenever the scope of jobs happens to change;
- a review of procedures in respect of excavations and permits required for this work has been undertaken with all maintenance crews in the area.

Work that is currently underway is as follows:

- plant containment areas will be marked to denote the 'high level' points for reference;
- the excavation permit is being revised to aid in the identification of potential spills or releases to the environment due to planned excavations;

- the incident will be included as an example in training. This training is given to trades, operators and engineers and occurs in a variety of different forms on an ongoing basis throughout the property.

As a number of these items have property-wide implications, it will take some time before they have been completed.

Please contact me if you require additional information regarding this incident.

Yours truly

D. Edward Kniel

Ed Kniel
Environmental Engineer

.cc MMartin, WavanBeek, KCairns, RSentis, DBoateng, MCross, SBharmhal, GGawryletz, WJKuit (all via e-mail)

C ied to
Peter Stent Feb 01/01 Ed Stuhet
32936-20/025

To File PE-2753 January 31, 2001

Report of loss of zinc in excess of permit limits
Incident occurred on January 27 and was initially reported by voice mail to C Johnson on Sunday January 28 by Ed Kniel of Cominco Environment

At approximately 11:00 am on January 27 the conductivity alarm on 06Z indicated that something had entered the sewer system that raised the conductivity above the set point. This initiated a systematic search of the SLP where it was suspected that a problem could be found.
By 11:20 am a leaking pipe flange was found on the pipe trestle that carrys lasta filtrate from the smelter to the zinc plant for recycle
The loss occurred above a demolition area where the old zinc plant offices used to be near the old melting plant.
The pumps were shut down and the line repaired. It was estimated that about 1 m3 (1000 l) of solution was lost to ground. It was not easy to determine how the solution eventually got into 06 Z sewer line but it is speculated that when the plant was demolished a few years ago the sewer connections were not plugged off. This will be determined through excavation and dye testing. If the pipes are not sealed they will be with concrete. Current demolition practice requires that all sewer connections be sealed before the foundations are backfilled. This part of the plant was removed several years ago.
The 24 hour daily composite sample from sewer II for Saturday is 103 kg of zinc with the permit limit being 75 kg/day.
The plant investigation will be done on Feb 9 and a formal report submitted following.
All the flanges on this piping will be checked following this incident.

Carl Johnson

cc. JB
Peter Stent

Peter; note that this spill incident was not reported to PEP in accordance with spill reporting requirements
- failure to report the incident requires review and/or follow-up by C.O. Services
- a more detailed incident report will be available following Cominco's investigation process.

Ed

RR - [illegible]
PE-02753

Report of Spill to Combined II

Initially reported to PEP by Rob Frew

Cominco contacted by C Johnson in late AM on Feb1
-loss occurred on Jany31 at 21:02 for about 45 minutes 2001
-belts on #2 Acid Thickener at SLP plant came off with the result that return acid and calcine overflowed to floor area in plant
-at the time there was an excavation in the area where crews were working on the sewer system to repair some undefined problem
-the solution overflowed to the pit and made its way into the sewer system triggering alarms as it moved through the system
-eventually the pump was shut off and spill stopped but solution was in the system
-On Feb 2 sewer analysis reported to C Johnson by R Frew and Ed Kniel at 9:30 AM
Sewer II 24 hour composite sample for the day the loss occurred:
529.7 kg of Dissolved Zinc – 7 times the permit limit
6.6 mg/l dissolved zinc

Permit limit 75 kg/day D Zn max concentration 1.4 mg/l

Total loss of zinc for the day was estimated at 577 kg, total concentration 7.2 mg/l
Cd loss .030 mg/l – not a permit violation

Plant investigation anticipated on Feb 7 PM

Carl Johnson CJ

Julie B.

To File PE-2753 January 31, 2001

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All the flanges on this piping will be checked following this incident.

Carl Johnson CJ

cc Ed Stockell
Peter Stest.

PE-2253

Spill of Calcine and Return Acid to Outfall II January 31,2001

-First reported to MOE and PEP Feb 1 as per attached form
-initial explanation documented in note by CJ
-info passed to CO service by Ed and CJ as per procedure
decision by P Stent that CJ would participate in Cominco internal investigation on February 7 without the active participation of CO
-CJ did this and reported back to Stent on Feb 8

Notes from investigation meeting

-CJ met with Bill Van Beek and Ed Kniel of Cominco prior to the discusssion to explain the position of MOE in this investigation and to tour the site
-meeting chair by Daniel Boatang, plant supt
-many Cominco staff from the plant were in attendance to discuss what happened, why, and what could be done to prevent future situations like this from reoccurring
-the format for the discussion is attached
-CJ gave a short introduction to alert the attendees that I expected to learn what happened to cause the problem, and to avoid future losses, any information I learned could be given to the CO service in the event that further formal investigation was warranted based on my findings on this particular investigation

WHEN AND WHERE
Sulphide Leaching Plant – north end at wall of F switch room vault
January 31, 2001, around 9:00 pm

WHAT HAPPENED
-belts came off #2 Acid Thickener feed pump
-caused overflow of pump feed tank to floor of building
-noticed by worker on catwalk area
-reported to control room operator
-switch to #1 pump – takes about 10 minutes to open and close valves and launders
-pull plugs on containment area under mix tanks to lower level (normally these plugs are open – why they were not at this time is not known)
-flow rate through system about 400-500 m3 per hour (350 l/min)
-estimated solution strength 130-150 g/l zinc
-mixture of sulphuric return acid and calcine
-due to high flow rate the sump pump could not handle the volume (since it was designed and sized for floor washing and general cleanup) the level of solution on the floor rapidly rose and eventually entered the excavation at the switch room
-earlier in the week a work order for repair of the oil drain lines from transformers in switch room F was issued

-excavation was started on dayshift but not completed due to problems with extra heavy concrete encasing the cooling water line in the excavation area.
-Hand breaking of concrete stopped and heavy equipment on the bobcat was used to break the concrete to expose the piping
-this is when the cast iron water line (3" dia) that transfers cooling water from the transformers to the sewer system (SLP north, 06z , II) was broken
-when the pit filled with solution it is suspected that the head of solution caused flow to the sewer for a period of time through the broken pipe
-a small sump pump was placed in the excavation to take the cooling water from the excavation pit to the sewer not to the process due to bulk problems in the electrolytic process
-the excavation had a small berm of excavated sand around it – placed during the digging process
-when it became apparent to workers the solution was flooding the excavation pit and entering 06Z sewer and eventually the river, they placed sandbags and constructed a wooden dyke filled with concentrate around the pit
-the alarm system functioned as designed
-total time that sewer was in alarm was about 45 minutes
-there was a high level alarm on the pump tank that operated correctly
-the belts came off about 9:02, the conductivity in the SLP north sewer conductivity alarm came on at 9:06, the fire dept called at 9:07 that there was a problem, 06 conductivity alarmed at 9:12,
-workers were already switching the pump and placing sandbags around the excavation pit
-pumps had recently been checked out OK

ENVIRONMENTAL IMPACT
-exceeded the permit limit
-assay sheet shows that II would be toxic
-dilution in river but for some distance d/s there would be some impact

PRIMARY CAUSE
-break in water line allowed loss to sewer system
-poor backfill practice during past repair of lines in which excess concrete had been placed around water line that what is considered normal practice
-pump failure at pump tank is also a cause but this happens several times per year with no loss to environment

PLANNING FOR THE REPAIR WORK

-workers and supervisors had a reasonable drawing to work from and plan the job
-excavation permit was issued by plant
-permit is focused on worker safety not on environment
-reasonable training for worker that was digging

-communication was done in shift book to notify others that excavation had been done and there was a broken pipe, pump in place to pump cooling water to sewer
-this helped the shift workers to know where the problem was in very short order when the pump failed and sewer alarms started to go off
-there was very fast reaction time from shift people
-shift workers had environmental training and awareness of loss and consequences of the loss
-EMS system in place in this plant with regular quarterly reviews of outstanding issues
-SLP is generally considered to be good due to the many historical losses and the acknowledged need to contain solutions in the plant

RECOMMENDATIONS
-need to consider when the scope of a job changes in the implementation (when the water pipe broke) – what additional efforts need to be made to prevent environmental losses
-when containment in a plant is breached in any form there is a need to consider environmental impacts of potential losses
-the excavation permit needs to consider environmental issues not just for potential losses to sewer but also losses to ground
-need to look at maximum possible flooding for design of sump pumps etc
-need to thing of worst case situations

Carl Johnson, PEng
Industrial Section Head

CJ Feb 12/01

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Carl Johnson, PEng
Industrial Section Head

CJ Feb 12/01

BRITISH COLUMBIA

PE-2753

File: 200101096

March 26, 2001

Doug Magoon
General Manager
Cominco Ltd.
Box 1000
Trail, BC V1R 4L8

Dear Doug Magoon:

Re: PE- 05309: Discharge of dissolved zinc to the Columbia River via Sewer Outfall II on January 31st, 2001

On January 31st, 2001 a forty-five minute loss of return acid and calcine occurred which accessed Sewer II and ultimately the Columbia River. The Sewer II twenty-four hour composite sample for the day the loss occurred was 529.7 kg of dissolved zinc, approximately seven times the permitted level, which is a violation of Section 54(6) of the Waste Management Act.

After considering available information and contributing circumstances, including Cominco's prompt response to the spill, and quick, decisive actions by Cominco staff, it has been decided to warn Cominco of this violation.

We have discussed this investigation with Carl Johnson, Pollution Prevention Industrial Section Head, who will discuss methods of reducing/eliminating future occurrences such as this with Cominco.

Sincerely,

Steve Wasylik
Conservation Officer

MAR 2 2001

cc: Randy Sentis, Environmental Manager, Cominco
Carl Johnson, Assistant Regional Waste Manager

Ministry of Environment, Lands and Parks

Environment and Lands
Kootenay Region

Mailing/Location Address:
401 - 333 Victoria Street
Nelson BC V1L 4K3

Telephone: (250) 354-6333
Facsimile: (250) 354-6332
PP Facsimile: (250) 354-6367

opied to Peter Stent Feb 01/01

32936-20/02

BRITISH COLUMBIA

DGIR INLAND

Dangerous Goods Incident Report

DGIR 22661

Category : Code I [X] Code II [ ]

Incident Date/Time : 31/01/2001 21:07

MCTS # :

Spiller :
COMINCO LIMITED

Location :
TRAIL OPERATIONS

Area TRAIL PEP Region : SEA MELP Region Kootenay Reg

Material (s) : CALCINE AND RETURN ACID

Amount (s) : UNKNOWN

Received from :

Caller A :	Caller B :	Caller C :
Org : COMINCO LIMITED	Org :	Org :
Phone : 250-364-4382	Phone :	Phone :
Time : 01/02/2001 08:00	Time :	Time :

Received at PEP by Duty Officer : PATRICK When Received : 01/02/2001 11:52

Affected Environment : [ ] marine [ ] ground [ ] groundwater [ ] lake [ ] stream [ ] atmosphere [■] other (specify) : Columbia River

Type of Spill : [ ] slick [ ] LUST [ ] dumping [■] other (specify) : Equipment Failure

Accidents : [ ] MVA [ ] other transport (specify) : [ ] non-transport (specify) :

Sector : [■] industrial [ ] commercial [ ] crown [ ] public [ ] unknown [ ] other

Cause :
Break down on pulleys on pump motor in an overflow caused unknown amount of Calcine and return acid spill through combined 2 effluent and into Columbia River at approximately 21:00 hours, 31 Jan 01. Flow lasted 45 minutes. Area was diked with sandbags to prevent solution from further flowing into combined 2 effluent. System presently off line pending investigation and repairs.

Response :

Jurisdiction : [ ] Federal [■] Provincial [ ] Other (specify) :

Task # : Amount : $ Issued to :

Notifications :

Date and Time	Action	Agency / Contact Person	Details / Additional Information
01/02/2001 11:58	Paged	MELP RO Nelson	No response
01/02/2001 12:24	Phoned	MELP RO Jim Jensen	Briefed. Code 1
01/02/2001 12:29	Faxed	MELP Nelson/EPS	Faxed MELP Cranbrook

Provincial Emergency Program

printed at: 01/02/2001 12:30

Emergency Coordination Centre
phone: 1-800-663-3456
fax: (250) 952-4872

Report of Spill to Combined II

Initially reported to PEP by Rob Frew

Cominco contacted by C Johnson in late AM on Feb1
-loss occurred on Jany31 at 21:02 for about 45 minutes
-belts on #2 Acid Thickener at SLP plant came off with the result that return acid and calcine overflowed to floor area in plant
-at the time there was an excavation in the area where crews were working on the sewer system to repair some undefined problem
-the solution overflowed to the pit and made its way into the sewer system triggering alarms as it moved through the system
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-On Feb 2 sewer analysis reported to C Johnson by R Frew and Ed Kniel at 9:30 AM
Sewer II 24 hour composite sample for the day the loss occurred:
529.7 kg of Dissolved Zinc – 7 times the permit limit
6.6 mg/l dissolved zinc

Permit limit 75 kg/day D Zn max concentration 1.4 mg/l

Total loss of zinc for the day was estimated at 577 kg, total concentration 7.2 mg/l
Cd loss .030 mg/l – not a permit violation

Plant investigation anticipated on Feb 7 PM

Carl Johnson CJ

JC106 Cominco Sample Review 2001/02/02 17:41
WCWSTCMT Page 1

			HG PPM	AS %	CD %	PB %	ZN %	PH -	SUS/SLDS MG/L	T/AS MG/L	DISS/AS MG/L	T/CD MG/L	DISS/CD MG/L	T/CU MG/L	DISS/CU MG/L	T/PB MG/L	DISS/PB MG/L	T/ZN MG/L
EW99	20010131	0036																
EW99	20010131	0034	Waneta Sigma #24					7.8	<1.	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.003	0.003	0.03
EW99	20010131	0033	"	"	#21			7.8	<1.	<0.001	<0.001	<0.001	<0.001	0.001	0.001	0.011	0.010	0.05
EW99	20010131	0032	"	"	#19			7.9	<1.	<0.001	<0.001	<0.001	<0.001	0.002	0.001	0.005	0.004	0.05
EW99	20010131	0031	"	"	#17			7.8	<1.	<0.001	<0.001	<0.001	<0.001	0.002	0.001	0.009	0.009	0.07
EW99	20010131	0030	"	"	#15			7.8	<1.	<0.001	<0.001	<0.001	<0.001	0.001	0.001	0.012	0.012	0.06
EW99	20010131	0029	"	"	#13			7.7	<1.	<0.001	<0.001	<0.001	<0.001	0.001	0.001	0.007	0.006	0.03
EW99	20010131	0028	"	"	#11			7.7	<1.	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.01
EW99	20010131	0027	"	"	#9			7.5	<1.	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01
EW99	20010131	0026	"	"	#7			7.4	<1.	0.002	<0.001	<0.001	<0.001	0.001	<0.001	0.014	0.001	0.01
EW99	20010131	0025	"	"	#5			7.3	<1.	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.003	<0.001	<0.01
EW99	20010131	0024	"	"	#3			7.4	<1.	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	<0.01
EW99	20010131	0023	Waneta Sigma #1					7.5	<1.	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	0.002	<0.001	<0.01
EW99	20010131	0022	Waneta 24HR Compo Compo					7.7	<1.	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.01
EW99	20010131	0021	π Comb Sigma #6					7.7	2.	0.002	<0.001	0.011	0.011	0.013	0.011	0.054	0.023	3.1
EW99	20010131	0020	"	"	#5			7.6	2.	0.001	<0.001	0.029	0.029	0.022	0.015	0.070	0.044	6.5
EW99	20010131	0019	"	"	#4			7.3	18.	0.015	<0.001	0.51	0.47	0.29	0.075	1.0	0.18	120.
EW99	20010131	0018	"	"	#3			6.9	39.	0.036	<0.001	1.4	1.3	0.77	0.14	2.0	0.79	350.
EW99	20010131	0017	π Comb Sigma #2					6.9	39.	0.032	<0.001	1.4	1.4	0.68	0.13	1.9	0.80	320.
EW99	20010131	0016	π Comb Sigma #1					7.0	50.	0.025	<0.001	1.1	1.1	0.47	0.099	1.8	0.64	265.
EW99	20010131	0015	SLP Acid Thickner Feed					3.7	8160.	11.	<1.	600.	590.	370.	330.	1025.	9.5	—

D/2n →

Jan 31/01 - Col. River speed = 50,700 ft³/sec - 1436 m³/sec - 124 041 395 m³/d.
- Waneta Sigma activated by PH @ 22:45 for 4 hour run.
- Note: Inst. did pH calibration on π Comb on Jan 31 @ 05:09

Sigma sampler triggers automatically when outlet is in alarm [illegible] 10 minutes.

CARL

			DISS/ZN MG/L
EW99	20010131	0036	
EW99	20010131	0034	0.03
EW99	20010131	0033	0.05
EW99	20010131	0032	0.05
EW99	20010131	0031	0.07
EW99	20010131	0030	0.06
EW99	20010131	0029	0.03
EW99	20010131	0028	<0.01
EW99	20010131	0027	<0.01
EW99	20010131	0026	<0.01
EW99	20010131	0025	<0.01
EW99	20010131	0024	<0.01
EW99	20010131	0023	<0.01
EW99	20010131	0022	<0.01
EW99	20010131	0021	2.4
EW99	20010131	0020	5.6
EW99	20010131	0019	105.
EW99	20010131	0018	345.
EW99	20010131	0017	315.
EW99	20010131	0016	265.
EW99	20010131	0015	---

PE-2753

APR 2 - 2001

Mr. Carl Johnson, P.Eng.
Head, Industrial Section
Ministry of Environment, Lands & Parks
#401 - 333 Victoria Street
Nelson, B.C.
V1L 4K3

March 26, 2001

Dear Sir:

Two recent elevated metals assays from our 24hour composite and one alarm from the Combined -II (C-II) outfall have exceeded our internal targets, which are 50% of the permit limits. This letter is to inform you that we are closely monitoring the C-II outfall along with it's tributaries and working very hard to ensure we do not exceed any permit limits for this outfall. The following are the dates, issues, involved individuals and actions, which have been or are being actively pursued.

C-II outfall dates which have exceeded Cominco's internal targets:

- March 8th - Total Cadmium 2.4 kg/day
- March 18th - Total Zinc 42 kg/day (This may have been attributed to the heavy rains that day)
- March 23rd - 2:50 am, the O6Z conductivity instrument (the O6Z tributary is part of the C-II effluent system) was in alarm for seven minutes, the alarm limit is 500 and one reading peaked at 1050 μse-cm for one minute.

The following operating personnel have been actively involved; Bill Van Beek, Daniel Boateng, Dominque Verhelst, Marc Cross, Steve Douglas, and their staff along with Property Support; David Langille, his staff and myself.

- An audit of the C-II outfall has been completed. This was to ensure the integrity of the above ground pipes which enter the C-II outfall. Also to ensure that only the designated pipes report to the C-II system.
- An inspection of the C-II manhole covers to ensure that they remain sealed. To confirm this, we have monitored the C-II alarm system when washing roads and no elevated instrument readings were noted.
- An audit of the Cadmium operating personnel to ensure they know which of their plants effluent discharges go to C-II and which go to the Effluent Treatment plant.
- Attempts were made to correlate the March 23rd C-II's O6Z outfall alarm reading with one of it's tributaries to try and identify source.

Cominco Ltd.; Trail Operations Trail, British Columbia, Canada V1R 4L8 Tel. (604) 364-4222

- A sampling campaign is on going on additional Sulphide Leach Plant effluents to try and identify potential sources.
- Reviewed Control Documents pertaining to C-II to ensure procedures are up to date.

To date we have been unable to identify the source of these issues.
In addition to these tasks, all Corrective Actions that resulted from the 1999 – year to date for the C-II permit violations have been reviewed to ensure they have been or are near completion, and we continue to improve the overall C-II management plan.

Please contact me if you require additional information.

Yours truly

Garry Gawryletz
Group Leader, Environmental Monitoring

.cc Bill VanBeek, Mike Martin, Kelly Cairns, Randy Sentis, Daniel Boateng, Dominic Verhelst, Marc Cross, Steve Douglas

PE-2753

Environmental Protection
FEB 6 2001

Cominco

Mr. Carl Johnson
Industrial Sectionhead
Ministry of Environment, Lands & Parks
#401 - 333 Victoria Street
Nelson, B.C.
V1L 4K3

January 30th, 2001

Re: December 10, 2000 Report of fume slurry spill to ground

Dear Sir:

On December 10th, 2000 during routine operations of the fume leach process, we experienced a spill of fume slurry to the ground due to the failure of a pipe at a flange. The slurry was being pumped from Area 1 (pH adjustment) to Area 2 (filtration) at the time, and the spill occurred in an intermediate area known as the 'old tankroom' area. The spill was contained by an adjacent rail siding and a pipe way. None entered the sewer system. The duration of the spill has been estimated at 15 minutes, and the quantity spilled estimated at 6 tonnes. The slurry contained metals present in the fume, but these metals are largely insoluble due to the high pH of the slurry. Within an hour of the spill, the material was being vacuumed from the ground for reclamation into KIVCET. Subsequent to pick-up of the material, a few inches of fresh soil were laid down over the affected area.

The particular line in question is subject to at least two scheduled maintenance activities, including walking inspections of the line, as well as checks on the heat-tracing to ensure the line remains clear in sub-zero temperatures. A break such as this in this particular line has not been experienced prior to this incident.

Following the spill, the line has been repaired and back-flushed to ensure it is clear of obstructions. In addition to continuing with the planned maintenance tasks outlined above, the line will be fitted with flow alarms at the discharge tank within Area 2. These flow alarms will be interlocked to the Area 1 pumps, so that in the event of a low flow condition, the Area 1 pumps will be tripped. It is expected that this work will be completed within 3 months.

A formal investigation was held to review this issue. A Corrective Action (CA 2640) was opened to manage this incident.

Cominco Ltd.; Trail Operations Trail, British Columbia, Canada V1R 4L8 Tel. (604) 364-4222

Please contact me if you require additional information.

Yours truly

J. Edward Kniel

Ed Kniel
Environmental Engineer

.cc DMagoon, WVanBeek, MMartin, KCairns, RSentis, BKuffner, DReynolds, DBoateng, SDouglas, GGawryletz (all via e-mail)

PE-2753

ENVIRONMENTAL PROTECTION
JAN 26 2001
NELSON, B.C.

Cominco

Mr. Carl Johnson, P.Eng.
Head, Industrial Section
Ministry of Environment, Lands & Parks
#401 - 333 Victoria Street
Nelson, B.C.
V1L 4K3

Re: October 8th, 9th, and 11th 2000 Report of Thallium Discharge - Permit PE-02753

January 18th, 2001

Dear Sir:

Regarding the October 8th, 9th, and 11th 2000 reported discharge of thallium, from Cominco's Trail Lead/Zinc Smelter.

The following is a description of the incidents, as was discussed with yourself by telephone on October 10th and October 12th.

On October 12th Cominco reported to the MOE the October 8th discharge of 43 kgs, and the October 10th, 11th discharges of 34 kgs and 31 kgs of thallium, from Cominco's Trail Operation to the Columbia River.

The three discharges resulted from accretions accumulated on the uptake boiler shaft of the Kivcet lead furnace. These accretions contained a high concentration of thallium. The accretions dislodged from the wall and dissolved into the molten bullion/slag bath. This created a rich thallium slag. This rich thallium slag then reported to the #3 Slag fuming furnace on October 8th, 9th and #2 Slag fuming furnace on October 11th. The thallium remained in the fume, until it reached the Zinc Fume Leach plant where the thallium separated from the fume and reported to the effluent, then to the Combined–III outfall that flows into the Columbia River. The Zinc Fume Leach plant's control parameters are cadmium and arsenic. During these elevated thallium discharges, these elements were in conformance. Thallium deportment to Combined-III can occur from numerous sources; it was only from reviewing each potential source that the above conclusions were reached.

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The following action plans are being implemented to prevent a similar occurrence:

- The #2 and #3 Slag Furnace and KIVCET Standard Operating Procedures (SOPs) are being modified. During the startup of the KIVCET furnace after a prolonged shutdown (i.e. greater than 12 hours), the slag sampling frequency will increase. This sample will include thallium in the assay;
- If elevated thallium concentrations are detected in the KIVCET slag following the prolonged shutdown, the KIVCET slag will not be treated in the #3 Slag Fuming Furnace until the thallium concentration decreases. This slag will instead be granulated, bypassing the #3 Slag Fuming Furnace.
- The resulting high-thallium slag would be blended with low-thallium slag, and be treated by the #2 Slag Fuming Furnace.
- Alternative Zinc Fume leach options are also being reviewed.

Please contact me if you require additional information regarding these issues.

Yours truly,

for G.J. Gawryletz
Group Leader, Environmental Monitoring

.cc DHM, MTM, KAC, WVB, BWK, DGR, DJW, RRS, RHF, CAV, WK

76750.40/Cominco/EFi
PE-02753

ENVIRONMENTAL PROTECTION
JAN 23 2000
NELSON, B.C.

Cominco

Regional Manager
Environmental Protection
#401 - 333 Victoria Street
Nelson, B.C.
V1L 4K3

January 21, 2000

Attention: **Mr. Carl Johnson, P. Eng.**
Head Industrial Section

Reference: **Permits PE-02753 PE-05309**

Dear Sir:

In accordance with the monitoring programs associated with Effluent Permits PE-02753, PE-05309, I am submitting the required effluent and receiving water data for November 1999.

The following monitoring data in report format is included in this submission:

- NAPS schedule 24-hour composite sample results for Outfall II, Outfall III and Outfall IV.
- NAPS schedule grab sample results from Topping (Stoney) Creek.
- Monthly grab sample results from the Columbia river.

Computer coded monitoring results have been E-mailed to your office.

Yours truly,

G.J.Gawryletz
Group Leader, Environmental Monitoring
Cominco Ltd.

Attachments:

Effluent Permit PE-02753: Combined Outfall II
All NAPS required sampling results are under permit limits for November.

Effluent Permit PE-02753: Combined Outfall III
All NAPS required sampling results are under permit limits for November.

Permit PE-05309 - Combined Outfall IV
All NAPS required sampling results are under permit limits for November.

Cominco Ltd. Trail Operations Combined Outfall 11
Waste Management Branch Effluent Permit PE-02753
1999 Compliance Monitoring

Date: 12/20/99

(Tributaries T-1, T-3, T-4, T-5 & T-6)

Sample Date	Flow (m3/day)	TMax Deg C	TMin Deg C	TAvg Deg C	pH	Sus/Slds (kg/day)	T/Pb (kg/day)	Diss/Pb (kg/day)	T/Zn (kg/day)	Diss/Zn (mg/l)	Diss/Zn (kg/day)	T/Cd (kg/day)	Diss/Cd (mg/l)	Diss/Cd (kg/day)	T/As (kg/day)	Diss/As (kg/day)	T/Cu (kg/day)	Diss/Cu (kg/day)	T/Hg (kg/day)
11/2/99	86090	22.0	19.6	20.7	7.70	43.0	0.43	0.43	51.7	0.36	31.0	0.043	<.001	0.043	0.43	0.43	0.43	0.43	.0086
11/8/99	83361	22.9	22.3	22.6	7.70	250	13.34	1.67	75.9	0.33	27.5	0.333	0.001	0.083	0.42	0.42	0.83	0.42	.0042
11/14/99	82940	23.7	21.6	22.3	7.80	41.5	2.49	0.41	43.1	0.34	28.2	0.166	0.002	0.166	0.41	0.41	0.83	0.41	.0041
11/20/99	82447	23.3	20.9	22.0	7.80	82.4	1.65	0.41	61.8	0.44	36.3	0.165	0.002	0.165	0.41	0.41	0.41	0.41	.0082
11/26/99	80380	21.5	20.2	20.9	7.70	40.2	1.61	0.40	64.3	0.48	38.6	0.080	0.001	0.080	0.40	0.40	0.40	0.40	.0080

Cominco Ltd. Trail Operations Combined Outfall III

Date: 12/20/99

Waste Management Branch Effluent Permit PE-02753

1999 Compliance Monitoring

(Tributaries T-8, T-9, T-10)

Sample Date	Flow (m3/day)	TMax Deg C	TMin Deg C	TAvg Deg C	pH	Sus/Slds (kg/day)	T/Pb (kg/day)	Diss/Pb (kg/day)	T/Zn (kg/day)	Diss/Zn (mg/l)	Diss/Zn (kg/day)	T/Cd (kg/day)	Diss/Cd (mg/l)	Diss/Cd (kg/day)	T/As (kg/day)	Diss/As (kg/day)	T/Cu (kg/day)	Diss/Cu (kg/day)	T/Hg (kg/day)	T/Tl (kg/day)	DissTl (kg/day)	Diss/F (kg/day)	T/NH3/N (kg/day)
11/2/99	86853	24.0	21.2	22.8	7.90	86.9	8.69	5.21	39.1	0.27	23.45	0.434	0.004	0.347	0.43	0.43	0.43	0.43	.0174	8.69	8.69	235	43.4
11/8/99	93439	24.5	22.7	23.7	8.50	46.7	6.54	3.74	18.69	0.12	11.21	0.187	0.001	0.093	0.93	0.47	0.47	0.47	.0280	4.67	4.67	355	93.4
11/14/99	91913	24.8	23.1	24.0	8.30	46.0	10.11	4.60	38.6	0.11	10.11	0.460	0.004	0.368	1.84	1.84	0.46	0.46	.0046	4.60	4.60	322	91.9
11/20/99	96499	23.2	19.9	22.0	8.30	193	11.58	3.86	37.6	0.20	19.30	0.868	0.008	0.772	0.48	0.48	0.48	0.48	.0193	4.82	4.82	338	96.5
11/26/99	92469	22.4	19.0	21.7	8.30	92.5	8.32	3.70	24.04	0.16	14.80	0.462	0.004	0.370	0.92	0.46	0.92	0.46	.0740	4.62	4.62	176	92.5

Cominco Ltd. Trail Operations Combined Outfall IV

Date: 12/20/99

Waste Management Branch Effluent Permit PE-05309

1999 Compliance Monitoring

(Tributaries T-11, & T -12)

Sample Date	Flow m3/day	TMax Deg	TMin Deg	TAvg Deg C	pH	Sus/Slds (kg/day)	T/Zn (kg/day)	Diss/Zn (kg/day)	D/NH3/N (mg/L)	D/NH3/N (kg/day)	Diss/SO4 (kg/day)	T/Hg (kg/day)
Nov/02	26422	21.6	19.7	20.8	7.60	13.21	12.15	6.87	7.00	185	1691	.0026
Nov/08	27610	21.7	19.9	20.5	7.60	27.6	10.22	8.28	7.00	193	1601	.0014
Nov/14	26231	22.7	22.7	22.7	7.80	78.7	8.92	6.30	10.00	262	997	.0013
Nov/20	27247	24.9	23.4	24.1	7.80	27.2	6.81	3.81	9.00	245	1226	.0027
Nov/26	26824	23.2	21.1	22.5	7.60	53.6	7.24	4.83	8.00	215	1341	.0027

Cominco Ltd. Trail Operations Topping (Stoney) Creek

Date: 01/17/2000

Waste Management Branch Effluent Permit PE-02753

1999 Compliance Monitoring

Sample Date	T/Pb mg/l	Diss/Pb mg/l	T/Zn mg/l	Diss/Zn mg/l	T/Cd mg/l	Diss/Cd mg/l	T/As mg/l	Diss/As mg/l	T/Sb mg/l	Diss/Sb mg/l	Flow m3/min
02-Nov-99	<0.01	<0.01	4.40	4.40	0.05	0.05	0.77	0.74	<0.01	<0.01	1.1
08-Nov-99	<0.01	<0.01	7.70	6.40	0.10	0.09	1.20	0.85	<0.01	<0.01	0.5
14-Nov-99	<0.01	<0.01	0.84	0.77	0.01	<.01	0.14	0.11	<0.01	<0.01	25.7
20-Nov-99	<0.01	<0.01	1.60	1.10	0.02	0.02	0.18	0.18	<0.01	<0.01	12.1
26-Nov-99	<0.01	<0.01	1.70	1.70	0.03	0.03	0.31	0.27	<0.01	<0.01	6.0

Cominco Ltd. Trail Operations Columbi
Waste Managment Branch Effluent F
1998 Complian

Report Date	Sampling Location Name	T/NH3/N mg/l	D/As ug/l	D/Cd ug/l	D/Cu ug/l	D/F mg/l	D/Pb ug/l
11/1/99	Columbia River Downstream from Stoney Creek	<0.50	<1.00	0.060	0.17	0.09	<0.05
	Columbia River East Side at Waneta	<0.50	<1.00	0.030	0.31	0.09	<0.05
	Columbia River West Side at Birchbank	<0.50	<1.00	0.010	0.18	0.09	<0.05
	Columbia River West side of Old Trail Bridge	<0.50	<1.00	0.020	0.22	0.09	<0.05

BRITISH COLUMBIA

Your File: PA-2690, 91, 92; PE-2753, 5309
Our File: PA-2690, 91, 92; PE-2753, 5309

January 26, 2000

Cominco Ltd
PO Box 1000
Trail BC V1R 4L8

Attention: Gary Gawryletz, Group Leader, Environment

Re: Submission of Data for October 1999

This will acknowledge the submission of data associated the above noted permits. The poor results for bioassay samples for Outfalls II and IV are of concern since the previous results have been much better. The elevated zinc and cadmium appear have been the reasons for fish toxicity. Although it is not stated the poor result for Stoney Creek may be flow and dilution related. Do you have flow measurements for the creek?

Yours truly,

Carl Johnson, PEng
Industrial Section Head

CJ/mh

Ministry of Environment, Lands and Parks
Environment and Lands
Kootenay Region
Mailing/Location Address:
401 - 333 Victoria Street
Nelson BC VIL 4K3
Telephone: (250) 354-6333
Facsimile: (250) 354-6332
PP Facsimile: (250) 354-6367

CARL

ENVIRONMENTAL PROTECTION
1 2 2000
Cominco
NELSON, B.C.

Mr. Carl Johnson, P.Eng.
Head, Industrial Section
Ministry of Environment, Lands & Parks
#401 - 333 Victoria Street
Nelson, B.C.
V1L 4K3

October 18, 1999

Re: September 22nd, October 7th, October 11th, 1999 Report of Cadmium Discharge - Permit PE-02753

Dear Sir:

Pursuant to reporting requirements in Effluent Permit PE-02753, I am submitting the following information pertaining to the cadmium discharge to the Columbia River.

On September 22nd , 1999 the 24-hour composite sample of Combined Outfall II indicated that we exceeded the permit limits for both dissolved cadmium concentration and for the loading of dissolved cadmium. On October 7th, and11th ,1999 the 24-hour composite samples of Combined Outfall II indicated that we exceeded the permit limits for the loading of dissolved cadmium. The results are given in the table below. The source was traced to the Zinc Sulphide Leach Plant.

Combined Outfall II Results

Date	[Cd/Diss] (mg/L)	Cd/Diss loading (kg/d)
September 22	0.073	6.04
October 07	N/a	3.48
October 11	N/a	2.86
Permit Limits	0.060	2.75

The root cause of this series of incidents can be attributed to a crack in a cement covering which was intended to seal an effluent manhole, which historically was part of a pipeline that deported to the Columbia River. This manhole was located in the Sulphide Leach Purification courtyard, an area normally sealed and used to temporary store materials for processing. The materials in this area can have a low viscosity and therefore can cover the asphalt/cement base, making it extremely difficult to visually inspect this area. This area is designed with a collection area and a sump to pump metal containing effluent back into the Sulphide Leach process. Cadmium residue with a high moisture content was stored in this area. Some leachate material flowed through the crack in the cement then through the manhole cover, then entered the effluent system and ultimately the Columbia River.

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The 24-hour composite samples taken from the Waneta sampling site indicate there was no impact to the river. Refer to the following table:

Columbia River Water Analysis: Waneta Station

Date	Cd/Total (mg/L)	Cd/Diss (mg/L)
September 22	0.0003	0.0002
October 07	0.0003	0.0002
October 11	<0.0001	<0.0001

Corrective Action #749 (attached) was opened to deal with this complicated matter. Upon discovery of the cracked cement the area was bermed to prevent additional material from entering. The manhole was reopened, vacuumed then filled with cement. An asphalt covering will then be placed over the metal manhole to: 1) redirect solution around this area, and 2) provide a second seal of the manhole.

It is worth noting that the actions taken to date appear to have corrected the problem. Several longer term solutions/tasks are in progress and will reduce the likelihood that similar events will occur in the future, e.g. General approach to sealing the manholes, improving containment in the SLP area, reviewing effluent alarming criteria etc.

Please contact me if you require additional information.

Yours truly

Garry Gawryletz
Group Leader, Environmental Monitoring

.cc DMagoon,WVanBeek, MMartin, KCairns, SKnoerr, RSentis, MEdwards, JSzpak, RFish, CVanelli, DHorswill, WKuit (all via e-mail)

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Environmental Incident

Request No: 749

Description: High Cd in C-II Sept. 22/99 sample

Corrective Action: 749
Description : High Cd in C-II Sept. 22/99 sample
Plant : Sulph/Cadmium
Location : Source appears to be S/C area
Incident Date : Sep 22/1999
Time : 07:00
Create Date : Sep 24/1999
Submitted by : MARK EDWARDS
Accepted by : JOE SZPAK
Assigned to : DOUGLAS MCKAY
Required Date : Oct 27/1999

Spill Information:

Duration of Spill: 24 Hours 0 Minutes
Reported by : MARK EDWARDS
Aspect Type : Effluent
Assayed Solution : EW86 19990922 0
H2SO4 <1. MG/L
SUS/SLDS 1. MG/L
T/AS <0.01 MG/L
DISS/AS <0.01 MG/L
T/CA 18.3 MG/L
T/CD 0.086 MG/L
DISS/CD 0.073 MG/L
T/CU 0.01 MG/L
DISS/CU <0.01 MG/L
T/MG 3.2 MG/L
T/MN 0.007 MG/L
T/PB 0.02 MG/L
DISS/PB <0.01 MG/L
T/SB <0.01 MG/L
T/TL <0.1 MG/L
T/ZN 0.85 MG/L
DISS/ZN 0.46 MG/L
T/HG 0.0002 MG/L
Volume to River : 6.04 KG
Chemical Composition : contained Cd and likely Zn
Type & Strength of Material: Unknown at this time

Detailed Description:

Cadmium concentration and loading permit limits exceeded for the Sept. 22/99 sample for Combined outfall II. Zinc levels were also high but did not exceed permit limits. Assay results were as follows:

T/Cd = 0.086 mg/L (No permit limit specified)
Diss/Cd = 0.073 mg/L (Permit limit = 0.06 mg/L)
Diss/Cd loading = 6.04 kg/day (Permit limit = 2.75 kg/d)

Diss/Zn = 0.46 mg/L (Permit limit = 1.4 mg/L)
Diss/Zn loading = 38 kg/d (Permit limit 75 kg/d)

Analysis of an upstream tributary (06Z - the smelter feed plant)

indicates that the source of the Cd was likely the Sulphide/Cadmium area. Assay results for 06Z are as follows:

T/Cd = 0.39 mg/L
Diss/Cd = 0.35 mg/L
T/Zn = 1.6 mg/L
Diss/Zn = 1.5 mg/L
(Information entered by MEdwards on Sept. 24/99)

Immediate Action Taken:
Review of assay data from the tributaries indicates that the most likely source of the Cd was SLP/Cd area. Env. monitoring tech (HByers) contacted SLP shift leaders at about 16:00 on Sept. 23/99 when the assay results for C-II first came in. HByers spoke with Doug Deyotte and Randy Peebles (Shift leaders?) who indicated that no initial problems were found/identified other than possibly road washing in CHocolate Alley. SLP/Cd investigating. RMacAskill contacted on morning of Sept. 24 - will look into it.

HByers inspected the Choc. alley area on the evening of Sept. 23/99. There was no obvious source/spill and the manholes in the area are sealed.

Root Cause Category:

Suspected Cause (Root Cause Analysis):
Suspected source of the Cd is the SLP/Cd business area as indicated by high Cd levels in 06Z tributary.

Action Plan and Results: (address the Root Cause)

1. Audit Conductivity Probe PMs Monitoring and Measurement
Assigned to : ROSS MACASKILL
Due by : Sep 30/1999
Completed on : Sep 30/1999
Task Details :
Determine if all Conductivity Probes on 06z Sewer tributaries are functioning properly.

The conductivity probes are on a PM MM804238 - SEWER CONDUCTIVITY AUDIT which is done monthly (every 4 weeks) by Specialist Support (SVM). A report called "EFFLUENT ALARMS - MONTHLY AUDIT REPORT" is generated by this PM/Audit. These reports are up to date.

Results:
On Sept. 24th Len Pitman checked 02 Sewer Conductivity and found probe was dead. Len also checked 06z Sewer Conductivity the same day. It was working properly.

The two conductivity probes in the Cadmium Plant (Vacuum Pump Sewer & Heat Exchanger Sewer) were checked on Sept. 27 and were both out of calibration by +/- 50 & 250 us-cm. These two conductivity probes were

not a part of the "EFFLUENT ALARMS - MONTHLY AUDIT REPORT" and were not covered on the Maintenance Order MM804238. They have now been added to this PM.

2. Audit Manhole Cover PM Operational Control
Assigned to : ROSS MACASKILL
Due by : Oct 10/1999
Completed on : Oct 8/1999
Task Details :
Determine if all Manhole Covers in Chocolate Alley are being sealed as per Maintenance Order MP046280.

Results:
Sept 29 - 12:45pm
Called Dave Langille. He said the covers are sealed / resealed monthly as required but as soon as a large vehicle runs over the cover, it breaks the seal and the cover will leak again.

Oct 6 - 10:00am
Inspected Chocolate Alley (manhole covers) with Rich Proulx, Garry Gawryletz, Marc Cross and Ken Moon.
Identified more than manhole cover that appeared to have a broken seal. An agreement was reached to blacktop over the top of all manhole covers in Chocolate Alley to seal them permanently. The PM MP046280 will remain in place to ensure the continued integrity of this covering.

See task #5 of this Corrective Action.

3. Assay effluents leaving Cadmium Plant Monitoring and Measurement
Assigned to : HUW GEORGE
Due by : Oct 25/1999
Completed on :
Task Details :
Determine how much Cadmium is "normally" in the Cadmium Plant effluent streams.

Assay the Heat Exchanger Sewer effluent and the Vacuum Pump Sewer effluent.

THE DUE DATE FOR THIS TASK WAS EXTENDED ON OCT.18th.

Results:
Vacuum Pump Sewer
ASSAY #DL99
1999/09/29 0002
T/Cd .11 mg/L
T/Zn 2.3 mg/L

Cd Heat Exchanger Sewer
ASSAY #DL99
1999/10/08 0000
CD 0.066 MG/L

Request No: 749
Description: High Cd in C-II Sept. 22/99 sample

ZN 0.04 MG/L

Cd Heat Exchanger Sewer
ASSAY #ZC99
1999/10/06 0201
Cd .12 mg/L
Zn .24 mg/L

NOTE: The sampling points for Cd plant are located in areas such that "salting" of the sample is possible.

Vacuum Pump Sewer
ASSAY #ZC99
1999/10/13 0207
Cd <.01 mg/L
Zn .32

Cd Heat Exchanger Sewer
ASSAY #ZC99
199/10/14 0206
Cd .03
Zn .73

NOTE: A handcheck of the conductivity of this sample showed it to be similar to tap water (^220 microS/cm).

4. Cadmium in effluent vs conductivity — Monitoring and Measurement
Assigned to : DOUGLAS MCKAY
Due by : Oct 31/1999
Completed on :
Task Details :
Determine if Conductivity Probes, with an alarm set point of 500 US-CM, are sensitive enough to pick up Cadmium in the effluent streams.

Results:

5. Seal manhole covers in Chocolate Alle — Operational Control
Assigned to : DAVID LANGILLE
Due by : Oct 29/1999
Completed on :
Task Details :
Permanently seal manhole covers in chocolate alley to ensure surface drainage does not enter sewer system.

Continue with monthly PM (MP046280) to ensure seal integrity is not lost.

Results:

6. Incident Investigation — Monitoring and Measurement
Assigned to : GARRY GAWRYLETZ
Due by : Oct 15/1999
Completed on : Oct 14/1999
Task Details :

Results:
Several informal investigations have been held to date. These investigations have included plant operations representatives,

Request No: 749
Description: High Cd in C-II Sept. 22/99 sample

management staff, service groups and technical support personnel.

7. Report to Ministry of Env Formal — Communication
Assigned to : GARRY GAWRYLETZ
Due by : Oct 15/1999
Completed on :
Task Details :

Results:

8. Re-seal manhole cover at Purification — Operational Control
Assigned to : MARC CROSS
Due by : Oct 29/1999
Completed on :
Task Details :

Results:

9. Conductivity Probe configuration in C — Monitoring and Measurement
Assigned to : ROSS MACASKILL
Due by : Oct 29/1999
Completed on :
Task Details :
Evaluate and make recommendations about Conductivity Probe location and configuration in the Cadmium Plant.
Specialist Support - Len Pitman will assist with this task.

Results:

Closed by:

Action Closing Comments:

** End of Report **

Memo to file PE-2753
Permit exceedances at Cominco

7am Oct 7 to 7am Oct 8 sample of Outfall II
-did not exceed permit limits for concentration of cadmium but did exceed loading limit
-permit limit 2.75 kg/day
-actual loss 3.48 kg
-no alarms were noted in the computer system during the sample period
-may have been related to leaking manholes again
-Cominco to pursue efforts for additional containment at sulphide leach area which is the most likely area for loss to have occurred

same day
-Outfall III
permit limit for dissolved zinc 90 kg/day and .90 mg/l
-actual loss was 106 kg and 1.07 mg/l
-loss did not come from ETP or fume leach area
-still looking for source of loss

Carl Johnson Carl Johnson

To Peter Start
CO Service

Memo to file PE-2753
Permit exceedances at Cominco

7am Oct 7 to 7am Oct 8 sample of Outfall II
-did not exceed permit limits for concentration of cadmium but did exceed loading limit
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Carl Johnson Carl Johnson

BRITISH COLUMBIA

MEMORANDUM

To: Carl Johnson
Industrial Section Head

Date: October 19, 1999

File: PE02753

Re: Sewer II Zinc Spill - Oct 5, 1999

The following is an assessment of the potential environmental impact in the Columbia River of the above incident.

Incident: (information provided to me by yourself)

In the early hours of October 5, 1999 a loss of electrolyte from the sulphide leach plant was discovered as the result of a pH alarm on sewer 06Z. Samples were taken by G. Gawryletz as required and you were notified at 08:00 on Oct 6. Greatly increased zinc, but not cadmium, from the Sewer II composite samples, confirmed that the sulphide leach plant was the source of the loss. The electrolyte is suspected of entering sewer 06Z through a leaking manhole seal at the south end of chocolate alley. From here it enters combined Sewer II and directly to the Columbia River.

- The total quantity of electrolyte loss is estimated to be 300 m^3 over a 2 hour period.
- Typical electrolyte quality is 145 - 150 g/L dissolved Zn at about pH 5.
- Sewer II flow on Oct 5 was 86595 m^3/d.
- Sewer II 24 hour flow-proportioned sample taken (7am Oct 4 to 7 am Oct 5) had 1.9 mg/L dissolved Zn, 2.7 mg/L total Zn. This produced a dissolved Zn loading of 164.5 kg/d.
- There was no change in the pH of Sewer II.
- River flow on Oct 4 was 2240 m^3/s.

Impact Assessment:

The permit limits on Sewer II for dissolved Zn are 1.4 mg/L and 75 kg/d, based on a 24 hour flow-proportioned composite sample. This effluent is currently not required by permit to be non-lethal to fish as determined by a 96 hr Rainbow trout LC_{50}, but must be so after Dec 31, 2000. Zinc discharge averages for 1995 were 110 kg/d and 2.46 mg/L total zinc, 29.4 kg/d and 0.66 mg/L dissolved zinc, based on the 24 hour flow-proportioned composite samples and daily flow (McDonald 1996). Cooling water from the new Kivcet lead smelter have nearly doubled the flow from Sewer II but without any additional metal loading (Carl Johnson, personal communication, 1999). This means the average concentrations will be about half those in 1995 but the loadings will be approximately the same.

Since the release of electrolyte containing dissolved Zn occurred over 2 hours we can assume that this is the period when all the additional Zn loading that discharged to the river through Sewer II on Oct 5, occurred. It is over this 2 hour period that the greatest concentrations of zinc would occur in the river. The toxicity of zinc to aquatic life is dependent on the concentration and the duration of exposure and its chemical form. Since the duration was very short, 2 hours, there is no need to consider long-term exposure, only the acute toxicity, which is predominantly caused by the dissolved form.

Based on these assumptions, the amount of dissolved Zn spilled over the 2 hours can be calculated as the loading on the day of the spill (164.5 kg/d) minus the average daily loading (29.4 kg/d) = **135.1 kg**. The spill loading from Sewer II over these 2 hours is this quantity plus a normal hourly loading, simply calculated as 29.4 kg/d ÷ 24 = 1.22 kg/hr, which gives a value of **136.3 kg/hr.**

The concentration of dissolved Zn in Sewer II during this 2 hour period can be calculated from the spill loading and 1/24th of the daily flow (86,595 m^3/d ÷ 24 = 3608 m^3/hr).

$$\frac{136.3 \text{ kg/hr}}{3608 \text{ m}^3\text{/hr} \times 0.001} = \textbf{37.8 mg/L dissolved Zn}$$

Estimated River Concentrations

Using the loading of dissolved Zn over the 2 hours of the spill, we can estimate the concentration in the Columbia River during the spill. To be conservative an initial dilution zone (IDZ) which assumes the effluent is mixed into 10% of the river flow is used.

Ten percent of the river flow on this day was 224 m^3/s or 806,400 m^3/hr. The calculated dissolved Zn concentration at the end of the IDZ is then:

$$\frac{136.3 \text{ kg/hr}}{806{,}400 \text{ m3/hr} \times 0.001} = \textbf{169 µg/L dissolved Zn}$$

From this point upstream to the Sewer II outfall, the concentration would be progressively higher until it reached 37.8 mg/L (37,800 µg/L) at the end of the pipe. This estimate ignores all other possible sources of Zn upstream, such as Stony Creek, so actual river concentrations would be somewhat higher.

For comparison, the concentrations under **normal** discharge conditions (1.22 kg/hr) and this river flow would be **660 µg/L** at the end of the pipe and **1.5 µg/L** at the end of a 10% IDZ (again assuming Sewer II as the only source of Zn).

Summary of Calculations

Duration of spill:	2 hours

Loading of dissolved Zn from Sewer II (from Oct 5/6 24 hr composite):	164.5 kg/d
Normal loading of diss Zn from Sewer II:	29.4 kg/d
Permit Limit:	75 kg/d
Loading of dissolved Zn from Sewer II during spill:	136.3 kg/hr
Normal hourly loading of dissolved Zn from Sewer II:	1.22 kg/hr
Concentration of diss Zn in Sewer II (from Oct 5/6 24 hr composite):	1.9 mg/L
Normal concentration of diss Zn in Sewer II:	0.66 mg/L
Permit Limit:	1.4 mg/L
Concentration of dissolved Zn in Sewer II during spill:	37.8 mg/L
Concentration of dissolved Zn at end of 10% IDZ during spill:	169 µg/L
Concentration of dissolved Zn at end of 10% IDZ normally:	1.5 µg/L
Acute lethal threshold to fish (Duncan and Antcliffe 1996):	700 µg/L
Provincial water quality guideline for protection of aquatic life:	33 µg/L

Enforcement Recommendation:

This incident represents an exceedance of permit limits and is worthy of the non-compliance list. I do not believe, however, that it is a strong case for prosecution. Technical realities have lead us to set permit limits on 24 hour composite samples on combined sewers which receive numerous contaminant sources. Some spills and upsets may produce quite high levels of metals in the discharge for short periods but daily averages, as represented by composite samples, may show considerably less dramatic results.

During the 2 hours of this spill the effluent was probably acutely toxic to fish, although the range of LC_{50}s in the literature is large, from 90 to 7210 µg/L (Duncan and Antcliffe 1996). The concentration of dissolved zinc over during the 2 hours is estimated to have been 54 times the fish acute toxic threshold for zinc of 700 µg/L (Duncan and Antcliffe 1996) and thus constitutes a violation of the Canada Fisheries Act, S. 36(3), the deposit of a deleterious substance into fish bearing waters. This lethal threshold, however, is based on 96 hr LC50 data, or 4 days of exposure, and this spill only resulted in 2 hours. If we use the 24 hour composite concentration (remembering that fish in the river would have been exposed to a 2 hour slug that dispersed as it moved downstream) the lethal threshold was exceeded by 2.7 times (1900 µg/L). The problem here is that the current permit limit (1.4 mg/L or 1400 µg/L) is itself 2 times this threshold. We are not requiring in the permit that Sewer II be non-toxic until the end of 2000.

My calculations, assuming all the spill occurred over 2 hours, show that dissolved Zn levels may have reached lethal levels within a 10% IDZ but not beyond. The case for a Fisheries Act S.36(3) is weakened by the uncertainty of the lethality of this concentration of dissolved zinc, and we have no bioassay during the spill, the short duration of the spill compared to the research on the lethality of zinc which is based on 96 hours of exposure.

In summary, I recommend we not proceed with prosecution on this incident. The dissolved Zn levels were not high enough be able to state, beyond a reasonable doubt, that the effluent was lethal to fish. A due diligence investigation by us and the company should still be carried out to determine if there is any way of preventing or limiting such incidents, particularly if there is a chance that greater quantities of Zn electrolyte could be released over a longer period of time.

References:

Duncan, B. and B. Antcliffe. Toxicity Assessment of Effluent from the cominco Metallurgical & Fertilizer Operations at Trail, B.C. Nov. 1996. 34 p + app.

McDonald, L.E. Assessment of 1995 Effluent Metals Sample Results at Cominco Ltd, Trail Operations. B.C. Environment, May 1996. 50 p

Les McDonald, RP Bio
Impact Assessment Biologist

ASSOCIATION OF PROFESSIONAL BIOLOGISTS OF B.C.
Leslie E. McDonald
R. P. Bio
#161
APB

Spill Report memo to file PE-2753 Oct 6

-Loss from sulphide leach plant
-first noted through sewer 06Z alarms received in plant early hours of October 5
-G Gawryletz notified by plant early am Oct 5
-samples taken as required by GG
-assay results reported back to GG late Oct 5
-CJ notifed before 8:00am on Oct 6
-loss appeared to come from sulphide leach plant as sewer II analysis showed only elevated zinc not cadmium although cadmium was elevated above normal in 06Z
-loss entered chocolate alley and most flowed to north pond area for capture and treatment
-more details to follow when plant has had investigation on Oct 7
-loss estimated to be 300m3 - most was captured and recycled to process
-electrolyte is typically 145-150 g/l zinc (dissolved)
-some solution entered the 06Z system apparently through a leaking manhole on the southern end of chocolate alley
-manholes in this area are sealed regularly with silicon sealant type material
-apparently the alarm was intermittent but real
-the grab sample of 06Z shows loss of zinc total zinc 11 mg/l and dissolved zinc
-the 24 hour compo of Outfall II confirmed the loss
-permit limit 75 kg/d of d zinc
-actual loss 160 kg/day
-sewer II analysis reported as 1.9 mg/l dissolved zinc and 2.7 mg/l total zinc
-there was no change itn he Ph of sewer II but this is not surprising since electrolyte is normally pH 5 so it would take a lot of solution to make the pH of the sewer volume change
-Sewer II flow 86595 m3/day
-sample confirmed to be 1.9 mg/l
loading 164.5 kg/day
River flow for Oct 4 2240 m3/sec

Carl J Carl Johnson

discussion with Gary C. Oct 7
EMAS quarterly review at SHP shortly will deal with corrective actions as a result of this loss - why it happens
Choc. alley is not primary containment due to truck traffic issues - need to contain within plant boundaries

- 3:30 Am
- flood at SFP 300 m^3 of electrolyte → N Pond.
  20 minutes
- flowed over raised manhole that was sealed with sealant
- Cond alarm at 500 micro siemens. 2 hr. ensymmetric.
- truck washed road.
- pH III no change

99% to N pond.

Response will pave over all the manholes.

- Sewer II 86,595 m^3
  dis 2 hr 1.9 mg/l.
  loading 164.5 Kg.

River Flow - Oct 4 ~~100,000 ft³/sec~~ 2240 m^3/s

6. Zinc Loss Oct 43-5

-loss occurred when sperry filter system of piping was being cleaned out
-solution entered the courtyard and out the door into Chocolate alley
-the solution was washed back to the North pond for capture and recycle
-loss entered the sewer through leaking manhole covers in the alley
-key point to be made is that Chocolate Alley is not primary containment and the plant must find a better method to keep their solutions inside the plant for capture and recycle
-Gary G attended investigation
-3 items for corrective action

1. 2 berms to be installed inside the plant to keep the solutions inside especially when the sperry needs to be flushed
2. redo the piping so that when the flushing is done it goes back into the plan not out the door into chocolate alley
3. pave all the manholes in chocolate alley

Carl Johnson

Oct 4 1999.

Zn. II

Mr. Carl Johnson, P.Eng.
Head, Industrial Section
Ministry of Environment, Lands & Parks
#401 - 333 Victoria Street
Nelson, B.C.
V1L 4K3

Sperry Filter
Choc Alley-manhole

October 18, 1999

Re: October 4th, 1999 Report of Zinc Discharge -Permit PE-02753

Dear Sir:

Pursuant to reporting requirements in Effluent Permit PE-02753, I am submitting the following information pertaining to the zinc discharge to the Columbia River.

On October 4th, 1999 the 24-hour composite sample of Combined Outfall II indicated that we exceeded the permit limits for both dissolved zinc concentration and for the loading of dissolved zinc. The results are given in the table below.

Combined Outfall II Results

Date	[Zn/Diss] (mg/L)	Zn/Diss loading (kg/d)
October 4	1.90	165
Permit Limits	1.40	75.0

The source was traced to the Zinc Sulphide Leach Plant. The root cause of this incident can be attributed to a process upset. While flushing the Number 2 Sperry filter, solution containing 155 g/l zinc overflowed the plants primary containment area and flowed into Chocolate alley. The majority of this solution flowed into the North Containment pond, however a small amount (<1.m3) flowed through cracks into a manhole cover in Chocolate alley and entered the effluent system and then the Columbia River.

The 24-hour composite samples taken from the Waneta sampling site indicated there was no negative impact to the river. Refer to the following table:

Columbia River Water Analysis: Waneta Station

Date	Zn/Total (mg/L)	Zn/Diss (mg/L)
October 4	0.0059	0.0049

Corrective Action #1490 (attached) was opened to manage this incident. Also an investigation was held to identify opportunities for preventing further occurrences. Three major action plan items were identified, they are:

Cominco Ltd.; Trail Operations Trail, British Columbia, Canada V1R 4L8 Tel. (604) 364-4222

1) Improve the primary containment area within the Sulphide Leach plant by establishing additional berms.
2) Review Sperry piping to try to determine if pipe outlets can be directed back into the primary containment area.
3) Develop and implement primary and secondary sealing of manhole coverings in Chocolate Alley.

Please contact me if you require additional information.

Yours truly

Garry Gawryletz
Group Leader, Environmental Monitoring

cc DMagoon, WVanBeek, MMartin, KCairns, SKnoerr, RSentis, MEdwards, JSzpak, RFish, CVanelli, DHorswill, WKuit all via e-mail

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Environmental Incident

Request No: 1490
Description: Sperry filtrate in Chocolate Alley

Corrective Action: 1490
Description : Sperry filtrate in Chocolate Alley
Plant : Sulphide Leach
Location : Chocolate Alley
Incident Date : Oct 5/1999
Time : 02:30
Create Date : Oct 5/1999
Submitted by : ERIC TAYLOR
Accepted by : JOE SZPAK
Assigned to : MARC CROSS
Required Date : Dec 3/1999

Spill Information:
Firehall notified on : Oct 5/1999 at: 03:25
Duration of Spill: 0 Hours 20 Minutes
Reported by : ERIC TAYLOR
Aspect Type : Effluent
Chemical Composition : Zinc Electrolyte
Type & Strength of Material: Zinc Electrolyte (cold stage)

Detailed Description:
Flushing Sperry loop when we had a massive dose of sperry rocks. Some of the flow went down Chocolate alley.
Approx 300 litres were put in chocolate alley.

The following are comments from PI Report (Oct. 4):
"There is a sewer alarm 06 sewer, we cannot find the problem. It cannot be a large amount as the readings have not gone over 550. Have talked to fire dept. I did a C/A on the product to roadway."

Immediate Action Taken:
Washed the roadway with a fire hose and had the wash down truck wash it. Contained in the north containment pond and pumped back into SLP plant process.

Root Cause Category:

Suspected Cause (Root Cause Analysis):
Rocks in Cold Stage Filter (Sperry) feed.
While flushing the sperry filter feed loop at the north end, solution went out the door onto road way in Chocolate Alley. Suspect a small amount of the solution may have entered leaking manhole cover.

Action Plan and Results: (address the Root Cause)

1. Seal Manhole Covers in Chocolate Alle Operational Control
Assigned to : ROSS MACASKILL
Due by : Oct 14/1999
Completed on : Oct 14/1999
Task Details :

Request No: 1490
Description: Sperry filtrate in Chocolate Alley

This task is already being covered in a seperate CA and will be complete within the next two weeks.
See Corrective Action #749 - Task 5.

Seal manhole covers in Chocolate Alley
Assigned to : DAVID LANGILLE
Due by : Oct 29/1999

Task Details :
Permanently seal manhole covers in chocolate alley to ensure surface drainage does not enter sewer system.

Continue with monthly PM (MP046280) to ensure seal integrity is not lost.

Results:
see task details

2. Incident Investigation Communication
Assigned to : ROSS MACASKILL
Due by : Oct 21/1999
Completed on : Oct 18/1999
Task Details :
The purpose of the investigation is to determine the following:
1. root cause.
2. required spill containment changes or modifications.
3. required operating procedure changes or modifications.

Results:
1. The Root Cause of the incident was rocks in the Sperry Filter feed. This problem has been looked at by technical resources in the plant for quite some time. This technical work continues.
2. Required spill containment changes have been identified in this CA. See task #4 & #5.
3. Required operating modifications are also identified in this CA See task #6.

3. Ensure instrument is working properly Monitoring and Measurement
Assigned to : ROSS MACASKILL
Due by : Oct 14/1999
Completed on : Oct 14/1999
Task Details :
Have an Instrument Mechanic check 06z Conductivity Instrument to ensure it is functioning properly.

Results:
Len Pitman - Specialist Support checked 06z Sewer Conductivity Instrument at 9:30am on Oct.6th.
Len reported to me that it was OK although it was reading high by approximately 93 us-cm and that the cell was a little sluggish or slow to respond but would stabilize after a minute or two.
This instrument is normally checked every second week.

Request No: 1490
Description: Sperry filtrate in Chocolate Alley

4. Construct burm at main door - SLP Operational Control
Assigned to : LESLIE LEPINE
Due by : Nov 5/1999
Completed on :
Task Details :
Construct a speed-bump burm (dam) at the SLP main door to prevent effluent on the floor from flowing out the door into Chocolate Alley.

Results:

5. Construct burm at Purification Alley Operational Control
Assigned to : LESLIE LEPINE
Due by : Nov 5/1999
Completed on :
Task Details :
Construct a burm at the Purification Alley area to divert effluent away from Chocolate Alley, back into our process.

Results:

6. Modify Sperry feed piping Operational Control
Assigned to : LESLIE LEPINE
Due by : Nov 5/1999
Completed on :
Task Details :
Modify Sperry feed line piping such that it can be flushed into plant.

Results:

7. Communicate this CA to plant personal Communication
Assigned to : KIRK DUFF
Due by : Nov 19/1999
Completed on :
Task Details :
Ensure this Corrective Action is communicated to the appropriate plant personal.

Results:

Closed by:

Action Closing Comments:

** End of Report **

76750-40/COMINC/EFF

ENVIRONMENTAL PROTECTION
JAN 26 2000
NELSON, B.C.

→ PE 02753

Cominco

Regional Manager
Environmental Protection
#401 - 333 Victoria Street
Nelson, B.C.
V1L 4K3

January 19, 2000

Attention: **Mr. Carl Johnson, P. Eng.**
Head Industrial Section

Reference: **Permits PE-02753 PE-05309**

Dear Sir:

In accordance with the monitoring programs associated with Effluent Permits PE-02753, PE-05309, I am submitting the required effluent and receiving water data for October 1999.

The following monitoring data in report format is included in this submission:

- NAPS schedule 24-hour composite sample results for Outfall II, Outfall III and Outfall IV.
- NAPS schedule grab sample results from Topping (Stoney) Creek.
- Monthly grab sample results from the Columbia river.
- 3rd Quarter LC-50 results

Computer coded monitoring results have been E-mailed to your office.

Yours truly,

G.J.Gawryletz
Group Leader, Environmental Monitoring
Cominco Ltd.

Attachments:

Effluent Permit PE-02753: Combined Outfall II
All NAPS required sampling results are under permit limits for October. Permit exceedances occurred on October 7th and the 11th for Cadmium, refer to letter sent to Ministry dated October 18th. Also a permit exceedance occurred October 4th for Zinc, refer to a second letter sent to Ministry dated October 18th.

Effluent Permit PE-02753: Combined Outfall III
All NAPS required sampling results are under permit limits for October. A permit exceedance occurred October 7th for Zinc. Reported verbally to the ministry.

	Loading	Permit Limit	
October 7th Diss/Zn	107.0	90	kg/day

No process spills, process upsets, or unusual events were reported and no effluent pH or conductivity alarms were triggered. Potential contributing plants were investigated, source remains unknown.

Permit PE-05309 - Combined Outfall IV
All NAPS required sampling results are under permit limits for October.

Permit PS-08310 - Stoney (Topping) Creek Monitoring

LC-50 Toxicity 3rd quarter results for C-II, C-III, and C-IV and Stoney Creek.

The analytical lab (EVS) was unable to provide the trout necessary to complete this sampling program in the 3rd quarter The 3rd quarter test was conducted the first week of October and the results are included. The forth quarter LC-50 test was conducted in December.

Cominco Ltd. Trail Operations Combined Outfall ll
Waste Management Branch Effluent Permit PE-02753
1999 Compliance Monitoring

Date: 11/23/99

(Tributaries T-1, T-3, T-4, T-5 & T-6)

Sample Date	Flow (m3/day)	TMax Deg C	TMin Deg C	TAvg Deg C	pH	Sus/Slds (kg/day)	T/Pb (kg/day)	Diss/Pb (kg/day)	T/Zn (kg/day)	Diss/Zn (mg/l)	Diss/Zn (kg/day)	T/Cd (kg/day)	Diss/Cd (mg/l)	Diss/Cd (kg/day)	T/As (kg/day)	Diss/As (kg/day)	T/Cu (kg/day)	Diss/Cu (kg/day)	T/Hg (kg/day)
10/3/99	87779	26.4	23.7	25.5	7.70	87.8	0.44	0.44	28.1	0.22	19.31	0.439	0.005	0.439	0.44	0.44	0.44	0.44	.0176
10/9/99	86119	26.3	23.9	25.0	7.80	43.1	2.58	0.43	40.5	0.28	24.11	1.03	0.011	0.947	0.43	0.43	0.43	0.43	.0172
10/15/99	75602	22.8	18.8	20.5	7.80	75.6	1.51	0.38	43.8	0.35	26.5	0.454	0.006	0.454	0.38	0.38	0.38	0.38	.0038
10/21/99	88041	25.1	22.0	23.9	7.70	44.0	2.64	1.76	36.1	0.33	29.1	0.616	0.007	0.616	0.44	0.44	0.44	0.44	.0176
10/27/99	87347	22.6	21.0	21.9	7.70	87.3	4.37	1.75	58.5	0.43	37.6	1.83	0.017	1.48	0.44	0.44	0.87	0.44	.0087

Cominco Ltd. Trail Operations Combined Outfall III

Date: 11/23/99

Waste Management Branch Effluent Permit PE-02753

1999 Compliance Monitoring

(Tributaries T-8, T-9, T-10)

Sample Date	Flow (m3/day)	TMax Deg C	TMin Deg C	TAvg Deg C	pH	Sus/Slds (kg/day)	T/Pb (kg/day)	Diss/Pb (kg/day)	T/Zn (kg/day)	Diss/Zn (mg/l)	Diss/Zn (kg/day)	T/Cd (kg/day)	Diss/Cd (mg/l)	Diss/Cd (kg/day)	T/As (kg/day)	Diss/As (kg/day)	T/Cu (kg/day)	Diss/Cu (kg/day)	T/Hg (kg/day)	T/Tl (kg/day)	DissTl (kg/day)	Diss/F (kg/day)	T/NH3/N (kg/day)
10/3/99	99275	26.9	23.8	25.4	7.90	199	11.91	6.95	33.8	0.27	26.8	0.596	0.006	0.596	1.99	1.99	0.50	0.50	.0199	4.96	4.96	288	99.3
10/9/99	98079	26.6	24.4	25.6	8.20	49.0	7.85	3.92	23.54	0.14	13.73	0.687	0.005	0.490	0.98	0.49	0.49	0.49	.0392	4.90	4.90	324	98.1
10/15/99	93481	24.1	20.6	22.6	7.80	46.7	6.54	2.80	35.5	0.28	26.2	0.374	0.004	0.374	0.47	0.47	0.47	0.47	.0374	4.67	4.67	150	93.5
10/21/99	105351	26.3	24.5	25.5	7.70	52.7	3.16	2.11	24.23	0.21	22.12	0.316	0.003	0.316	1.05	1.05	0.53	0.53	.0105	21.07	21.07	284	105
10/27/99	95590	24.3	22.6	23.4	7.90	47.8	8.60	4.78	32.5	0.28	26.8	0.669	0.006	0.574	0.48	0.48	0.48	0.48	.0096	9.56	9.56	182	95.6

Cominco td. Trail Operations Combir ' Outfall IV

Date: 11/23/99

Waste Management Branch Effluent Permit PE-05309

1999 Compliance Monitoring

(Tributaries T-11, & T -12)

Sample Date	Flow m3/day	TMax Deg	TMin Deg	TAvg Deg C	pH	Sus/Slds (kg/day)	T/Zn (kg/day)	Diss/Zn (kg/day)	D/NH3/N (mg/L)	D/NH3/N (kg/day)	Diss/SO4 (kg/day)	T/Hg (kg/day)
Oct/03	26810	29.0	21.3	24.1	7.60	26.8	7.51	7.24	8.00	214	831	.0027
Oct/09	26891	28.1	22.6	24.4	7.60	26.9	9.68	8.87	6.00	161	1183	.0081
Oct/15	26088	23.3	20.7	21.5	7.40	52.2	5.22	4.70	4.00	104	2296	.0078
Oct/21	25964	26.2	22.0	23.6	7.20	26.0	6.75	5.45	7.00	182	1116	.0013
Oct/27	27236	22.5	20.6	21.4	7.50	13.62	9.26	7.90	9.00	245	1471	.0027

Cominco Ltd. Trail Operations Topping (Stoney) Creek
Waste Management Branch Effluent Permit PE-02753
1999 Compliance Monitoring

Date: 11/23/99

Sample Date	T/Pb mg/l	Diss/Pb mg/l	T/Zn mg/l	Diss/Zn mg/l	T/Cd mg/l	Diss/Cd mg/l	T/As mg/l	Diss/As mg/l	T/Sb mg/l	Diss/Sb mg/l	Flow m3/min
03-Oct-99	0.02	<0.01	18.00	18.00	0.22	0.22	2.20	1.60	<0.01	<0.01	<.1
09-Oct-99	<0.01	<0.01	9.10	4.60	0.07	0.07	1.40	0.67	<0.01	<0.01	0.5
15-Oct-99	<0.01	<0.01	7.30	6.30	0.11	0.09	0.97	0.88	<0.01	<0.01	0.1
21-Oct-99	<0.01	<0.01	4.50	4.40	0.06	0.06	0.90	0.83	<0.01	<0.01	0.8
27-Oct-99	<0.01	<0.01	10.00	8.20	0.14	0.12	1.80	1.20	<0.01	<0.01	0.4

tions Columbia River Grab Sample Monitoring
ıch Effluent Permits PE-02753 & PE-05309
998 Compliance Monitoring

Date: 12/21/99

d l	D/Cu ug/l	D/F mg/l	D/Pb ug/l	D/SO4 mg/l	D/Tl ug/l	D/Zn ug/l	Hardness Calc.(mg/l)	T/As ug/l	T/Cd ug/l	T/Cu ug/l	T/Pb ug/l	T/Tl ug/l	T/Zn ug/l	Temp C	pH	Flow m3/sec
;0	0.59	0.09	<0.05	9.80	<0.01	5.00	50	2.00	0.060	1.14	0.09	<0.01	17.00	10.5	7.04	1580
.0	0.44	0.10	<0.05	9.60	0.18	2.00	49	1.00	0.040	1.12	0.16	0.18	4.00	11.0	7.38	1580
0	0.69	0.09	<0.05	9.10	<0.01	1.00	51	1.00	0.010	1.11	0.10	<0.01	8.00	10.5	7.48	1580
.0	0.34	0.09	<0.05	9.40	0.25	3.00	48	1.00	0.050	1.16	0.49	0.25	12.00	10.5	7.52	1580

To File PE-2753 September 27, 1999

RE:Cadmium Losses to Columbia River

Cominco (G Gawryletz) called to report 2 separate losses of cadmium over the permit limits

September 22
-dissolved cadmium outfall II
-permit limits .06 mg/l, 2.75 kg/day
-actual loss .073 mg/l, 6.04 kg/d
-based on analysis of upstream tributaries of outfall II - 06Z which comes from cadmium, indium, germanium and sulphide leach plant area was elevated in Cd
-almost all in dissolved form
-did not show up on alarm system for conductivity

September 25
-dissolved cadmium - outfall III
-permit limits .03 mg/l, 3 kg/day
-actual loss .06 mg/l, 5.8 kg/d
-appears to have come from fume leach area due to pH control problems similar to those that occurred last March but after much effort seemed to be under control until now.

More details to follow

Carl

99.09.27
To Carl Johnson.
① Sept 22 incident. No investigation. Ensure Cominco follows through on EMS review to determine cause & corrective action
② Sept 25. Conduct preliminary investigation accompanied by COS. Discussed with Richard Dalouse. Peter Stent will fill in for Steve who is on holiday. Peter returns to work Sept 28th.

Rich

BRITISH COLUMBIA

MEMORANDUM

To: Carl Johnson
Industrial Section Head

Date: October 6, 1999

File: PE02753

Re: Sewer III Cadmium Spill - Sept 24, 1999

The following is an assessment of the potential environmental impact in the Columbia River of the above incident.

Incident: (information provided to me by yourself)

Sometime on September 24 an upset in the fume leach plant caused the release of a quantity of dissolved cadmium into Sewer III and hence to the Columbia River. The release occurred over a period of between 30 minutes and 1 hour. The flow-proportioned composite sample for that day on Sewer III had a dissolved Cd concentration of **0.06 mg/L**. The flow from Sewer III on Sept 24 was 100,300 m3/d and 95,300 m3/d on Sept 25, meaning the flow from the sewer over the composite sample (7am to 7am) was the average of these two flows or 97,800 m3/d. This means the dissolved Cd loading for this 24 hour period was **5.87 kg/d**. The flow in the Columbia River at this time was 1560 m3/s. The river flow timed sampler at Waneta was deployed but the samples were not able to detect an increase in Cd from this incident.

Impact Assessment:

The permit limits on Sewer III for dissolved Cd are 0.03 mg/L and 3.0 kg/d. In 1995 the average loading was 1.2 kg/d (McDonald 1996), which, using the flow for this 24 hour period, gives a calculated average concentration of 0.012 mg/L.

Since the release of dissolved Cd occurred over one hour we can assume that this is the period over which all the additional loading, calculated from the 24 hour composite sample, was released to the river. It is the quantity of cadmium released to the river over this hour that has the greatest potential for impact. The toxicity of cadmium to aquatic life is dependent on the concentration and the duration of exposure. Since the duration is very short in this case, one hour, there is no need to consider long-term bioaccumulation of low levels, only the acute toxicity.

Based on these assumptions, the amount of dissolved Cd spilled over the hour can be calculated as the loading on the day of the spill (5.87 kg/d) minus the average daily loading (1.2 kg/d) = **4.67 kg**. The actual loading from Sewer III over this hour is this quantity plus a normal hourly loading, simply calculated as 1.2 kg/d ÷ 24 = 0.05 kg/hr, giving a value of **4.72 kg/hr.**

The concentration of dissolved Cd in Sewer III during this hour can be calculated from the loading and 1/24th of the daily flow (97,800 m3/d ÷ 24 = 4075 m3/hr).

$$\frac{4.72 \text{ kg/hr}}{4075 \text{ m3/hr} \times 0.001} = \textbf{1.16 mg/L dissolved Cd}$$

Estimated River Concentrations

Using the loading of Cd over the hour of the spill, we can estimate the concentration in the Columbia River after some mixing. To be conservative an initial dilution zone (IDZ) which assumes the effluent is mixed into 10% of the river flow is used. Dye testing in 1996 determined that under low flow, mixing into 10% of the river flow extended to around Trail Creek for Sewer III, at the higher flow on Sept 24 it would be farther upstream, perhaps around the location of the old slag launder.

Ten percent of the river flow on this day was 156 m3/s or 561,600 m3/hr. The calculated dissolved Cd concentration is:

$$\frac{4.72 \text{ kg/hr}}{561{,}600 \text{ m3/hr} \times 0.001} = \textbf{8.4 µg/L dissolved Cd}$$

From this point, the end of a 10% IDZ, upstream to the Sewer III outfall, the concentration would be progressively higher until it reached 1.16 mg/L (1,160 µg/L) at the end of the pipe. This estimate ignores all other possible sources of Cd upstream, such as Stony Creek, so the actual concentrations were slightly higher. For comparison, the concentrations under **normal** discharge conditions (0.05 kg/hr) and this river flow would be **12 µg/L** at the end of the pipe and **0.009 µg/L** at the end of a 10% IDZ.

Summary of Calculations

Duration of spill:	1 hour
Loading of dissolved Cd from Sewer III (from Sept 24/25 24 hr composite):	5.87 kg/d
Normal loading of diss Cd from Sewer III:	1.2 kg/d
Permit Limit:	3.0 kg/d
Loading of dissolved Cd from Sewer III during spill:	4.72 kg/hr
Normal hourly loading of dissolved Cd from Sewer III:	0.05 kg/hr
Concentration of diss Cd in Sewer III (from Sept 24/25 24 hr composite):	60 µg/L
Normal concentration of diss Cd in Sewer III:	12 µg/L
Permit Limit:	30 µg/L
Concentration of dissolved Cd in Sewer III during spill:	1,160 µg/L
Concentration of dissolved Cd at end of 10% IDZ during spill:	8.4 µg/L

Concentration of dissolved Cd at end of 10% IDZ normally:	0.009 µg/L
Acute lethal threshold to fish:	10 µg/L
Proposed water quality objective:	0.05 µg/L

Enforcement Recommendation

This incident is obviously an exceedance of permit limits and worthy of the non-compliance list. I do not believe, however, that this case is a strong case for prosecution. Technical realities have lead us to set permit limits on 24 hour composite samples on combined sewers which receive numerous contaminant sources. While spills and upsets may produce quite high levels of metals for short periods, the daily average discharge, as represented by the composite sample may show considerably less dramatic results.

The effluent during the hour of the spill was clearly acutely toxic to fish, 116 times the threshold for cadmium, and thus in violation of the Canada Fisheries Act, S. 36(3), deposit of a deleterious substance into fish bearing waters. The problem here is that the lethal threshold of 10 µg/L (Duncan and Antcliffe 1996) is based on 96 hr LC50 data, or 4 days of exposure, and we have only 1 hour of exposure. If we use the 24 hour composite concentration, though this is not what fish in the river were exposed to (they received a 1 hour slug that dispersed as it moved downstream), we exceed the lethal threshold by 6 times (60 µg/L). The problem here is that the current permit limit (30 µg/L) is itself 3 times this threshold and normal levels are around 12 µg/L. We are not requiring in the permit that Sewer III be non-toxic until the end of 2000.

My calculations, assuming all the spill occurred over 1 hour, show that dissolved Cd levels reached lethal levels within a 10% IDZ but not beyond. Again the weakness of this evidence is that the data for lethal toxic levels of this metal are based on 96 hours of exposure and this incident only lasted 1 hour.

In summary, I recommend we not proceed with prosecution on this incident. Dissolved Cd levels were not high enough to result in lethal levels in the river except very close to the outfall and they did not occur for long enough to result in a toxic response of any consequence. A due diligence investigation by us and the company should still be carried out to determine if there is any way of preventing or limiting such incidents, particularly if there is a chance that greater quantities of Cd could be released over a longer period of time.

Les McDonald, RP Bio
Impact Assessment Biologist

JC106 Cominco Sample Review 1999/09/29 11:52
TR01GPG1 Page 1

	PH	H2SO4	SUS/SLDS	T/AS	DISS/AS	T/CA	T/CD	DISS/CD	T/CU	DISS/CU	T/MG	T/MN
	-	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L
EW99 19990927 3954	7.5	<1.	N.A.	<0.01	<0.01	15.0	0.00021	0.00020	<0.01	<0.01	3.1	<0.005
EW99 19990927 3953	7.5	<1.	N.A.	<0.01	<0.01	14.5	0.00026	0.00022	<0.01	<0.01	3.0	<0.005

	T/PB	DISS/PB	T/SB	T/SE	DISS/SE	T/TL	DISS/TL	T/ZN	DISS/ZN
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L
EW99 19990927 3954	<0.01	<0.01	<0.01	<0.001	<0.001	<0.1	<0.1	<0.01	<0.01
EW99 19990927 3953	<0.01	<0.01	<0.01	<0.001	<0.001	<0.1	<0.1	0.01	<0.01

EW99 1999 0927 3954
Waneta 24 hour composite for Sept 24/99

EW99 1999 0927 3953 -
Waneta 24 hr · compo- for Sept. 22/99.

PE-2753

LOSS OF CADMIUM TO COLUMBIA RIVER SEPTEMBER 24-25 1999

Loss to river via outfall III
-permit limit dissolved cadmium .03mg/l and 3 kg/day
-actual loss .06 mg/l , 5.8 kg/day
-based on 24 hour composite sample
-loss from fume leach plant area II

C Johnson met with Cominco officials on September 29 to discuss what happened to cause loss over permit limit and what had been done since the last incident in March of 1999 to prevent such occurances

participants:
Carl Johnson MOE Nelson
Mark Edwards Cominco Environment
Roger Fox , operator Area II
Steve Douglas, Supt Leaching area
Dave Renyolds, Engineer Smelter Technical support, Area I
Dale Webb, Engineer Smelter Technical Support Area I

Process Description

Fume (mainly zinc oxide) is produced in the fuming furnace at the lead smelter part of Cominco operations. The fume (white dust) is transferred from the baghouse (ABB or Dracco) to Area I of the fume leach process. At this part of the plant which is physically located near the smelter the fume is mixed with "dirty liquid" from the filtration process (recycled from area II) and water to make a slurry. Soda ash and acid and sometimes sodium sulphide are added in one of two mix tanks. The slurry is agitated for about 2 hours until the pH has stabilized at between 8.8 and 9.3. Based on research studies as well as experience, when this pH has been reached and is consistent the dissolved cadmium in the slurry should be about 2 mg/l and arsenic less than 10 mg/l. The slurry is sampled and sent for assay to confirm the concentrations. If acceptable it is pumped to Area II near the Oxide plant for storage and filtration. This is a batch process with about 85 tonnes of fume per batch processed. 2-3 batches are processed each day depending on the production rate at the Kivcet smelter. Since the Kivcet has started up the fume has been inconsistent in quality which has meant that the operators have to be more careful about ensuring that the dissolved cadmium is low enough for further processing in area II. There are still technical difficulties with Kivcet relating to the coke checker and movement of metals from the slag into the bullion. Under the former operation of the conventional smelter the fume was very consistent.

In area II, once the slurry is accepted for transfer, the slurry is pumped into a large holding tank that is well agitated. The slurry is tested for pH to confirm that the

pH is correct since there have been times when the pH has changed in the pumping process between the two plants (speculated to be due to additional mixing caused by pumping). The sample is checked for pH , gravity and occasionally for Cadmium and arsenic content especially on night shift. If the slurry in the tank is acceptable based on pH and dissolved Cd content it is ready for filtration. If not, additional mixing and addition of soda ash is done to increase the pH into the correct range. In this solution if the pH goes above about 9.3 there is a risk that the dissolved arsenic will be too high and if less than about 8.8 the dissolved cadmium will be too high in the filtrate. It is important to note that the filtrate from the presses goes directly to the river at this time. Once the filtration process is started the slurry is pumped from the holding tank to the filter area. Filtration is batch using plate and frame filters .When filtration starts the first portion of the filtrate contains high solids due to the cloth not yet being blinded off. This water (referred to earlier as dirty liquid) is returned to Area I for reuse. A continuous turbity meter measures the filtrate and if readings are above a set point the filtrate goes to Area I and indicates by alarm that a filter cloth has been damaged. The filtrate which contains most of the chlorides and fluorides which are impurities that cause severe problems for the electrolytic plant are discarded to the river. A bypass ine has been installed that allows the plant supt. To make a decision that if a batch cannot be treated by filtration it could be pumped directly to oxide at some risk to the overall process in the zinc recovery circuit. This is only done infrequently and cannot be done regularly due to CL and F problems. Once the pressure drop increases to a set point the feed of slurry tot he filter is shut off and the wash cycle starts for about 7 minutes. Then the filter is opened and the cake containing zinc and cadmium is recovered. There is a continuous pH meter on the filtrate but it is not considered as reliable as the two lab quality meters used by the plant operators.

September 24 loss

The batch of slurry in this case was difficult to stabilize and in fact had been held for several days in Area I for pH adjustment and additional mixing time in order to reduce the cadmium levels to within specifications. This appeared to be the case when the slurry was pumped to Area II for filtration. When the slurry reached area II the pH was checked and seemed to be within the normal values. Filtration commenced and the pH started to drop indicating that higher cadmium levels were possible in the filtrate. The process was shut down immediately and the operator called for technical assistance from the plant superintendent at home. The operator was instructed to bypass the filtration process and send the slurry unfiltered to oxide due to the problem.

Potential Solutions to this problem:

Take more samples of the filtrate for dissolved cadmium on a regular basis in order to ensure that the filtrate discharge will not result in a permit exceedance.

A research project has been studied to develop fume leach treatment on a large scale. The estimated cost is $4.3 Million.

Examine the dissolved cadmium levels in the filtrate vs. wash water in the filter process to determine the volumes of water involved to evaluate treatment options for the most likely to be most contaminated.

Install a short term storage tank or tanks to contain filtrate until a lab result can be obtained that will provide better guidance to operators as to what to do with the filtrate.

Evaluate whether filtrate, if captured separately from wash water, could be sent to ETP

Conclusions

Based on my discussions the plant operator had followed the written operating procedures that had been time tested to be correct and had taken reasonable steps to ensure that his operation would not cause an environmental exceedance. The plant operations and management are very aware of the vulnerability of this plant to dissolved cadmium problems and have been able to demonstrate based on assays the number of times that they have been able to solve similar problems since the last incident in March. The corrective action system of EMS has a number of projects and activities that have been implemented since March which have likely been responsible for better operation. There are many batches processed each day, assuming that the Kivcet is operational. Since March there has only been one exceedance of dissolved cadmium due to this problem even considering the operational difficulties at Kivcet.

PE-2753

Ministry of Environment, Lands, and Parks
BC Environment, Kootenay Region
401-333 Victoria St.
Nelson, BC, V1L 4K3
FAX: (250) 354-6367

ENVIRONMENTAL PROTECTION
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Cominco

November 2, 1999

Attention: Mr. Carl Johnson, Head, Industrial Section Environmental Protection

Re: PE-02753 Discharge of Cadmium to the Columbia River via Outfall III on Sept. 24, 1999.

Dear Sir,

Pursuant to the reporting requirements in our Effluent Permit PE-02753 I submit the following information pertaining to the discharge of cadmium to the Columbia River via Outfall III.

On September 24, 1999 the 24-hour composite samples of Combined Outfall III indicated that the concentration and loading of dissolved cadmium exceeded their respective permit limits. The results are given in the table below. The source was traced to the Zinc Fume Leach Plant. Two environmental incident investigations were held, the first, which you attended, with personnel from Areas I and II of fume leach, and the second an in-plant investigation with personnel from Area II. This letter outlines the events surrounding the incident and describes actions taken to minimize the likelihood of further occurrences.

Date	[Cd/Diss] (mg/L)	Cd/Diss loading (kg/d)
Sept. 24/99	0.061	5.8
Permit Limits	0.03	3.0

On the night of Sept. 24/99 the batch of fume in question had been assayed as required by standard operating procedure in Area I and met the specifications for pH and for the concentrations of dissolved Cd (0.32 mg/L) and As (2.7 mg/L). Note the specifications for this stage of the fume leach process are: Cd < 2.5 mg/L and As < 10 mg/L. The fume slurry must meet this specification before it is accepted into Area II for filtration.

After receipt of the batch of fume in Area II the operator collected a sample of slurry for pH analysis and discovered that the pH had fallen to 8.45. The operating specification for the pH in Area II is 8.9 to 9.3. Previous operating experience has demonstrated that

Copies: DHMagoon, WAVanBeek, MTMartin, SRDouglas, PCPistner, GJGawryletz, RSSentis, KACairns, WJKuit, Environmental Files.

when the slurry pH is within this pH range the concentrations of both dissolved Cd and As will be well below the levels required to meet the permit limits for Outfall III. As a result of this pH drop the operator proceeded to add soda ash in order to bring the slurry pH back into operating specifications. Once within pH specifications the slurry was processed through the filters. Note the pH probes and meters used in both Area I and II are subject to frequent and rigorous calibration checks. The operator maintained the slurry pH within specifications during the entire filtration of the batch (56 filter cycles). The Sept. 24th 24-hour composite sample for Combined Outfall III (3) exceeded the permit limit for both the concentration and loading of dissolved cadmium as a result of excessive Cd loading from the fume leach filtrate. Several additional pH checks and solution analyses were performed with the subsequent batch to ensure that the residual portion of the batch from Sept. 24 did not further impact on effluent quality. There were no equipment faults or failures.

A Corrective Action Request (CAR 1477) was initiated immediately following this incident to record the facts surrounding the event and to develop a longer-term action plan. A copy of CAR 1477, which is still in progress, and a copy of CAR 1248 on the related March 1999 cadmium incidents, are enclosed as per your request.

As a result of this cadmium release the following actions have been taken or are planned as long-term improvements:

1. Fume leach Area II will now perform solution analyses on the slurry for both the day and night shifts. Prior to this incident a sample was only collected during the night shift to confirm the analysis done in Area I.

2. If a batch of slurry requires an unusually large amount of soda ash to maintain the pH within operating specifications a slurry sample will be collected and analyzed for Cd and As prior to commencing filtration.

3. The operating procedures (controlled documents) in Area II will be rewritten to reflect these changes in procedure.

4. The revised procedure will be reviewed with all operators that may be involved in fume leach area II.

5. A preliminary assessment of on-line methods for the analysis of metals contained in fume leach slurry/filtrate was conducted and existing methods such as ICP and AA were deemed unsuitable for this particular application. However, the Trail Operations Technical Support group will explore opportunities for continuous pH monitoring and adjustment.

6. Pilot-scale testing of a process for the treatment of fume leach filtrate was conducted this summer. While the process was proven to be effective the capital cost of such a treatment facility is estimated to be over $4 Million. As a result other filtrate treatment alternatives are being investigated.

In general terms considerable technical resources are being devoted to; (i) improving on the performance of the current fume leach process, (ii) developing new processes for the treatment or processing of fume leach filtrate, and (iii) investigating alternatives to the existing fume leach process.

Please contact me if you have any questions regarding this incident.

Sincerely

Mark Edwards.

Mark Edwards, Ph.D.
Superintendent, Environment and Quality Programs
Cominco Ltd.
Trail Operations.

File path and name: C:\My Documents\Incidents\MOE Spill Letter Cd to C-III Sept. 24,1999.doc

Environmental Incident

Request No: 1282
Description: Cd from ZFL filtrate exceeded specs.

Corrective Action: 1282
Description : Cd from ZFL filtrate exceeded specs.
Plant : Oxide Leaching
Location : Zinc Fume Leach
Incident Date : Mar 24/1999
Time : 00:01
Create Date : Mar 29/1999
Submitted by : STEPHEN DOUGLAS
Accepted by : DANIEL BOATENG
Assigned to : MARK EDWARDS
Required Date : May 7/1999

Spill Information:
Duration of Spill: 24 Hours 0 Minutes

Detailed Description:
Fume Leach Area 2 is required to treat a fume slurry from Area 1 in the Lead operations. The specs. for the batches received are to arrive and be treated within the parameters of 8.9 pH to 9.3 pH. It has be routine over the last while to add varying amounts of soda ash in area 2 to maintain the slurry within operating paramenters.
Operators will add, measure and if correct filter the slurry. During the past week the pH has dropped quickly and significantly out of range. So fast in fact that they will test, determine the slurry to be correct, begin operating, retest and have to shutdown.

Although we have exceeded our limits for cadmium to filtrate, it is only through the operates adherence and knowledge of the procedure have we been a able to avoid a more significant exceedence.

Immediate Action Taken:
Actions taken.

We have raised our treatment pH to 9.0. Stopped all processing and recieving of fume until we are absolute certain the pH is stable. We will test and treat only when within parameters.

Root Cause Category:
Procedure inadequate
Process is not capable

Suspected Cause (Root Cause Analysis):
pH below 8.9 will begin to put cadmium into solution. Cd in solution with deport through the presses and deport to 08 sewer in the filtrate.

Action Plan and Results: (address the Root Cause)

1. Complete action plan car#1048 Structure and Responsibility
Assigned to : STEPHEN DOUGLAS
Due by : May 3/1999
Completed on : Oct 15/1999

Request No: 1282
Description: Cd from ZFL filtrate exceeded specs.

Task Details :
Complete the elemens identified in AC #1048.

Results:
Corrective action #1048 has been completed and is awaiting sign off from D.Boateng. This CA identified a review, increased sampling and an acceptance criteria based on samples.

2. Incident Investigation Communication
Assigned to : MARK EDWARDS
Due by : May 3/1999
Completed on : May 7/1999
Task Details :
An incidnet investigation is required that includes personnel from Areas I and II. The investigation must be documented and key action items must be entered into the CA.

Results:
An incident investigation was held on March 31, 1999. The attendees were MEdwards, SRDouglas, LMeredith, NSmith, PPistner, GSterzic, AHall , GParker, GStewart, HByers. The invistigation findings were documented using the Environmental Incident Investigation Checklist. Hard copies were distributed to the participants. A hard copy of the document is on file in Greenhouse (Environment & Quality Programs Group) File 1.6.0 Environmental Incidents. The key action items were entered as tasks in this CAR. (Closing comments by MEdwards, May 7, 1999).

3. Report to the MOE Communication
Assigned to : MARK EDWARDS
Due by : May 3/1999
Completed on : May 7/1999
Task Details :

Results:
Details of the incident and the findings of the incident investigation were discussed in a letter to Carl Johnson of the B.C. Minisitry of the Environment (Nelson Office). The letter was send vis email and a hard copy was mailed on April 6, 1999.

4. Review events with crew - Area I Communication
Assigned to : DALE WEBB
Due by : Oct 29/1999
Completed on : Oct 7/1999
Task Details :

Results:
Although crewtalks cannot be confirmed following the environmental incident (turnover of personnel), there have been subsequent crewtalks reviewing fume leach procedures. Further crewtalks are planned as per corrective action 1477.
G. Parker confirmed that Andrew Hall (who has since left Cominco) had had crew talks following the incident.

Request No: 1282
Description: Cd from ZFL filtrate exceeded specs.

5. Review, revise and train Area I proc. Communication
Assigned to : DALE WEBB
Due by : Oct 29/1999
Completed on : Oct 7/1999
Task Details :

Results:
The area 1 procedures have been reviewed, control documents have been updated, and the operators have been trained. This was completed by Gerald Parker by April 30.

6. Review, revise and train Area II proc Communication
Assigned to : GERALD STERZIK
Due by : May 3/1999
Completed on : Sep 15/1999
Task Details :

Results:
Area 2 Procedures have been reviewed, the controlled documents have been

revised, and all operators have been trained on these procedures.

7. Review and revise acid addn strategy Communication
Assigned to : GERALD PARKER
Due by : May 3/1999
Completed on : May 6/1999
Task Details :
The acid addition stratigies have been wrritten and reviewed with the opert
ing crews. Complete April 30.

Results:
Revised Acid Addition SOP complete April 30, 1999. Document approved and s
ubmitted for update to the Livepage control document system.

8. Identify mixing option for Area I Operational Control
Assigned to : DALE WEBB
Due by : Oct 29/1999
Completed on : Oct 7/1999
Task Details :

Results:
Research testwork is complete in this area. The greensheet has been submitted for approval for a mixing upgrade. The upgrade will consist of a high shear, dual impellor agitator, and a permanent re-circulation line with an in-line dynamic mixer. The testwork indicated improved batch stabilization with high shear mixing.

9. Review and revise pH control system Operational Control
Assigned to : DALE WEBB

Request No: 1282
Description: Cd from ZFL filtrate exceeded specs.

Due by : Oct 29/1999
Completed on : Oct 7/1999
Task Details :

Results:
An automatic acid control strategy has been installed to control high pH batches. The acid will be used to trim the batch once the pH rises above 9.2. Soda ash will be continued to be used to trim batches as per the current control strategy. Operations continue to take handchecks to monitor the pH of the batch, and confirm the accuracy of the pH probes.

The present pH set point is 9.1. Research has performed some testwork with different pH set points during a single batch with limited success. Further testwork is planned to review the present pH set points.

10. Assess on-line Cd analysis options Operational Control
Assigned to : MARK EDWARDS
Due by : May 3/1999
Completed on : Jun 8/1999
Task Details :
Need to determine our options for having more rapid chemical analysis of filtrate for elements such as cadmium, thallium, and arsenic. This would possibly done in-plant with on-line anaysis.

Results:
A note was sent to Juris Harlamovs and Heinz Sittig (both of Cominco Research) to outline the problem and determine what our options are. (MEdwards, May 7, 1999).

June 8/99: MEdwards spoke with HSittig regarding options for the rapid analysis of fume leach filtrate samples. Polarographic analysis does not seem to be appropriate for this application. A small AA dedicated to the plant is likely the best option. However, there would be significant operator training needed and the cost would be several thousand dollars for equipment and a similar amount in annual operating costs. In general there does not seem to be an easy, effective, and inexpensive method that would be suitable for use by plant operators. The best option appears to be to follow current practice of relying on the assay office for rapid turnaround. (MEdwards, June 8/99).

Closed by: DANIEL BOATENG on Oct 20/1999

Action Closing Comments:
Problem has been adequately addressed.

** End of Report **

Environmental Incident

Request No: 1477

Description: Cd to C-III from ZFL Sept. 24/99

Corrective Action: 1477
Description : Cd to C-III from ZFL Sept. 24/99
Plant : Lead Smelter BA
Location : Zinc Fume Leach (filtrate) from OLP
Incident Date : Sep 24/1999
Time : 07:00
Create Date : Sep 29/1999
Submitted by : MARK EDWARDS
Accepted by : PETER PISTNER
Assigned to : DALE WEBB
Required Date : Nov 19/1999

Spill Information:
Duration of Spill: 24 Hours 0 Minutes
Reported by : GEORGE BYERS
Aspect Type : Effluent
Assayed Solution : EW87 19990924 0
H2SO4 <1. MG/L
SUS/SLDS 1. MG/L
T/AS 0.01 MG/L
DISS/AS <0.01 MG/L
T/CA 58.7 MG/L
T/CD 0.070 MG/L
DISS/CD 0.061 MG/L
T/CU <0.01 MG/L
DISS/CU <0.01 MG/L
T/MG 4.1 MG/L
T/MN <0.005 MG/L
T/PB 0.11 MG/L
DISS/PB 0.06 MG/L
T/SB 0.04 MG/L
T/SE 0.018 MG/L
DISS/SE 0.017 MG/L
T/TL <0.1 MG/L
DISS/TL <0.1 MG/L
T/ZN 0.51 MG/L
DISS/ZN 0.41 MG/L
T/HG 0.0002 MG/L
T/NH3/N 1. MG/L
D/NH3/N 1. MG/L
DISS/F 3.3 MG/L
Volume to River : 5.81 KG
Chemical Composition : ZFL Filtrate
Type & Strength of Material: ZFL filtrate (ZF03) Cd = 27mg/L

Detailed Description:
Cadmium concentration and loading exceeded permit limits for Combined Outfall III. Source of the release was determined to be Zinc fume leach filtrate. The daily composite for ZFL filtrate (ZF03) contained 27 mg/L total Cd.

Immediate Action Taken:

Request No: 1477
Description: Cd to C-III from ZFL Sept. 24/99

During the fume leach filtration cycle the pH dropped unexpectedly below 8.9 to 8.45 which automatically shut down the filtration cycle at approx. 19:00 on Sept. 24/99. Area II added 1 1/2 bags of soda ash and restarted at about 21:00 on Sept. 24.

Root Cause Category:

Suspected Cause (Root Cause Analysis):
Suspected cause is as in March 1999 - pH instability problems with some batches of fume. Since the March incidents the procedures were tightened with respect to pH parameters and sampling requirements, in Areas I and II. An internal investigation will be held.

Action Plan and Results: (address the Root Cause)

1. Incident Investigation — Emergency Preparedness and Response
Assigned to : MARK EDWARDS
Due by : Oct 15/1999
Completed on : Nov 2/1999
Task Details :
Hold environmental incident investigation with plant personnel.

Results:
Two investigations were conducted. The first was held on Sept. 29/99 and was attended by M. Edwards (env), S. Douglas (OLP), Rodger Fox (OLP), D. Reynolds (Smelter), D. Webb (Smelter), and Carl Johnson of the Nelson office of the MELP. A review of the fume leach process was presented to Carl for background information. The incident was then reviewed. Notes on the meeting are filed in the incident file retained by the Environmental Monitoring group. After the meeting Carl toured fume leach Area II with S. Douglas and M. Edwards.

A second investigation was held by the fume leach Area II plant personnel
(I don't know the specific date but minutes were issued on Oct. 20/99). A copy of the minutes is retained in the Environmental monitoring file on this incident.

2. Reporting to MOE Formal — Communication
Assigned to : MARK EDWARDS
Due by : Oct 15/1999
Completed on : Nov 2/1999
Task Details :
Issue a formal letter of notification to the Nelson MOE office (note they have requested copies of the CAR's open on Cd incidents from fume leach as part of the package - CAR 1282 and this CAR).

Results:
Formal notification was spent via snail mail to Carl Johnson of the Nelson MOE office on Nov. 2/99. Copies of the letter were distributed internally via email and a hardcopy is retained in the Environemntal Monitoring files (Greenhouse). Copies

of CAR 1282 and 1477 were included with the formal letter of notification as per Carl's request.

3. Plant investigation of incident (Area — Communication
Assigned to : STEPHEN DOUGLAS
Due by : Nov 10/1999
Completed on : Oct 29/1999
Task Details :
Plant investigation was held identifying the events and establishing recommendations.

Results:
Copies of investigation have been forwarded to required personnel.
Recommendations included increased sampling, rewriting control document, operator reviews and the technical group is exploring continuous pH monitoring and adjustment.

4. Review incident with operators (Area — Communication
Assigned to : DALE WEBB
Due by : Nov 10/1999
Completed on :
Task Details :

Results:

5. Review sampling procedures (Area 2) — Monitoring and Measurement
Assigned to : STEPHEN DOUGLAS
Due by : Nov 10/1999
Completed on : Oct 29/1999
Task Details :
Plant review of exisiting sampling.

Results:
The plant will now conduct a ZF04 (Cd andAs in filtrate) on both day and night shift. Originally this was only done on night shift as a back up to Area 1's SL03 assay.

6. Review sampling procedures (Area 1) — Monitoring and Measurement
Assigned to : DALE WEBB
Due by : Nov 10/1999
Completed on :
Task Details :

Results:

7. Investigate continuos pH measurement — Documentation / Document Control
Assigned to : STEPHEN DOUGLAS
Due by : Nov 10/1999
Completed on :
Task Details :
The plant will investigate continuous pH monitoring on the Area 2

Request No: 1477
Description: Cd to C-III from ZFL Sept. 24/99

slurry tank. This would enable the operator to notice any change in pH instantly.

Results:
Technical group has been assign the work. The criteria is to find a pH monitor that is self cleaning, self calibrating and extremely accurate. The intent is for the operators to continue to perform hand checks to verify readings. The equipment has to be very reliable as any reliance on the equipment if not accurate may lead to incorrect treatment.
Technical group approached one company with expertise in the pH field. Upon hereing our intended application they have declined to propose or quote on equipment. We will continue to research.

8. Review procedure for large pH changes Operational Control
Assigned to : STEPHEN DOUGLAS
Due by : Nov 10/1999
Completed on :
Task Details :

Results:

9. Update/review control documents (Area Documentation / Document Control
Assigned to : STEPHEN DOUGLAS
Due by : Nov 10/1999
Completed on :
Task Details :

Results:

10. Update/Review Control Documents (Are Documentation / Document Control
Assigned to : DALE WEBB
Due by : Nov 10/1999
Completed on :
Task Details :

Results:

Closed by:

Action Closing Comments:

** End of Report **

Memo to file PE-2753 - Cadmium spill Sept 24, 1999

Discussed report with Mark Edwards on Nov 16
-CA report does not mention the option of short term storage of filtrate in tankage near the Cd plant until after analysis is available so that correct decisions can be made on treatment /disposal options
-option of ETP needs to be considered more formally
-this is a deficiency in the report since it was discussed with Steve during meeting at plant

Carl Nov 16

BRITISH COLUMBIA

Ministry of Environment, Lands and Parks

Environment and Lands
Kootenay Region

MEMORANDUM

To: Richard Daloise
Regional Enforcement Manager

Date: November 29, 1999
File: 31010-01

Re: Cominco Permit Exceedances

In discussion with you and Bill Stalker yesterday I advise you I would forward two Cominco Permit Exceedances to you for review and concurrence as to what action should be taken.

In review of your memorandum of September 9th, 1999, concurrence is only needed on files where an expert cannot attend an investigation in a timely manner, however it also states an officer cannot conclude a cases of low environmental impact, so this is being forwarded for your review.

Cominco had two exceedances of their permit, one on September 24th of cadmium, and one on October 4th of zinc.

The cadmium exceedance of .061 mg/l was approximately double their permitted level of .03 mg/l . Les McDonald's memo of October 7th 1999 assessing the environmental impact states that the dissolved Cd levels were not high enough to result in lethal levels in the river except very close to the outfall and they did not occur for long enough to result in a toxic response of any consequence, and recommend we not proceed with prosecution.

The zinc exceedance of October 4th of 1.90 mg/L exceeded the permit limit of 1.40 mg/L. Les McDonald's memo of October 19th 1999 assessing the environmental impact states that the dissolved Zn levels were not high enough to be able to state beyond a reasonable doubt that the effluent was lethal to fish, and recommends we not proceed with prosecution.

While assessments have been made, there also may be an underlying factor to consider on these two incidents as well which involves staff resources and time. The attached information does not allude to the reduction of staff in both Pollution Prevention and Conservation Officer Service which may subtly add to the perceived reluctance to proceed with these exceedances.

Peter Stent
Senior Conservation Officer
Nelson

PS:sm

cc: Len Butler

To File PE-2753 September 27, 1999

RE:Cadmium Losses to Columbia River

Cominco (G Gawryletz) called to report 2 separate losses of cadmium over the permit limits

September 22
-dissolved cadmium outfall II
-permit limits .06 mg/l, 2.75 kg/day
-actual loss .073 mg/l, 6.04 kg/d
-based on analysis of upstream tributaries of outfall II - 06Z which comes from cadmium, indium, germanium and sulphide leach plant area was elevated in Cd
-almost all in dissolved form
-did not show up on alarm system for conductivity

September 25
-dissolved cadmium - outfall III
-permit limits .03 mg/l, 3 kg/day
-actual loss .06 mg/l, 5.8 kg/d
-appears to have come from fume leach area due to pH control problems similar to those that occurred last March but after much effort seemed to be under control until now.

More details to follow

Carl

99.09.27
TO Carl Johnson.
① Sept 22 incident. No investigation. Ensure Cominco follows through on EMS review to determine cause & corrective action
② Sept 25. Conduct preliminary investigation accompanied by COS. Discussed with Richard Palassé. Peter Stent will fill in for Steve who is on holiday. Peter returns to work Sept 28th.

Rich

> SO_2 analyzer - range problem.
- dust handling problems.
- CEM for particulate
BHA instrument problems.
tribo flow electric -

> Cd
high conductivity.
II - spike 1:00 AM. 3 minutes
- either sulphide or cadmium plant

III - fume leach filtrate
- actual date 7:00 AM 24th → 7:00 AM 25th
- area I + II have procedure
- fume leach investigate today
- could have been 1 batch acted differently.
- 3-4 batches/day
- pH monitored regularly
- II pH ok, started to filter, check pH after filter
- instruments are calibrated regularly
- shut filter down immediately
- 250 m^3/batch.
- no storage between filtration prior to discharge
- pilot work completed for fume leach 4.3 MM
- 2 mg/l internal target for Cd.
4.0 target
8-4-85 dropped 8-9 continuous probe.
divert shut filter

KCRO Sept 24/85

Rivers malfunction - Commission

Last Fri Sat Mon

loss of Cadmium to river

limit .03 mg/litre

Double permit limit → S 0700-0700 24-25th

Loading 3 kg/day

loss of 5.8 kg/day → 5.8 kg loss over that period of time.

24 hr composite sample:

if grab sample taken @ that time might be toxic.

happened 64 - took Chem.

Stent, Peter

From: Johnson, Carl
To: Crozier, Rick
Cc: Stent, Peter
Subject: Cominco Cadmium Loss
Date: Tuesday, September 28, 1999 2:00PM

Had a brief discussion with Peter Stent re loss of Sept 24-25 at Cominco Sewer III of 5.8 kg/d of Cd and conc of .06 mg/l (both almost double the permit limit). Data based on 24 hour composite sample 7:00 am to 7:00 am. He will need a quick and dirty environmental assessment from Julia prior to making a commitment of CO staff time for investigation. I need to make a decision asap.

Otherwise I will do my own visit and ask questions tomorrow while the memories in Trail are still relatively fresh.

Carl

Stent, Peter

From: Johnson, Carl
To: Stent, Peter
Subject: FW: Cominco Cadmium Loss
Date: Tuesday, September 28, 1999 2:54PM

From: Crozier, Rick
Sent: Tuesday, September 28, 1999 2:31 PM
To: Johnson, Carl
Cc: Beatty, Julia
Subject: RE: Cominco Cadmium Loss

No chance of that now. Julia is committed until she leaves for Russia. By copy of this I'll ask Julia to have Les do the quick and dirty. Determine what the concentration would have been and potential impact at the end of the IDZ as per the objectives draft and if there was a chance of acute toxicity within the IDZ. That should be enough. In the meantime do your own inspection and inform them that we may conduct an investigation in conjunction with the COS at a future date. So they should be aware that what they say could become part of an investigation. Based on Les's evaluation we'll talk to Peter about next steps.

Thanks for the update

-----Original Message-----
From: Johnson, Carl
Sent: Tuesday, September 28, 1999 2:00 PM
To: Crozier, Rick
Cc: Stent, Peter
Subject: Cominco Cadmium Loss

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Carl

Stent, Peter

From: Beatty, Julia
To: McDonald, Les
Cc: Crozier, Rick; 'Stent, Peter'; Johnson, Carl
Subject: FW: Cominco Cadmium Loss
Date: Tuesday, September 28, 1999 4:06PM
Priority: High

Les: Over to you my friend. I've attached the spill spreadsheet (cheat sheet) that I think both you and I have used in the past to assist with EIA of spills.

Flow at Birchbank on Sept 24-25th was roughly 84 kcfs (1560 cms), on a rising hydrograph (was increased from 25th on)

Thanks
Julia

<<File Attachment: SPILLS95.XLS>>

Julia Beatty, R.P.Bio.
Head, Environmental Assessment Section
Kootenay Region

Julia.Beatty@gems4.gov.bc.ca
250) 354-6752 (ph)
(250) 354-6367 (fx)

-----Original Message-----
From: Crozier, Rick
Sent: Tuesday, September 28, 1999 2:32 PM
To: Johnson, Carl
Cc: Beatty, Julia
Subject: RE: Cominco Cadmium Loss

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Thanks for the update

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Sent: Tuesday, September 28, 1999 2:00 PM
To: Crozier, Rick
Cc: Stent, Peter
Subject: Cominco Cadmium Loss

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Carl

Table 2 Cominco Non-Compliances between Dec 1994 and July 1995.

Sewer	Date	Ave. Daily Flow @ Birchbank	Est. Flow for Dilution @ NewTrail	Hg Load	Cd Load	Zn Load	Est. [Hg] @ NTB	Est [Cd] @ NTB	Est. [Zn] @ NTB
		(M3/sec)	(M3/day)	Kg/day	Kg/day	Kg/day	mg/L		
CS III	94/12/18	2010	17366400	0.011			6.334E-07		
CS III	94/12/19	2000	17280000	0.009			5.208E-13		
CS III	94/12/21	1840	15897600	0.011			6.919E-07		
CS II	95/02/05	1420	12268800	0.3375			2.751E-05		
CS II	95/02/26	1230	10627200	0.1804			1.698E-05		
CS II	95/03/09	1240	10713600	0.235			2.193E-05		
CS III	95/03/10	1250	10800000		101.88			0.0094333	
CS III	95/03/26	1310	11318400	0.6768			5.980E-05		
CS III	95/03/27	1260	10886400	0.7659			7.035E-05		
CS III	95/04/03	1005	8683200	0.6957			8.012E-05		
CS III	95/04/04	982	8484480	0.9636			1.136E-04		
CS III	95/04/05	977	8441280	0.6624			7.847E-05		
CS II	95/05/06	1100	9504000	0.3496			3.678E-05		
CS II	95/05/07	1140	9849600	0.444			4.508E-05		
CS III	95/05/15	1500	12960000	0.828			6.389E-05		
CS III	95/05/16	1610	13910400	0.7688			5.527E-05		
CS III	95/05/22	1710	14774400	1.0413			7.048E-05		
CS II	95/05/31	2040	17625600	0.233			1.322E-05		
CS III	95/06/13	2310	19958400			960			0.0529
CS III	95/06/25	2640	22809600	0.418	4.18	407.55	1.833E-05	0.0001833	0.017867
		1530	13219200		13.5		0.000E+00	0.0010212	

Note: Range of acute Hg toxicity for FW Invertebrates 0.0014 to 0.004 mg/L
Range of chronic toxicity for FW invertebrates 0.00072 to 0.00182 mg/L
Range of acute toxicity for FW fish 0.0005 to 0.275 mg/L
Range of chronictoxicity for FW fish is 0.000037 to 0.0026 mg/L
From Nagpal 1989, Ambient Water Quality Criteria for Hg
Toxic response is dependent on many factors including sensitivity of organism, form of Hg and hardness.

PE-2753

Ministry of Environment, Lands, and Parks
BC Environment, Kootenay Region
401-333 Victoria St.
Nelson, BC, V1L 4K3
FAX: (250) 354-6367

ENVIRONMENTAL PROTECTION
AUG 18 1999
NELSON, B.C.

Cominco

August 5, 1999

Attention: Mr. Carl Johnson, Head, Industrial Section Environmental Protection

Re: Spill of Fume Contaminated Water to Columbia River July 23, 1999.

Dear Carl,

This letter provides detailed information surrounding the spill of water, which was likely contaminated with zinc fume, to the Columbia River from Cominco's Trail Metallurgical Operations on July 23, 1999. The incident was initially reported to Ed Stockrell of your office on July 24, 1999. This was followed by a second discussion with Mr. Stockrell on July 27 during which additional details and the initial analytical results were reviewed.

The spill occurred in the 'Highline' area adjacent to the No. 2 Slag Fuming Furnace on the southeast corner of the operation. This area is experiencing a significant amount of activity as a result of the demolition program (Economizer), commissioning of the new ABB baghouse, and the restart of the No. 2 Fuming Furnace.

On the evening of July 23, 1999 a crew from West Kootenay Mechanical (WKM), working on the No. Fuming Furnace, was washing down the A-fan area of the No. Fuming Furnace. The crew was hosing down the corrugated walls of the building, causing materials to be washed down to the containment system in the basement level of the No. 2 fuming furnace. The excessive flow filled the containment area, which consists of a sandbagged berm. A Cominco Shift Leader, upon noticing the large flow of wash water, stopped the WKM crew from further washing. By that time (8:10 p.m.) a small amount of wash water, estimated at 100 gallons, had breached the sandbag berm and flowed to the ground and the riverbank just beside the launder for Combined outfall II. An estimated 40 gallons of water entered the river via the launder or directly down the riverbank beside the launder. The incident was estimated to be 5 to 10 minutes in duration. Cominco Environmental Monitoring personnel arrived at the site at 8:45 p.m. to assess the situation. By that time the spill had stopped completely and consequently no sample could be collected.

The wash water is believed to have contained an unknown amount of old zinc fume (ca. 50% Zn, 20% Pb, plus minor amounts of As and Cd). Metals concentrations in the July 23 composite sample for Combined outfall II were 'normal' (see Table 1). Columbia River water samples were collected at the Waneta station every 10 minutes by a Sigma

Copies: MTMartin, PCPistner, SBharmal, BKuffner, MWomacks, GJGawryletz, RSSentis, KCairns, LDoskoch.

sampler, starting at 8:28 p.m. and running for 3 ½ hours. Eight of the samples, spanning from 8:38 p.m. to 11:58 p.m., were analyzed and the results are shown in Table 1.

There was a detectable increase in the concentrations of total and dissolved zinc and lead. The concentrations of total zinc and lead reached 0.09 ppm and 0.03 ppm, respectively. There was no detectable change in the concentrations of cadmium (all <0.001 ppm), arsenic (all <0.01 ppm), or suspended solids (all <1.0 ppm).

While the quantity of material reaching the river is believed to have been very small Cominco will be upgrading the containment system in the highline area to minimize the likelihood of future occurrences. This will include:

1. The installation of a new sump area near the ABB baghouse to intercept road sprays and some slag dewatering.
2. Upgrading of the secondary/emergency containment in the highline area.
3. Upgrading of the effluent pumps and piping in the fuming furnace basement.
4. Additional measures to intercept other sources of water before they reach the fuming furnace basement.

Cominco personnel and contractor crews working in the highline area will also receive additional environmental awareness training relating to the containment system.

Please contact me if you have any questions regarding this incident.

Sincerely

For Mark Edwards

Mark Edwards, Ph.D.
Superintendent, Environment and Quality Programs
Cominco Ltd.
Trail Operations.

Sample (July 23/99)	Concentration (Total in mg/L)					Concentration (Dissolved in mg/L)				pH
	Susp. Solids	Pb	Zn	Cd	As	Pb	Zn	Cd	As	
Waneta @ 20:38	<1.0	<0.01	<0.01	<0.001	<0.01	<0.01	<0.01	<0.001	<0.01	7.8
Waneta @ 21:08	<1.0	<0.01	<0.01	<0.001	<0.01	<0.01	<0.01	<0.001	<0.01	7.8
Waneta @ 21:38	<1.0	0.02	0.06	<0.001	<0.01	0.02	0.06	<0.001	<0.01	7.8
Waneta @ 22:08	<1.0	0.03	0.09	<0.001	<0.01	0.03	0.08	<0.001	<0.01	7.8
Waneta @ 22:38	<1.0	0.03	0.08	<0.001	<0.01	0.03	0.08	<0.001	<0.01	7.7
Waneta @ 23:08	<1.0	0.03	0.07	<0.001	<0.01	0.03	0.07	<0.001	<0.01	7.7
Waneta @ 23:38	<1.0	0.03	0.09	<0.001	<0.01	0.03	0.08	<0.001	<0.01	7.8
Waneta @ 23:58	<1.0	0.03	0.07	<0.001	<0.01	0.02	0.06	<0.001	<0.01	7.8
C-II Daily Compo	<1.0	<0.001	<0.01	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	7.7

PE-2753

Mr. Carl Johnson, P.Eng.
Head, Industrial Section
Environmental Protection
Ministry of Environment, Land, and Parks
401 - 333 Victoria St.
Nelson, B.C.
V1L 4K3

RECEIVED
MAY 2 6 1999
B.C. ENVIRONMENT
REGIONAL OFFICE

May 10, 1999

Re: PE-02753 Discharge of Thallium to the Columbia River via Outfall III: April 17-23, 1999

Dear Sir,

Pursuant to the reporting requirements in our Effluent Permit PE-02753 I submit the following information pertaining to the discharge of thallium to the Columbia River via Outfall III from Cominco's Trail Lead/Zinc Smelter.

From April 17th to April 23rd, 1999 a total of 768 kg of thallium was released to the Columbia River via Combined Outfall III. The daily results are given in the table below. Please note that while Cominco is required to analyze and report the release of thallium on a regular basis there are no thallium permit limits in place.

Date	[Tl/Total] (mg/L)	Tl/Total Loading (kg/d)
April 17	0.70	67.2
April 18	2.10	196
April 19	2.10	201
April 20	1.50	136
April 21	0.80	72.7
April 22	0.60	56.0
April 23	0.40	39.0
Total	-	767.9 (over 7 days)

The incident resulted from the cleaning of the Kivcet Electrostatic Precipitator (ESP) and Waste Heat Boiler (WHB) during a planned maintenance shutdown. A revised cleaning procedure that had been developed as a result of the previous thallium incident (July 21, 1998) was followed. The cleaning procedure involved the thorough removal of the dry dusts using dedicated a limited number of vactor trucks (2) which were not washed between trips. After the dry dust removal the ESP and WHB were washed out with water. The resulting slurry was then dewatered near #13 lagoon, which drains to the main

ETP lagoon. It was expected that the quantity of thallium reporting to the ETP would be minimized with this clean-out approach. It is suspected that the dust slurry contained more soluble thallium than anticipated. In addition, a significant amount of rain fell between April 18th & April 21st that may have contributed to the dissolution of thallium from the dry dusts that were stored adjacent to #13 lagoon.

An internal investigation was held to review the circumstances of this incident. Several action items were identified as a result. The key areas of action are;

1. The development of processes for the removal/precipitation of thallium from both the ETP and clean-out solutions.
2. The creation of an approval procedure for the processing of abnormal waste solutions and slurries through the ETP and #13 lagoon.
3. A planning session will be held prior to the next scheduled maintenance shutdown of the Kivcet gas handling system to ensure that the ESP and WHB dusts and any thallium-contaminated waste water are dealt with in the appropriate manner.
4. Review and revision of the standard operating procedures and associated training for the cleaning of the Kivcet ESP and WHB.

Progress on the action items is being tracked through our Corrective action system.

Please contact me if you require any additional information on this matter.

Yours truly,

Mark Edwards.

Mark Edwards
Supt. Environment & Quality Programs

Copies: DHMagoon, RSSentis, MTMartin, PCPistner, ACMikrovas, RMiller, KACairns, Env. File: PE-02753.

Mr. Carl Johnson, P.Eng.
Head, Industrial Section
Environmental Protection
Ministry of Environment, Land, and Parks
401 - 333 Victoria St.
Nelson, B.C.
V1L 4K3

ENVIRONMENTAL PROTECTION
APR 13 1999
NELSON, B.C.

Cominco

April 6, 1999

Re: PE-02753 Discharge of Cadmium to the Columbia River via Outfall III: March 24, 25, & 27, 1999

Dear Sir,

Pursuant to the reporting requirements in our Effluent Permit PE-02753 I submit the following information pertaining to the discharge of cadmium to the Columbia River via Outfall III.

On March 24, 25, and 27, 1999 the 24-hour composite samples of Combined Outfall III indicated that on each day we exceeded the permit limits for both dissolved cadmium concentration and for the loading of dissolved cadmium. The results are given in the table below. The source was traced to the Zinc Fume Leach Plant. An environmental incident investigation was held with plant personnel from Lead and Zinc Operations on March 31, 1999.

Date	[Cd/Diss] (mg/L)	Cd/Diss loading (kg/d)
March 24	0.040	3.53
March 25	0.045	4.01
March 27	0.040	3.32
Permit Limits	0.030	3.0

The fume leach process entails treating fuming furnace fume with soda ash in Area I (Lead Kivcet Furnaces) and, once the pH is stable and within specifications, forwarding this fume slurry to Area II (Zinc Specialty Leaching) for filtration. Current standard operating procedures require the addition of soda ash in Area II to maintain the slurry pH within very narrow operating parameters. A low pH results in the dissolution of cadmium while a high pH results in the dissolution of arsenic.

The root cause of this series of incidents can be attributed to a significant change in fume composition and thus it's subsequent leaching behavior. The changes in fume composition are the result of changes in the metallurgical behavior of the Kivcet and fuming furnaces. Some of the batches of fume treated over this period were very slow to react with soda ash, giving the false impression of pH stability in both Area I and Area II.

Pumping of the fume slurry from Area I to II and filtration in Area II appear to have triggered the leaching process, thereby dropping the pH and dissolving cadmium. The standard operating procedures were followed in both areas but the leaching reactions were apparently incomplete. There were no equipment faults or failures.

The initial incident prompted Area I and Area II to increase the frequency of pH hand checks and conducted more frequent assay checks on each batch. Area II also stopped processing and receiving fume slurry from Area I until they were certain that pH stability had been reached. Following the March 27 incident Area I raised the lower pH specification to 9.0 from 8.9.

In response to the fundamental changes in fume leaching behavior several measures have been initiated to minimize the likelihood of further occurrences; the operating procedures and pH control strategies are under review/revision to ensure that this new type of fume is taken into account; process changes are being tested in which sulfuric acid is added during the leaching process in Area I to improve pH stability; and options for increasing the mixing power in Area I are being investigated.

In addition, two longer-term solutions are being developed. It is our intention to conduct pilot-scale development of a process for the treatment of fume leach filtrate (removal of heavy metals). The process has been proven on the laboratory-scale. We plan to start this work in early May. Also, we intend to review options for the on-line analysis of heavy metals contained in fume leach filtrate.

Please contact me if you require any additional information on this matter.

Yours truly,

Mark Edwards

Mark Edwards
Supt. Environment & Quality Programs

Cc: DHMagoon, RSSentis, WAVanBeek, DABoateng/SRDouglas, PCPistner, KACairns, Env. File: PE-02753.

PE-2753

Memo to file PE-2753 April 1, 1999

Followup to Cadmium losses

-discussion with Mark Edwards of Cominco re their in house investigation of the 3 days where the cadmium loss to the Columbia River via Outfall III was slightly over the permit limit
-primary reason was that the fume leach plant was required to process unusual quality fume produced at the fuming furnace
-The kivcet flux mixture has been modified and the plant was operating fairly slowly which resulted in very low lead in slag fed to the fuming furnace which resulted in very low lead in fume and high zinc in fume
-not been seen by operators before
-this new fume is apparently slower to react with the soda ash
-at area 1 near lead smelter the fume is mixed with water and soda ash is added and mixed until the pH is stabilized
-the new fume apparently reached stable pH but when it was subjected to the additional mixing of pumping and transfer to the area 2 operation near the leaching plant the pH had reduced and Cd again when into solution
-additional soda ash was added at area 2, mixed and appeared to have reached stable pH again however when filtered pH again dropped slightly and some Cd went into solution

Options for improvement
-longer residence time for reaching pH stability
-more mixing at area 1
-slow the process down as much as possible
-add a small amount of H_2SO_4 at area 1 to ensure the reaction of soda ash starts
-need to check the computer control system at area 1
-need to evaluate changes in operating procedures at both area 1 and 2 as suggested by the operators of both parts of the plant.

A formal report will be submitted by the company

Carl Johnson

ENVIRONMENTAL PROTECTION

JAN 25 1999

NELSON, B.C.

Cominco

Mr. Carl Johnson, P.Eng.
Head, Industrial Section
Ministry of Environment, Lands & Parks
#401 - 333 Victoria Street
Nelson, B.C.
V1L 4K3

January 18, 1999

Re: December 26th, 1998 Report of Cadmium Discharge - Permit PE-02753

Dear Sir:

Pursuant to reporting requirements in Effluent Permit PE-02753, I am submitting the following information pertaining to the cadmium discharge to the Columbia River.

On December 29, 1998 Cominco reported to the Ministry of Environment a discharge of cadmium from Cominco's Zinc Smelter to the Columbia River. The incident occurred December 26th at 14:00 hours, and lasted approximately 5 hours.

The following is a brief description of the event:

The exceedance was a result of a small volume of solution from the Zinc Sulphide Leach plant mixing with rain runoff and seeping into a Sulphide Leach plant (SLP) manhole. This flows to O6Z tributary and then to the Combined – II (C-II) outfall. No alarm limits were exceeded at O6Z and C-II. The plants internal alarm did exceed its limit three times throughout the day, and the plant responded by building a dyke around the manhole. However a small amount did seep through the dyke creating the exceedance.

The assay results were reported December 29th^{h}, indicating approximately 4.5 kgs of cadmium had entered the river via Combined II Outfall. The current Permit limit is 2.75 kgs/day. Cominco's Spill procedure requires a Columbia River Grab sample only when a major tributary or Outfall alarms, therefore environmental impact to the river is unknown.

To help prevent future recurrences, the SLP Conductivity alarm setting has been lowered, and the manhole has been sealed and will be covered with pavement. We are investigating the feasibility of modifying the O6Z alarm to trigger, based on time waited averages in addition to elevated readings.

Please contact me if you require additional information.

Yours truly

G.J. Gawryletz
Group Leader, Environmental Monitoring

.cc DHM,WVB, MTM, KAC, EWN, RRS, ME, WAJ, RHF, CAV,DH,WK,DR

DEC 26 '98 05:51PM PEP ECC VICTORIA #2 32970-20/025 p.1/2 PC-2753

BRITISH COLUMBIA

Da..gerous Goods Incident Repo..

Carl FYI

DGIR 92775

Category : Code I ☐ Code II ☒

Incident Date/Time : 25/12/98 16:45

DGIR INLAND

MCTS # :

Spiller : COMINCO

Location : TRAIL

Area : TRAIL **PEP Region :** SEA **MELP Region :** Kootenay Reg

Material (s) : ZINC 177 kg/day CADMIUM 6.4 kg/day

Amount (s) : APPROX ~~87 KGS/DAY~~ Permit 2753 allows 90.0 APPROX ~~3 KGS/DAY~~ Permit 2753 allows 3.0 kg/day

Received from :

Caller A :	Caller B :	Caller C :
HOWIE BEYERS		
Org : COMINCO	Org :	Org :
Phone : 364-4318	Phone :	Phone :
Time :	Time :	Time :

Received at PEP by Duty Officer : YVONNE **When Received :** 26 Dec 98 1708

Affected Environment : ☐ marine ☐ ground ☐ groundwater ☐ lake ☐ stream ☐ atmosphere ■ other (specify) : Columbia River

Type of Spill : ☐ slick ☐ LUST ☐ dumping ■ other (specify) Exceeded Permit

Accidents : ☐ MVA ☐ other transport (specify) : ☐ non-transport (specify) :

Sector : ■ industrial ☐ commercial ☐ crown ☐ public ☐ unknown ☐ other

Cause : Apparently sourced from plant upset at Sulphide Leach Plant. Reference Permit 02753. Material came in to the effluent treatment plant too quickly. Had to shut it down. Exceeded their 24 hr permit. Tried starting the system up 2-3 times during the night, but problem persisted; had to shut down each time. Got it going this morning around 0700 hours. Was into the 3 combined (collection system). Then goes to the Columbia River. For Lab: Zn & Cd

Response : Plant shut down - restarted fully on Dec 27/98
- Cominco to submit summary incident report to MOE on Jan. 4/99

Jurisdiction : ☐ Federal ■ Provincial ☐ Other (specify) :

Task # : 993620 **Amount :** $ 50 **Issued to :** BEN VAN NOSTRAND

Notifications :

Date and Time	action	agency / contact person	details / additional information
26 Dec 98 1723	Paged	MELP RO	
26 Dec 98 1724	Paged	EPS	
26 Dec 98 1725	Briefed	MELP RO Ben Van Nostrand	Code 2. Faxed to office.
26 Dec 98 1727	Briefed	EPS Corine McGill	Faxed to office. Requested DGIR be faxed to DFO Radio Room.
26 Dec 98 1736	Briefed	Ginny RM	

Provincial Emergency Program

printed at: 26 Dec 98 1742

Emergency Coordination Centre
phone: 1-800-663-3456
fax: (250) 952-4872

Mr. Carl Johnson, P.Eng.
Head, Industrial Section
Ministry of Environment, Lands & Parks
#401 - 333 Victoria Street
Nelson, B.C.
V1L 4K3

January 18, 1998

Re: December 25th, 1998 Report of Cadmium and Zinc Discharge -Permit PE-02753

Dear Sir:

Pursuant to reporting requirements in Effluent Permit PE-02753, I am submitting the following information pertaining to the cadmium and zinc discharge to the Columbia River.

On December 26, 1998 Cominco reported to PEP a discharge of cadmium and zinc from Cominco's Trail Operations to the Columbia River. The incident occurred December 25th at 16:45 hours, and lasted approximately 2 hours.

The following is a brief description of the event: The exceedance resulted when the Zinc Sulphide Leach Plants North Pond was pumped to the Effluent Treatment Plant lagoon. The North Pond is an approved containment pond used to collect surface runoff, it also may be used by multiple business areas as containment for emergency process upsets. The ETP lagoon was at a very low level. This resulted in the solution flowing directly into the ETP operation, causing a process upset condition. The ETP plant operator minimized his process flow rate, verified the incident, then went into an emergency operating mode, only operating the equipment to prevent freeze-up, thus preventing a potentially larger environmental impact.

The composite assay results were reported December 29th^{h}, indicating 6.5 kgs of cadmium and 177 kgs of zinc entered the river via Combined III Outfall. The current Permit limit is 3.0 kgs/day cadmium and 90 kgs/day zinc. The concentrations for dissolved cadmium were 0.08 mg/L and for dissolved zinc 2.20 mg/L. Permitted concentrations for dissolved cadmium are 0.03 mg/L and dissolved zinc 0.9 mg/L. The December 25th 24-hour composite from the Waneta sampling site reported no measurable impact to the river.

To help prevent future recurrences, Sulphide Leach personnel are reviewing their North Pond pumping procedure. Instrumentation requirements are being reviewed to ensure that ETP operations are prewarned as to potential problems.

Please contact me if you require additional information.

Yours truly

Garry Gawryletz
Group Leader, Environmental Monitoring

.cc DMagoon,WVanBeek, MMartin, KCairns, ENorton, RSentis, MEdwards, WJankola, AMikrovas, RMiller, RFish, CVanelli, DHorswill, WKuit, DRiley

PE-2753

ENVIRONMENTAL PROTECTION
DEC 21 1998
NELSON, B.C.

Cominco

Mr. Carl Johnson, P.Eng.
Head, Industrial Section
Ministry of Environment, Lands & Parks
#401 - 333 Victoria Street
Nelson, B.C.
V1L 4K3

December 6, 1998

Re: October 24th, 1998 Report of Cooling Water incident from the Granulated Slag Process - Permit PE-02753

Dear Sir:

Pursuant to reporting requirements in Effluent Permit PE-02753, I am submitting the following information pertaining to the discharge of Cooling water from the Lead Slag Fuming process to the Columbia River.

The following is a brief description of the incident, as was discussed during the November 25th meeting between the Ministry and Cominco.

On October 24th, 1998 Cominco reported to PEP a discharge of Barren Slag from Cominco's Lead Smelter to the Columbia River. The incident occurred October 24th from 0800 - 0815.

The incident occurred while transferring product from the Kivcet furnace into the Slag fuming furnace. The Slag fuming furnace failed ("breakout") resulting in a spillage of cooling water and slag. The slag was retained in its containment area. The cooling water overflowed its containment area and flowed down the riverbank washing approximately thirty-five cubic meters of clean sand from the bank into the Columbia River.

Analytical results for water samples taken from the Old Bridge and Waneta sites are as follows:
Old Bridge: T/Pb <0.01, T/Zn 0.02, T/Cd <0.01, T/As <0.01, T/Cu <0.01 (all in mg/l).
Waneta: T/Pb 0.02, T/Zn 0.03, T/Cd <0.01, T/As <0.01, T/Cu <0.01 (all in mg/l).

Conclusion: The Slag containment area prevented slag from entering the environment as per design. A new sump and collection area for surface water and slag cooling water spills is under construction. Scheduled completion date is end of first quarter 1999.

OCT 24 '98 01:14PM PEP ECC VICTORIA Cont 32920-25 / PT.1

BRITISH COLUMBIA

Dangerous Goods Incident Report

DGIR 92093

copied to Peter Stent Oct. 26/98

Category : Code I [X] Code II [ ]

Incident Date/Time : 24/10/98 08:00

MCTS # :

PE-2753

DGIR INLAND

Spiller :
COMINCO

Location :
SMELTER SITE

Area : TRAIL **PEP Region :** SEA **MELP Region :** Kootenay Reg

Material (s) : GRANULATED SLAGG
Amount (s) : 15 DURATION

Received from :

Caller A :	Caller B :	Caller C :
Org :	Org :	Org :
Phone : 250 364 4318	Phone :	Phone :
Time :	Time :	Time :

Received at PEP by Duty Officer : DONW **When Received :** 24 Oct 98 1232

Affected Environment : [ ] marine [ ] ground [ ] groundwater [ ] lake [ ] stream [ ] atmosphere [■] other (specify) : River

Type of Spill : [ ] slick [ ] LUST [ ] dumping [ ] other (specify) : Equipment

Accidents : [ ] MVA [ ] other transport (specify) : [ ] non-transport (specify) :

Sector : [■] industrial [ ] commercial [ ] crown [ ] public [ ] unknown [ ] other

Cause :
Granulation area rock crusher plugged and granulated slagg (slurrey) went to the Columbia River.

Response :
Everything stopped. Ok now. No slagg particulate reached the Columbia River

Jurisdiction : [■] Federal [■] Provincial [ ] Other (specify) :

Task # : 992839 **Amount :** $ 100 **Issued to :** ROGER HAMILTON

Notifications :

Date and Time	action	agency / contact person	details / additional information
24 Oct 98 1237	Paged	MELP RO	
24 Oct 98 1242	Paged	EPS	
24 Oct 98 1247	Briefed	Roger Hamilton	Code 2 for US
24 Oct 98 1251	Briefed	Nick Russo	
24 Oct 99 1255	Briefed	Wash EMO Ed	
24 Oct 98 1307	Briefed	Ginny Rm	
24 Oct 99 1307	Faxed	EPS/MELP Nelson	

Provincial Emergency Program

printed at: 24 Oct 98 1308

Emergency Coordination Centre
phone: 1-800-663-3456
fax: (250) 952-4872

PE-2753

ENVIRONMENTAL PROTECTION
DEC 21 1998
NELSON, B.C.

Mr. Carl Johnson, P.Eng.
Head, Industrial Section
Ministry of Environment, Lands & Parks
#401 - 333 Victoria Street
Nelson, B.C.
V1L 4K3

Re: October 12th 1998 Report of Thallium Discharge - Permit PE-02753

December 7, 1998

Dear Sir:

Regarding the October 12th 1998 reported discharge of thallium, from Cominco's Trail Lead/Zinc Smelter.

The following is a brief description of the incident, as was discussed during the November 25th meeting between the Ministry and Cominco.

On October 13th, 1998 Cominco reported to the MOE a discharge of approximately 100kgs of thallium, from Cominco's Trail Operation to the Columbia River. The incident occurred October 12th.
The incident resulted from emergency cleaning of the Kivcet gas handling system. The material removed was routed to the zinc plant for processing, causing thallium to deport to Comincos effluent treatment plant and then to the Columbia River.

The following action plans have been implemented to try and prevent a similar occurrence:

- Internal targets have been established to allow management of this material.
- Procedures have been put in place that limits the amount of ESP dust that can be treated by Zinc Operations.
- Feed surge bins are now in place for the short-term storage of ESP material.
- Alternative options are being reviewed to process this material.

Please contact me if you require additional information regarding this incident.

Yours truly

G.J. Gawryletz
Group Leader, Environmental Monitoring

.cc DHM, MTM, KAC, EWN, WVB, RRS,MAE,RHF, CAV,DH,WK,DR

Oct 12/2000

PE-2753

Followup to report of excess loss of thallium on Oct 8 and 9

-loss is believed to be the result of a build up of acretion on the reaction shaft of Kivcet that fell back into the bath on start up of the furnace

-thallium is believed to accumulate in the acretion layer

-once the thallium is in the molten bath of lead and slag it goes into solution

-the thallium reports to slag and then to fume and gets to sewer from the fume leach process

-an investigation will be held internally to the company to try to develop methods of detecting when this situation occurs and when it does what treatment options are available for the effluent from fume leach

-apparently if it is known that fume leach filtrate is high in thallium, it can be directed to ETP where a special additive can be used to help reduce thallium losses

-another area of potential study is to try to drive the thallium to remain insoluble at the fume leach plant so that it reports to oxide and eventually is recovered in the cadmium plant as dichromate

the river samples for the 8 and9 of October were 0.2 ug/l and 0.3 ug/l respectively

-normals are .01 to .03 ug/l so the loss resulted in river water about 10 times normal.

Carl

Objective for Cd R. d/s of Trail is average of .8 µg/l – no max is specified

Memo to file PE-2753

October 11, 2000

G Gawryletz called to report that Thallium had been elevated in Outfall III for 2 days
-Oct 8 – 33 kg
-Oct 9 – 43 kg

there is no clear reason why the numbers are high but it is suspected that it may have coincided with the restart of #3 slag fumer (the new one attached directly to Kivcet)
-there may have been some material put into the feed that was very high in Thallium
-the thallium would be captured as a solid in the zinc fume and then be leached out in the fume leach plant and report directly to the river via Outfall III along with the halides

- an investigation will be done to try to determine what happened.
- -at present there are no limits set for thallium in the permit but there is an objective for thallium in the river
- -the river samples for those days will be analysed and the results reported.

Carl

Memo to file PE-2753 Oct 5, 2000

Report of explosion and subsequent water discharge at new slag fuming furnace at Cominco

-Gary G called to report that at midnight on Oct 2 there was an explosion at the granulation end of the new slag fuming furnace

-plugup at rock catcher part of process

-2 workers were hurt due to high temperature water

-water from the granulation system overflowed onto the road and down into the sump and into the flue tunnel for capture and treatment at ETP

-a small amount of water may have overflowed into Outfall II but not much is expected

-Daily assays were normal

Carl

Regional Manager
Environmental Protection
#401 - 333 Victoria Street
Nelson, B.C.
V1L 4K3

January 12, 1999

Attention: Mr. Carl Johnson, P. Eng.
Head Industrial Section

Reference: Permits PE-02753, PE-05309 and PS-08310

Dear Sir:

In accordance with the monitoring programs associated with Effluent Permits PE-02753, PE-05309 and PS-08310, I am submitting the required effluent and receiving water data for October 1998.

The following monitoring data in report format is included in this submission:

- NAPS schedule 24-hour composite sample results for Outfall II, Outfall III and Outfall IV.
- NAPS schedule grab sample results from Topping (Stoney) Creek.
- Monthly grab sample results from the Columbia river.
- Toxicity testing (96 hour LC 50) results for the 4th quarter.

Extended precision for Cadmium analysis data to three decimal places will be issued separately.

Computer coded monitoring results have been E-mailed to your office.

Yours truly,

G.J.Gawryletz
Group Leader, Environment

ENVIRONMENTAL PROTECTI
JAN 13 1999
NELSON, B.C.

Attachments:

<u>Effluent Permit PE-02753: Combined Outfall II</u>
All NAPS required sampling results under permit limits for October.

<u>Effluent Permit PE-02753: Combined Outfall III</u>
All NAPS required sampling results are under permit limits for October.

<u>Permit PE-05309 - Combined Outfall IV</u>
All NAPS required sampling results are under permit limits for October

<u>Permit PS-08310 - Stoney (Topping) Creek Monitoring</u>

Cominco Ltd. Trail Operations Combined Outfall 11
Waste Management Branch Effluent Permit PE-02753
1998 Compliance Monitoring

Date: 12/22/98

(Tributaries T-1, T-3, T-4, T-5 & T-6)

Sample Date	Flow (m3/day)	Max	TMin	TAvg	pH	Sus/Slds (kg/day)	T/Pb (kg/day)	Diss/Pb (kg/day)	T/Zn (kg/day)	Diss/Zn (mg/l)	Diss/Zn (kg/day)	T/Cd (kg/day)	Diss/Cd (mg/l)	Diss/Cd (kg/day)	T/As (kg/day)	Diss/As (kg/day)	T/Cu (kg/day)	Diss/Cu (kg/day)	T/Hg (kg/day)
10/2/98	104647	23.7	21.8	23.1	7.60	52.3	5.23	1.05	74.3	0.31	32.4	0.52	<0.01	0.52	0.52	0.52	0.52	0.52	.0419
10/8/98	91969	24.4	23.7	24.2	7.70	92.0	9.20	2.76	86.5	0.93	85.5	0.46	<0.01	0.46	0.46	0.46	0.46	0.46	.0276
10/14/98	86253	25.8	24.1	24.9	7.40	173	38.0	1.73	276	0.35	30.2	1.73	<0.01	0.43	2.59	0.43	6.04	0.43	.0086
10/20/98	74824	22.7	21.6	22.3	7.70	74.8	2.99	0.37	82.3	0.31	23.20	0.37	<0.01	0.37	0.37	0.37	0.37	0.37	.0374
10/26/98	88576	25.1	22.6	24.5	7.80	88.6	1.77	1.77	71.7	0.30	26.6	0.44	<0.01	0.44	0.44	0.44	0.89	0.44	.0044

Cominco Ltd. Trail Operations Combined Outfall III

Date: 12/22/98

Waste Management Branch Effluent Permit PE-02753

1998 Compliance Monitoring

(Tributaries T-8, T-9, T-10)

Sample Date	Flow (m3/day)	TMax	TMin	TAvg	pH	Sus/Slds (kg/day)	T/Pb (kg/day)	Diss/Pb (kg/day)	T/Zn (kg/day)	Diss/Zn (mg/l)	Diss/Zn (kg/day)	T/Cd (kg/day)	Diss/Cd (mg/l)	Diss/Cd (kg/day)	T/As (kg/day)	Diss/As (kg/day)	T/Cu (kg/day)	Diss/Cu (kg/day)	T/Hg (kg/day)	T/Tl (kg/day)	DissTl (kg/day)	Diss/F (kg/day)	T/NH3/N (kg/day)
10/2/98	103519	27.1	24.8	26.0	7.60	51.8	6.21	2.07	19.67	0.10	10.35	0.52	<0.01	0.52	0.52	0.52	0.52	0.52	.0414	5.18	5.18	217	104
10/8/98	105889	25.2	23.8	24.7	7.90	106	7.41	3.18	28.6	0.23	24.35	0.53	<0.01	0.53	0.53	0.53	0.53	0.53	.1059	5.29	5.29	169	106
10/14/98	108935	25.9	24.3	24.9	7.80	54.5	8.71	3.27	31.6	0.22	23.97	0.54	<0.01	0.54	0.54	0.54	0.54	0.54	.0327	65.4	54.5	294	109
10/20/98	93941	23.3	20.9	22.3	7.70	47.0	4.70	2.82	15.97	0.17	15.97	0.47	<0.01	0.47	0.47	0.47	0.47	0.47	.0282	4.70	4.70	93.9	47.0
/26/98	108572	25.0	23.7	24.4	7.70	109	7.60	3.26	21.71	0.17	18.46	0.54	<0.01	0.54	0.54	0.54	0.54	0.54	.0109	10.86	10.86	239	54.3

Cominco Ltd. Trail Operations Combined Outfall IV

Date: 12/22/98

Waste Management Branch Effluent Permit PE-05309

1998 Compliance Monitoring

(Tributaries T-11, & T-12)

Sample Date	Flow m3/day	TMax	TMin	TAvg	pH	Sus/Slds (kg/day)	T/Zn (kg/day)	Diss/Zn (kg/day)	D/NH3/N (mg/L)	D/NH3/N (kg/day)	Diss/SO4 (kg/day)	T/Hg (kg/day)
Oct/02	28641	26.7	22.9	24.7	7.80	28.6	6.87	5.16	10.00	286	1403	.0115
Oct/08	27012	24.7	16.9	23.6	7.30	13.51	7.83	7.56	13.00	351	1702	.0297
Oct/14	27123	24.5	21.6	22.6	7.70	54.2	10.04	4.88	9.00	244	1139	.0027
Oct/20	27771	23.9	18.8	21.5	7.40	55.5	7.78	6.66	11.00	305	1611	.0028
Oct/26	25771	24.3	20.6	21.9	7.70	12.89	4.12	3.61	1.00	25.8	747	.0026

Cominco Ltd. Trail Operations Topping (Stoney) Creek

Date: 12/22/98

Waste Management Branch Effluent Permit PE-02753

1998 Compliance Monitoring

Sample Date	T/Pb mg/l	Diss/Pb mg/l	T/Zn mg/l	Diss/Zn mg/l	T/Cd mg/l	Diss/Cd mg/l	T/As mg/l	Diss/As mg/l	T/Sb mg/l	Diss/Sb mg/l	Flow m3/min
11-Jan-98	0.02	0.01	3.70	3.40	0.05	0.04	0.61	0.56	0.01	0.01	
17-Jan-98	0.05	0.04	2.60	2.60	0.03	0.03	0.45	0.44	0.01	0.01	
23-Jan-98	0.02	0.02	3.00	2.80	0.04	0.04	0.54	0.48	0.01	0.01	
29-Jan-98	0.05	0.01	2.70	2.20	0.04	0.03	0.43	0.35	0.01	0.01	
04-Feb-98	0.18	0.02	2.60	2.30	0.03	0.03	0.41	0.35	0.01	0.01	
10-Feb-98	0.07	0.07	2.20	2.20	0.03	0.03	0.39	0.39	0.05	0.03	
16-Feb-98	0.01	0.01	1.80	1.60	0.03	0.03	0.25	0.23	0.01	0.01	
22-Feb-98	0.01	0.01	1.80	1.60	0.03	0.03	0.25	0.23	0.01	0.01	52.8
28-Feb-98	0.14	0.01	1.50	1.20	0.02	0.02	0.23	0.20	0.38	0.01	36.8
06-Mar-98	0.01	0.01	1.80	1.30	0.02	0.02	0.27	0.22	0.04	0.02	37.3
12-Mar-98	0.03	0.01	1.80	1.40	0.02	0.02	0.21	0.18	0.01	0.01	39.7
18-Mar-98	0.02	0.01	0.81	0.70	0.01	0.01	0.10	0.09	0.02	0.01	72.4
24-Mar-98	0.02	0.02	0.55	0.44	0.01	0.01	0.07	0.07	0.01	0.01	107.2
30-Mar-98	0.07	0.01	2.00	0.56	0.03	0.01	0.23	0.06	0.05	0.01	87.0
05-Apr-98	0.05	0.01	0.51	0.47	0.01	0.01	0.06	0.04	0.01	0.01	95.2
11-Apr-98	0.01	0.01	0.58	0.54	0.01	0.01	0.07	0.06	0.03	0.01	89.3
17-Apr-98	0.02	0.02	0.70	0.70	0.01	0.01	0.08	0.08	0.01	0.01	89.2
23-Apr-98	0.01	0.01	0.44	0.38	0.01	0.01	0.12	0.11	0.01	0.01	116.1
29-Apr-98	0.12	0.10	0.22	0.22	0.01	0.01	0.04	0.01	0.17	0.17	116.3
05-May-98	0.01	0.01	0.20	0.15	0.01	0.01	0.03	0.03	0.01	0.01	116.4
11-May-98	0.01	0.01	0.24	0.23	0.01	0.01	0.04	0.04	0.01	0.01	116.4
17-May-98	0.24	0.17	0.49	0.42	0.01	0.01	0.07	0.06	0.49	0.22	92.2
23-May-98	0.06	0.01	0.24	0.24	0.01	0.01	0.04	0.02	0.06	0.03	126.0
29-May-98	0.10	0.05	0.30	0.24	0.01	0.01	0.06	0.04	0.12	0.07	125.4
04-Jun-98	0.10	0.01	3.00	1.50	0.01	0.01	0.01	0.01	0.01	0.01	97.4
10-Jun-98	<0.01	<0.01	0.59	0.49	<0.01	<0.01	0.08	0.06	<0.01	<0.01	77.1
16-Jun-98	<0.01	<0.01	1.00	0.90	0.01	0.01	0.13	0.11	<0.01	<0.01	54.4
22-Jun-98	0.01	0.08	1.30	1.20	0.02	0.02	0.17	0.14	<0.01	<0.01	47.1
28-Jun-98	0.01	0.01	1.20	1.10	0.02	0.02	0.14	0.14	<0.01	<0.01	49.9
04-Jul-98	0.03	0.01	1.40	1.30	0.02	0.02	0.17	0.16	<0.01	<0.01	39.3
10-Jul-98	0.69	0.38	2.10	0.47	0.01	<0.01	0.02	0.01	0.02	0.02	32.7
16-Jul-98	0.03	<0.01	3.50	3.20	0.05	0.04	0.34	0.26	0.02	0.02	22.3
22-Jul-98	0.01	<0.01	5.60	4.50	0.07	0.06	0.61	0.33	0.01	0.02	14.3
28-Jul-98	0.08	0.05	7.60	6.10	0.10	0.09	0.77	0.31	0.05	0.01	13.5
03-Aug-98	0.05	<0.01	3.40	3.10	0.05	0.04	0.35	0.31	0.04	0.03	22.9
09-Aug-98	0.03	0.02	4.90	4.00	0.07	0.05	0.55	0.41	0.01	0.01	16.9
15-Aug-98	0.03	<0.01	6.60	6.00	0.09	0.08	0.50	0.26	<0.01	<0.01	13.0
21-Aug-98	0.04	<0.01	13.00	11.00	0.18	0.15	1.20	0.38	<0.01	<0.01	11.4
27-Aug-98	0.05	<0.01	15.00	11.00	0.22	0.16	1.60	0.20	<0.01	<0.01	11.3

Cominco Ltd. Trail Operations Topping (Stoney) Creek
Waste Management Branch Effluent Permit PE-02753
1998 Compliance Monitoring

Date: 12/22/98

Sample Date	T/Pb mg/l	Diss/Pb mg/l	T/Zn mg/l	Diss/Zn mg/l	T/Cd mg/l	Diss/Cd mg/l	T/As mg/l	Diss/As mg/l	T/Sb mg/l	Diss/Sb mg/l	Flow m3/min
02-Sep-98	0.05	<0.01	5.60	4.10	0.09	0.06	0.63	0.18	0.03	<0.01	10.3
08-Sep-98	0.56	<0.01	27.00	22.00	0.38	0.27	3.20	0.49	0.10	<0.01	10.1
14-Sep-98	0.30	<0.01	28.00	22.00	0.38	0.27	3.30	0.52	0.20	<0.01	9.9
20-Sep-98	0.09	<0.01	21.00	18.00	0.30	0.24	2.30	0.33	<0.01	<0.01	10.1
26-Sep-98	0.26	<0.01	16.00	0.06	0.22	<0.01	1.60	<0.01	0.12	0.07	10.6
02-Oct-98	0.09	<0.01	19.00	15.00	0.24	0.18	2.30	0.63	0.08	0.05	1.6
08-Oct-98	0.04	0.02	18.00	14.00	0.23	0.18	2.60	1.00	0.03	0.03	1.9
14-Oct-98	0.14	0.03	4.90	4.10	0.06	0.05	0.78	0.54	0.03	0.01	5.0
20-Oct-98	0.04	0.03	7.10	6.20	0.09	0.08	1.10	0.86	<0.01	<0.01	2.2
26-Oct-98	0.06	<0.01	13.00	10.00	0.17	0.13	1.80	0.85	<0.01	<0.01	1.8

PE-2753

Mr. Carl Johnson, P.Eng.
Head, Industrial Section
Ministry of Environment, Lands & Parks
#401 - 333 Victoria Street
Nelson, B.C.
V1L 4K3

ENVIRONMENTAL PROTECTION
OCT 1998
NELSON, B.C.

Cominco

Re: August 20th, 1998 Report of Slag Cooling Water Discharge - Permit PE-02753

Dear Sir:

Pursuant to reporting requirements in Effluent Permit PE-02753, I am submitting the following information pertaining to the Slag discharge to Columbia River.

The following is a brief description of the incident:
On August 20th, 1998 Cominco reported to PEP a discharge of Slag cooling water from Cominco's Lead Smelter to the Columbia River. The incident occurred August 20th at 7:50 A.M., and lasted approximately 10 minutes.

The incident resulted from a major process upset that occurred during the tapping of the Lead furnace. Conditions during the tapping process resulted in a failure of the process containment system. Consequently, approximately 1.9 cubic meters of slag cooling water, which is normally recirculated, deported to the Columbia River.
C-II outfall grab sample analysis: suspended solids 28.0 mg/l, dissolved cadmium 0.16, dissolved zinc 1.1 mg/l, total arsenic 0.02 mg/l, and total lead 2.3 m/l.
C-II outfall 24 hour composite analysis: suspended solids 2.0 mg/l, dissolved cadmium <0.1, dissolved zinc 0.23 mg/l, total arsenic <0.01 mg/l, and total lead 0.06 m/l, all elements were below our permit limits. Columbia River grab sample shows no measurable environmental impact.

The following action plans are a result of our internal environmental investigation:

The procedures for granulating directly from the Kivcet furnace have been reviewed. Operating procedures have been modified to ensure that the conditions, which caused the failure, will preclude the Granulation process through the bypass system.

Two subsequent process upsets occurred, the modified operating procedures prevented a reoccurrence of cooling water discharge to the environment.

Please contact me if you require additional information.

Yours truly

G.J. Gawryletz
Group Leader, Environmental Monitoring

.cc DHM, MTM, KAC. WVB, MAE, PCP, RHF, CAV, DH, WK, DR

PE-2753

Mr. Carl Johnson, P.Eng.
Head, Industrial Section
Ministry of Environment, Lands & Parks
#401 - 333 Victoria Street
Nelson, B.C.
V1L 4K3

August 4, 1998

Dear Sir:

On July 30th 1998, Cominco's Trail Lead/Zinc Smelter discharged approximately 15 kg of copper through Combined - II outfall to the Columbia River. The Permit limit for copper from this outfall is 8.0 kg/day.

This incident was discovered from the analytical results of the Combined – II outfall 24-hour composite sample.

It is believed that this incident is a result of heavy rainfall, 25 mm of rain fell within one hour on July 30th, resulting in an increase of flow through C-II by 900 M3. The hugh volume of surface runoff on the Northeast area of the property contributed to this incident. A plan is being developed to collect this areas runoff and prevent it from entering the River.

Yours truly

G.J. Gawryletz
Group Leader, Environmental Monitoring

.cc DHM, MTM, KAC, GFK, WVB, GMB, RHF, CAV,DH,WK,DR

Memo to File – PE-2753 August 9, 2000

Phone calls from Gary Gawryletz and Rob Frew regarding flow exceedances for Outfall II during late July

July 25, 26,29,30 all exceeded the permit limit of 125,000 m3/day due to higher air temperatures and river water temperatures. There is a higher cooling water demand due to the startup of # 2 SFF and BOC oxygen plant

Cominco had applied for a permit amendment a few years ago but there has been no time to complete the processing yet due to other MOE priorities. These non – compliances should not result in the company being put on the non-compliance list.

Carl

Mr. Carl Johnson, P.Eng.
Head, Industrial Section
Ministry of Environment, Lands & Parks
#401 - 333 Victoria Street
Nelson, B.C.
V1L 4K3

Re: July 21st, 1998 Report of Thallium Discharge - Permit PE-02753

August 10, 1998

Dear Sir:

Regarding the July 21st 1998 reported discharge of thallium, from Cominco's Trail Lead/Zinc Smelter, refer to Cominco letter to MOE dated July 23rd 1998.

Following is a brief explanation, along with a plan to minimize the risk of this incident from reoccurring.

The incident resulted from cleaning the Kivcet gas handling system during a plant shutdown. Procedures were in place and followed to miniize input to the Effluent Treatmemt system. These procedures included dry vactoring and containment of the dust for re-processing.

During the July shutdown the new procedure was followed. Over twenty truckloads were moved to a designated containment area, waiting reprocessing. However, after each truck was unloaded, the truck was washed at our truckwash, freeing the truck for other tasks. The residue from the truck wash went to our ETP, resulting in the elevated thallium readings.

Two action items resulted from this incident:

1) Two trucks are required for this job; their only task will be to vacuum this system, prior to getting washed, therefore minimizing the truck washings to two.
2) A procedure is being developed to capture truck wash residues from this process, minimizing the solids going to the ETP.

Please contact me if you require additional information regarding this incident.

Yours truly

G.J. Gawryletz
Group Leader, Environmental Monitoring

ENVIRONMENTAL PROTECTION
AUG 13 1998
NELSON, B.C.

.cc DHM, MTM, KAC, EWN,GFK, WVB, GMB, RHF, CAV,DH,WK,DR

PE-2753

Mr. Carl Johnson, P.Eng.
Head, Industrial Section
Ministry of Environment, Lands & Parks
#401 - 333 Victoria Street
Nelson, B.C.
V1L 4K3

July 23, 1998

Dear Sir:

On July 21st 1998. Cominco's Trail Lead/Zinc Smelter discharged approximately 129 kg of thallium through Combined - III outfall to the Columbia River. This amount exceeds normal operating quantities.

This incident was discovered from the analytical results of the Combined – III outfall 24-hour composite sample.

We are currently investigating this incident and will inform you of the results.

Yours truly

G.J. Gawryletz
Group Leader, Environmental Monitoring

.cc DHM, MTM, KAC, GFK, WVB, GMB, RHF, CAV,DH,WK,DR

Carl File a File PE 2753

BC Environment

ENVIRONMENTAL EMERGENCY INCIDENT REPORT
Dangerous Goods

DGI # 90684

Incident Date: 02 06 98 (Day Mon Yr)

Incident Time: 12 hr duration (24 hour)

CATEGORY: (see over) Non-Urgent (Code I) [ ] Urgent (Code II) [✓]

SPILLER: Cominco

LOCATION: Trail Smelter

MATERIAL(s): Total arsenic (Permit PE-02753 limits exceeded 15.0 kg/day)

AMOUNT(s): 20.36 kg [as determined by analysis of 24hr comp sample from Sewer III]

RECEIVED FROM: A: PEP Victoria ⇐ B: Howie Byers (Cominco) ⇐ C: Assay Office 1830 hrs

TIME RECEIVED: (24 hour) 2057 (250) 364-4318

RECEIVED BY: Ed Sto DATE: (Day/ Mon/ Yr) 03/06/98 TIME: (24 hour) 2102

AFFECTED ENVIRONMENT: Marine ___ Ground ___ Groundwater ___ Lake ___ Stream [✓] Atmosphere ___ Other ___ (Specify)

TYPE: Slick ___ LUST ___ Dumping ___ Other unknown (Specify)

ACCIDENTS: MVA ___ Other Transport ___ (Specify) Non-Transport ___ (Specify)

SECTOR: Industrial [✓] Commercial ___ Crown ___ Public ___ Unknown ___ Other ___ (Specify)

CAUSE: - suspect that copper arsenate product overflowed mix tank at refinery Duncan dome slurry
- pugger screen.
- spill passed thru Effluent Treatment Plant prior to discharging to Columbia R. via sewer III Cont'd [ ]

RESPONSE: - Spill Cause, source & amount being confirmed by following incident review on part of Cominco - in-house review
2112 hrs ECS contacted Howie Byers at Cominco to verify details Cont'd [✓]

PEP ZONE	ENV. REG.
SE	4

See Over

JURISDICTION: Federal [✓] Provincial [✓] Other ___ (Specify)

NOTIFICATION:

		Paged	Answered
ESPO	Ed Stockerl	2100	2102
EESB			
EPS			
PEP			
Other (Specify)			

TASK NUMBER: 990939
ISSUED TO: Ed Stockerl

AMOUNT: 50.00

FAXED TO EESB: ___ Date Time

BRITISH COLUMBIA

Dangerous Goods Incident Report

DGIR 90684

Category : Code I [X] Code II [ ]

Incident Date/Time : 02/06/98 DAY SHIFT

MCTS # :

DGIR INLAND

Spiller :
COMINCO MINING & SMELTING

Location :
TRAIL OPERATION

Area : TRAIL PEP Region : SEA MELP Region : Kootenay Reg

Material (s) : TOTAL ARSENIC Discharge via Sewer III (CODE 2 US) Note PERMIT PE 2753
Amount (s) : 20.36 KG (over 24 hrs) allow max of 15 Kg/day

Received from :

Caller A :	Caller B :	Caller C :
HOWIE BYERS	ASSAY OFFICE	
Org : COMINCO	Org : VIA COMPUTER	Org :
Phone : 250-364-4318	Phone :	Phone :
Time : 03/06/98 18:30	Time :	Time :

Received at PEP by Duty Officer : PAT When Received : 03 Jun 98 2057

Affected Environment : [ ] marine [ ] ground [ ] groundwater [ ] lake [ ] stream [ ] atmosphere [■] other (specify) : Columbia River

Sector : [■] industrial [ ] commercial [ ] crown [ ] public [ ] unknown [ ] other

Type of Spill : [ ] slick [ ] LUST [ ] dumping [■] other (specify) : Eqpt Failure

Accidents : [ ] MVA [ ] other transport (specify) : [ ] non-transport (specify) :

Cause :
Occurred during day shift 02 Jun over a 12 hour period. Was notified by Assay Office that had exceeded 24 hour permit limit. Permit # 02753. Believe it came from copper arsenic product that had overflowed in one of the mix tanks. Discharged to Columbia River via Effluent Treatment Plant & Combined Sewer III

Response :
Incident is presently under investigation to verify cause, source and amount.

Jurisdiction : [■] Federal [■] Provincial [ ] Other (specify) :

Task # : 990939 Amount : $ 50 Issued to : ED STOCKERL

Notifications :

Date and Time	action	agency / contact person	details / additional information
03 Jun 98 2101	Paged	MELP RO	
03 Jun 98 2103	Paged	EPS	
03 Jun 98 2106	Briefed	MELP RO Ed Stockerl	Code 1. Task $50. Advises downstream effect of release would be negligible due to high water levels.
03 Jun 98 2115	Briefed	EPS Scott Nickerson	
03 Jun 98 2115	Phoned	Washington State EMO	Briefed Operations Officer Ken Wolf. Assigned State File # 98-0996

Provincial Emergency Program

printed at: 03 Jun 98 2135

Emergency Coordination Centre
phone: 1-800-663-3456
fax: (250) 952-4872

RECEIVED

JUL 0 8 1998

B.C. ENVIRONMENT
OFFICE

July 3rd/1998

Mr. Carl Johnson, P.Eng.
Head, Industrial Section
Ministry of Environment, Lands & Parks
#401 - 333 Victoria Street
Nelson, B.C.
V1L 4K3

Re: June 1st, 1998 Report of Arsenic Discharge - Permit PE-02753

Dear Sir:

Pursuant to reporting requirements in Effluent Permit PE-02753, I am submitting the following information pertaining to the arsenic discharge to Columbia River.

On June 2nd, 1998 Cominco reported to PEP a discharge of arsenic from Cominco's Lead Smelter to the Columbia River. The incident occurred June 1st 1998.

The following is a brief description of the event:

The incident resulted from an increase of arsenic entering our Effluent Treatment Plant (ETP) lagoon.

The investigation identified that the excess arsenic resulted from problems in the area of the Sodium Antimonate Filter located at the Lead Copper Products plant. A leak developed in the filter and approximately two cubic meters of 90 g/l sodium arsenate solution reported to the ETP lagoon from the filters' sump. A valve in the system allows material to be recyled back into the process or can be diverted to allow equipment cleaning, this solution flows to our ETP. During this incident the valve was set to the ETP.

The immediate action taken by plant operations was to decrease the flow through the ETP plant by approximately 25% and to increase ferric sulphate addition to the process to assist with removing the additional arsenic.

The assay results were reported late afternoon of June 3rd, indicating approximately 20 kgs of arsenic had entered the river via Combined II Outfall. The current Permit limit is 15 kgs/day. The 24-hour composite assay for June 2nd, taken from the Columbia River at Waneta reported: Total arsenic < 0.01mg/l.

G.J. Gawryletz

Cominco Ltd.; Trail Operations Trail, British Columbia, Canada V1R 4L8 Tel. (604) 364-4222

Group Leader, Environmental Monitoring

.cc DHM, MTM, KAC, GFK, WVB, GMB, ACM, RIM, RHF, CAV, DH, WK,DR

TK Cont.
file

To: File

Date: May 19, 2000

File: PE2753

Re: Cooling Water Spill

Mark Edwards called at about 3 pm to advise that at about 1pm there has been a cooling water spill in the vicinity of the Kivset. Most of the water was contained in the containment area but they believe several 1000 gallons overflowed to the sewer system to combined outfall # 2. They took a grab sample and will have the assay tomorrow. They believe the #s will be low as the cooling water would only contain any residuals or fume it picked up in the course of the event. A few 100 gallons also leaked thru the containment wall to the sandy bank of the Columbia but did not appear to reach the river.

Barry Wood

/

cc:

PE-2753

Johnson, Carl

From: Stockerl, Ed
Sent: May 17, 2000 5:03 PM
To: Crozier, Rick; Stent, Peter
Cc: Johnson, Carl; Kinrade, Terri
Subject: RE: Cominco spill

I had discussed spill incident with Garry Gawyrletz and Mark Edwards of Cominco on May 16 PM. Advised that spill was clearly a reportable incident under provisions of *Spill Reporting Regulation* (i.e.. reportable to PEP) and urged them to do so. I received a page from PEP at 1301 hrs confirming their report. Note that for spills of mercury, reportable quantity is 5 kg. and density is 13.55 (i.e., one litre Hg weighs 13.55 kg).

I also advised Cominco of MOE expectations for site clean-up, confirmation sampling at limits of excavation, management and disposal of excavated wastes, registration of special wastes generated and reporting of results inclusive of cause, response, summary of analytical results characterizing contaminants and confirmation of remediation. Clean-up work is already underway by qualified Cominco personnel. A summary report will be submitted to Nelson MOE upon receipt of analytical data. Report should be available within 2 weeks.

Ed Stockerl, R.P. Bio.
Environmental Safety Officer
Ph. (250) 354-6358 Fax. (250) 354-6367
Ed.Stockerl@gems4.gov.bc.ca

-----Original Message-----
From: Crozier, Rick
Sent: May 16, 2000 3:00 PM
To: Stent, Peter
Cc: Johnson, Carl; Stockerl, Ed; Kinrade, Terri
Subject: Cominco spill

We have had another spill in which Cominco has not immediately notified PEP. This one was a spill of 2-3 gallons of elemental mercury from a gas flue located on Cominco property. The spill occurred at 1047 May 14th, 2000 and was not reported until 1047 May 16,2000. Ed Stockerl has details. Looks again that the company needs some enforcement to help them understand the requirement to report spills in a timely manner.

Rick Crozier
Rick.Crozier@gems1.gov.bc.ca

XR- PE-2753
32920-25/025

ENVIRONMENTAL PROTECTION
MAY 29 1998
NELSON, B.C.

Mr. Carl Johnson, P.Eng.
Head, Industrial Section
Ministry of Environment, Lands & Parks
#401 - 333 Victoria Street
Nelson, B.C.
V1L 4K3

Re: May 3rd, 1998 Report of Cadmium Discharge - Permit PE-02753

Dear Sir:

Pursuant to reporting requirements in Effluent Permit PE-02753, I am submitting the following information pertaining to the cadmium discharge to Columbia River.

On May 5th, 1998 Cominco reported to PEP a discharge of cadmium from Cominco's Zinc Smelter to the Columbia River. The incident occurred May 3rd at 15:43 P.M., and lasted approximately 7 minutes.

The following is a brief description of the event:

The incident occurred while starting the copper filter in the Cadmium Plant at the Zinc Smelter. A heat exchanger is used to cool the process solution. The warm cooling water goes to river. A conductivity alarm is located on the cooling water leaving this process. Soon after start up of the filter, the conductivity alarm was activated. This indicated a leak in the heat exchanger. Upon detection, the operator took immediate action to bypass the filter, minimizing the process solution entering the sewer and limiting the duration of the event to seven minutes.

The assay results were reported late afternoon of May 4th, indicating approximately 15 kgs of cadmium had entered the river via Combined II Outfall. The current Permit limit is 2.75 Kgs/day. The 24-hour composite assay for May 3rd, taken from the Columbia River at Waneta reported the following: Total cadmium 0.0002mg/l, dissolved cadmium 0.0001 mg/l.

To help prevent future recurrences, the Conductivity alarm will be interlocked with the process pump feeding the filter. When the alarm is triggered, the pump cannot be started, or if the pump is operating, it will shut down immediately. This change has been implimented and is operational.

Please contact me if you require additional information.

Yours truly

G.J. Gawryletz
Group Leader, Environmental Monitoring

.cc DHM, MTM, KAC, GFK, WVB, GMB, WAJ, DJP, RHF, CAV,DH,WK,DR

Peter Stent

..o File PE-2753 May 5, 1998

LOSS OF CADMIUM TO COLUMBIA RIVER ON MAY 3, 1998

-Phone call from Gary G received on May 5 early am
-loss of cadmium from cadmium plant to Columbia River via sewer II in excess of permit limit
-permit limit is 2.75 kg/d dissolved cadmium
-loss on May 3 15.64 kg total cadmium, 14.15 kg dissolved cadmium
-according to Gary G , he received the assays of the sewer at the end of the day May 4

- loss resulted from a problem at the Cadmium plant heat exchanger system
-operator started up the copper filter and heat exchanger which is on upper floor of plant
-walked down to control room where he became aware that the conductivity alarm was on
-immediate reaction was to bypass the heat exchanger which eventually stopped the alarm
-total time that the alarm was on was 7 minutes starting at 3:43 pm on May 3
-clean cooling water from the non contact heat exchanger normally flows to 06Z leg of the Cominco sewer system located in "Chocolate Alley"
-there are two conductivity alarms on the discharges from the cadmium plant to 06 sewer
-flow rate in the Columbia River on May 3 was 1530 m3/sec (54,000 cfs)
-a sample (24 hour composite) was taken at Waneta - no analysis is yet available
-the loss was reported to PEP on Tuesday May 5 in the morning
-a formal plant investigation will take place and a report submitted to MOE.

Carl Johnson
Industrial Section Head

Carl Johnson

To File PE-2753 May 5, 1998

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Carl Johnson
Industrial Section Head

BRITISH COLUMBIA

Dangerous Goods Incident Report

DGIR 90353

Category : Code I ☐ Code II ☒

Incident Date/Time : 03/05/98 15:43

MCTS # :

DGIR INLAND

Spiller :
COMINCO

Location :
TRAIL

Area : TRAIL **PEP Region :** SEA **MELP Region :** Kootenay Reg

Material (s) : CADMIUM
Amount (s) : APPROX. 12-15 KGS

Received from :

Caller A :	Caller B :	Caller C :
GARRY GAWRYLETZ		
Org : COMINCO	Org :	Org :
Phone : (250) 364-4731	Phone :	Phone :
Time :	Time :	Time :

Received at PEP by Duty Officer : YVONNE **When Received :** 05 May 98 0954

Affected Environment : ☐ marine ☐ ground ☐ groundwater ☐ lake ☐ stream ☐ atmosphere ■ other (specify) : Columbia River

Type of Spill : ☐ slick ☐ LUST ☐ dumping ■ other (specify) Equip failure

Accidents : ☐ MVA ☐ other transport (specify) : ☐ non-transport (specify) :

Sector : ■ industrial ☐ commercial ☐ crown ☐ public ☐ unknown ☐ other

Cause :
Had a process problem in the cadmium plant that lasted 7 mins. During that time they believe some cadmium solution went to the Columbia River. Has reported it to the local Ministry (Carl Johnson 354-6365). He mentioned it might be worthwhile for MELP to contact him.

Response :
There is an alarm on the tributary. The Operator started the process, walked to the control room, the alarm was on and he immediately bypassed the heat exchanger that caused it. Took samples. Being assayed.

Jurisdiction : ☐ Federal ■ Provincial ☐ Other (specify) :

Task # : **Amount :** $ **Issued to :**

Notifications :

Date and Time	action	agency / contact person	details / additional information
05 May 98 1002	Paged	MELP RC	
05 May 98 1003	Briefed	MELP RO Ed Stockerl	Code 2. Faxed to office.
05 May 98 1014	Briefed	Ken, Washington EMO	Incident #98-0768. Faxed.
05 May 98 1022	Briefed	Linda A/A	SEA Region. Faxed.
05 May 98 1024	Faxed	EPS	
05 May 98 1024	Faxed	MCTS	

Provincial Emergency Program

printed at: 05 May 98 1023

Emergency Coordination Centre
phone: 1-800-663-3456
fax: (250) 952-4872

Garry P Gawryletz
04/01/98 11:26 AM

To: Julia Beatty Spence,
cc: Greg Belland/Cominco Trail Operations,Daniel A Boateng/Cominco Trail Operations,
Subject: Zinc Pressure Leach incident July 23/1997

Julia, regarding the Zinc Pressure Leach incident which occurred July 23 1997. Following is the information you request via the phone. this data is the 24 flow proportional composite from Outfall III. The first line of data are the Permit limits, row starting with Jul 23 is followed by the data. Call me if you require additional information.

Combined Outfall III Daily Analyses & Kilogram Loading

* Indicates Daily Kilogram Loading Permit Limit Exceeded

JULY	Flow		Sus Slds	T/Pb	D/Pb	T/Zn	D/Zn	D/Zn	T Cd	D/Cd	D/Cd	T/As	T/Cu	T/Hg	T/Tl	D/F	Total NH3/N
1997	M³/Day	pH	kg/day	kg/day	kg/day	kg/day	mg/l	kg/day	kg/day	mg/l	kg/day	kg/day	kg/day	kg/day	kg/day	kg/day	kg/day
P.L.	140000	6.5 9.5	2000	128			0.98	90.00		0.03	3.00	11.00	11.00	0.65			
Jul/23	106892	7.7	641.95	21.40	2.14	588.46	4.80	513.56	2.14	0.02	2.14	1.07	3.21	0.32	5.35	203.28	53.50

Carl & File/Permit PE-2753

Mr. Ed C. Stockerl
Environmental Protection Officer
Ministry of Environment, Lands & Parks
#401 - 333 Victoria Street
Nelson, B.C.
V1L 4K3

August 28, 2000

Re: May 14th, 2000 Report of Mercury Incident

Dear Sir:

On May 14th 2000 during a routine plant maintenance shutdown, we experienced a spill of elemental mercury to the ground. The spill occurred at the base of the Sinter stack, located in Cominco's Lead operations. The following note, dated May 17th 2000, is from Dr Robert Stephens, a Cominco Research engineer who oversaw the cleanup and remediation of the area. The note describes the incident and steps taken to minimize the impact to workers and the environment.

> While installing a blind into the Kivcet flue to isolate the Kivcet off-gas system from the Roasters off-gas system, about 100 kg of metallic mercury was released into the environment when the flange was pulled apart. Installing the blind is a routine operation when we shut down Kivcet to perform maintenance work on the gas handling system and we have never before seen mercury at this point. Following this release of metallic mercury, the area around the spill was covered with plastic sheeting to prevent rain or wind further dispersing the mercury. A significant amount of the mercury was collected using a special vacuum cleaner approved for the collection of mercury or directly into paint pails. Some mercury continued to leak from the flange after the blind was installed, and most material was collected in collection containers or on the plastic sheet. However, because the mercury was leaking from the bottom of the flange approximately 8 metres in the air, fine droplets formed as the mercury fell (due to the wind) or when a larger droplet hit a solid surface such as the ground. These fine droplets became well spread around the release point for a distance of about 8 m (as indicated by visual inspection of very fine mercury droplets). The site was secured to prevent entry on Sunday night.
>
> Remediation began on Monday morning (the day after the spill). A plan of attack was devised by approximately 8:00 am and all necessary materials were delivered to the site by 10:00 am. It was decided to collect as much mercury as possible as elemental mercury since this material is returned to Bethlehem Apparatus for recycling and sale. Staff at the Roasters were able to supply three (3) metallic shipping flasks each capable of holding 75 lb (35 kg) of metallic mercury. Metallic mercury was vacuumed from the concrete and easily accessible steel and scaffold surfaces. Large pools (greater than about 15 mm in diameter) of mercury on the ground were also recovered using the vacuum cleaner. Approximately 60 kg of metallic mercury was collected in two (2) flasks and was delivered to the Acid Plant laboratory for shipment to Bethlehem Apparatus on Tuesday.

Z:\garryg\WP\MOE\00-0514Hg.doc

Since mercury was continuing to leak around the blind and further contaminate the site, a hole was drilled in the bottom of the flue immediately uphill of the flange through which mercury could escape. A large plastic funnel has been duct-taped into place and a hose has been taped to the bottom of the funnel to drain the mercury to ground level and then into a plastic bucket. The hose enters the bucket through a suitably sized opening in the bucket lid to minimize air emissions. Some water is also being drained from the duct and this is floating on top of the mercury, further lowering the mercury vapour pressure. The bucket is sitting on a double layer of plastic sheeting in a small depression to act as a secondary containment area. The bucket was drained into a flask on Tuesday morning, and it was found that approximately 4 kg of mercury had accumulated overnight. A permanent system will be designed and installed prior to start up of Kivcet.

Small droplets of mercury could not be collected using the vacuum cleaner as too much dirt was also collected. Following the advice offered by the Chemistry and Environment Group of Cominco Research, metallic zinc dust was spread around the release site to encourage the formation of an amalgam by aproximately 1:00 pm. Elemental sulfur was then spread over the zinc dust in an attempt to mop up any remaining mercury as mercury sulfide (cinnebar) by approximately 3:30 pm. All of the material plus the top 50 mm of soil was then recovered using an industrial vacuum truck operating in the dry collection mode. This work began by 5:00 pm was completed by approximately 9:00 pm on Monday night.

The 3-4 m^3 of material collected in the vacuum truck has been stored in a bin at the roasters feed handling area. A plastic tarp has been placed over the pile to prevent air or water contamination. This material will be treated through the roasters as soon as they restart after the shut down. A sample of this pile was taken on Tuesday morning. The vacuum truck was then pressure washed on the mercury pad.

A number of other materials became contaminated during the containment and cleanup activities, including plastic sheeting, personal protective equipment (PPE), buckets and containers, and some tools. Much of this material had been placed in a dumpster on Sunday. As much metallic mercury as possible was collected from the various materials and also inside the dumpster using the vacuum cleaner. Metallic zinc powder was placed in the bottom of the dumpster to mop up any uncollectible mercury. All of the materials were then placed in double-lined plastic bags and then placed back in the dumpster. These materials will be charged into the furnace prior to start up and will be effectively incinerated when the furnace starts up. All of the mercury will eventually either report to the mercury tower or will be collected in the new duct drain system.

The scaffolding used to install the blind was contaminated with mercury. The steel structure was diassembled and the components have been pressure-washed on the mercury pad. The wooden/aluminum planking has been placed in the marked and covered dumpster, and will also be placed in the furnace prior to start up.

The cleanup crew on Monday consisted of Mr. Gordon McTeer (Kivcet shift leader who responded to the spill on Sunday), Mr. Brian Kurtz (a 4th class steam engineer who has held a variety of supervisory positions at the Swan Hills hazardous waste treatment and disposal facility over a period of five (5) years and has more recently spent two (2) years training operators and supervising the operation of a hazardous waste incinerator in Saudi Arabia), and Dr. Rob Stephens (a Senior Research Engineer with 10 years work experience since graduating as a chemical engineer, and is currently seconded to the Kivcet smelter from Cominco Research to provide technical consulting services). Dr.

Rob Stephens is continuing to spearhead the clean up work in conjunction with Mr. Gordon McTeer.

Mr. Doug Connors periodically sampled the air around the site using a mercury monitor and found the airborne concentrations of mercury to be less than half of the TLV.

Inspection on Tuesday morning indicated that some mercury was still present in the soil immediately below the release point as fine droplets (less than 2 mm diameter). Elemental sulfur was spread over this area and is still on the ground. We will vactor up this material, along with a 50 to 100 mm layer of soil, in the next day or so. There were also very fine droplets of mercury still present on the steel work and some concrete surfaces despite being vacuumed. We are still devising a strategy for picking up this material as the vacuum cleaner does not seem to be very effective. The area is still cordoned off to warn people of the continued presence of mercury.

Options that were discussed for adsorbing the mercury but were ruled out due to recycling or material availability problems included diatomaceous earth and activated carbon. It is likely that the sulfur was too course to be very active and, with the benefit of hindsight, diatomaceous earth may well have proved a better adsorbant.

The plant initiated the Corrective Action Procedure on Tuesday to ensure that all required improvements are implemented prior as soon as practicably possible.

Dr Rob Stephens

Following the work completed in the above note, the contaminated soil was vacuumed using the vacuum truck and delivered to the Zinc Roasters for processing. Soil samples were taken from the remediated area and the Mercury analysis reported 16000 ppm. A second soil remediation program followed. Mercon-X, a commercial product designed to manage mercury contamination, was mixed into the contaminated soil and left for four weeks. The contaminated soil along with the Mercon-X was vacuumed and delivered to the Roasters for processing. Soil samples were taken from the remediated area and the Mercury analysis reported 37 ppm. To help ensure the remaining mercury is stabilized at that site, additional Mercon- X was again mixed into the soil. This area will be capped with cement, for two reasons:

1) To help prevent leaching.
2) To provide a concrete containment pad to prevent additional mercury spills to soil.

The mercury vacuum cleaner was refurbished with new filters and we were then able to vacuum the fine droplets of mercury that remained on the steel and concrete.

Health and hygiene measures during the cleanup were under the direction of Cominco's hygiene department. While working at the spill site the cleanup and remediation crews wore half mask air purifying respirators equipped with mercury vapour cartridges, disposable coveralls and chemical resistant gloves. A Jerome Model 411 Mercury Vapour Monitor was used on site to measure airborne mercury levels during and after the cleanup activities. As reported above, levels were found to be less than 0.010 mg/m^3, which is less than ½ of the occupational exposure level of 0.025 mg/m^3.

A formal investigation was held to review this issue. A Corrective Action (CA 1953, attached) was opened to manage this incident.

Please contact me if you require additional information.

Yours truly

Garry Gawryletz
Group Leader, Environmental Monitoring

.cc DMagoon, WVanBeek, MMartin, BKuffner, KCairns, SKnoerr, RSentis, RFish, CVanelli, RStephens, D Horswill, WKuit, GSaunders, EKniel , CJohnson (all via e-mail)

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Environmental Incident

Request No: 1953

Description: Spill of 100 kg of mercury onto ground

Corrective Action: 1953
Description : Spill of 100 kg of mercury onto ground
Plant : Smeltr Gas&Dust
Location : SO2 blind on Kivcet Flue to Glover Tower
Incident Date : May 14/2000
Time : 08:20
Create Date : May 16/2000
Submitted by : GORD MCTEER
Accepted by : PETER PISTNER
Assigned to : ROB STEPHENS
Required Date : Nov 15/2000

Spill Information:

Firehall notified on : May 14/2000 at: 08:25
Duration of Spill: 30 Hours 0 Minutes
Reported by : ROBERT HORST
Aspect Type : Solid Waste
Volume to Ground : 100.00 KG
Chemical Composition : Metallic Mercury (Hg)
Type & Strength of Material: Metallic Mercury (99+ %)

Detailed Description:

West Kootenay Mechanical was putting in the SO2 Blind as a normal part of the shutdown. After removing the bolts a large amount of mercury dump ed onto the two WKM ironworkers. The WKM rep notified Bob Horst who contacted Gordon McTeer.

Immediately upon seeing the leaking mercury we got two tarps from the warehouse and started to catch the leaking mercury. We next put large sheets of plastic down to catch the mercury coming off the scaffold.

The mercury on the scaffold planks was vacuumed off and placed in paint cans. The scaffold planks were removed and let to drip off the mercury caught in the scaffold planks.

The WKM ironworkers installed the SO2 blind (1330 finished). They sealed the flue with Silicone. No leaks of any kind were evident at this time.

The next day we attempted to remove the scaffold but found several more kg of mercury on the scaffold planks. This was leaking in very small drops from the low point of the flange.

Immediate Action Taken:

The immediate action taken was to catch all mercury which was dripping. We then secured the area with caution tape. We acquired the added PPE we felt this job required such as disposable coverals, rain suit with pants rubber gloves, and on the second day mercury rated respirator cartridges

On the second day we extended the security zone due to increased mercury spray into the roadway. The mercury vacuum was used to clean the scaffold. The mercury from both days was stored in mercury flasks supplied by the roaster.

Request No: 1953
Description: Spill of 100 kg of mercury onto ground

We spread zinc dust on all the soil and pavement which had any sign of mercury. We then worked in a sulphur based material to react with the mercury to prevent fuming. The scaffold was removed with the structural steel parts sent to the mercury decontamination area for cleaning. The scafold planks were condemmed due to mercury damage. All contaminated clothing and equipment was placed in a lugger for disposal in the Kivcet Furnace at startup.

The treated soil below the flue was vactored up and moved to the roaster for treatment. The treated soil has been tarped. The vactor truck was washed out at the decontamination site.

We also drilled a 1/2 inch hole in the flue on the roaster side of the SO2 blind. This drained about 1 kg of mercury. We have installed a funnel with layflat under the drain hole. This temperary drain has been catching small amount of mercury.

We have spread more sulphur mix and will secure the site with tape prior to the end of the shift today. The most severly effected ground directly under the blind location will be vacuumed again in the near future. The area is taped off.

Root Cause Category:
Procedure inadequate
Inadequate Process Design

Suspected Cause (Root Cause Analysis):
The suspected cause is condensation of mercury in the gas handling system. Raw Materials noted that we have been processing high rates of Greens Creek and Lucky Friday concentrates that both contain elevated levels of mercury compared with Sullivan concentrates. The gases are cooled in the gas cleaning section and the temperature is dropped to about 40 degC. If the gas temperature drops further as the gas passes along the flue, then the gas will become saturated with respect to mercury vapour and liquid mercury will condense in the flue.

The mercury liquid had pooled in the bottom of the flue. Because the flue is sloped, the mercury ran back to the lowest point in the flue. This happens to be where the blind is placed in the flue, so the mercury was spilled when the flue was broken apart to install the blind.

Action Plan and Results: (address the Root Cause)

1. Install Mercury Drain Operational Control
Assigned to : ROB STEPHENS
Due by : Jun 5/2000
Completed on : May 29/2000
Task Details :
Doug Coulson arranged for the installation of a mercury drain. A 4 inch lead flange was installed by Brian the Lead Burner. The smelter pipefitters then installed a 2 inch 316L stainless steel line that runs

Request No: 1953
Description: Spill of 100 kg of mercury onto ground

from the flue down to grade. The line will act as a reservoir in which mercury can acculumate and from which mercury can be periodically drained into mercury flasks for shipment to a recycler.

Results:
The drain has been installed. A concrete containment pad needs to be constructed on which the mercury can be decanted from the drain into the mercury flasks.

Closed by:

Action Closing Comments:

PE-2753

Johnson, Carl

From: Beatty Spence, Julia
To: McDonald, Dennis; Stent, Peter; Dabrowski, Alex; Wilhelm, Beth; Smithson, Kate; Crozier, Rick
Cc: Johnson, Carl
Subject: RE: Cadmium Spill at Cominco May 3
Date: Tuesday, May 12, 1998 8:54AM

I should add that Friday before speaking with the US radio station, I did a fast calculation of downstream mixing and dilution and found there would have been minimal (unmeasurable) impact since there was so little material lost over a short period of time.

I also received the sample results Monday, from Cominco's 24 hour composite sample at Waneta. The levels measured for Cd that day at Waneta were 0.00016 mg/L total Cd which is over the CCME Water Quality Guideline for protection of aquatic life (0.00003 mg/L) but well under the drinking water standard of 0.005 mg/L Cd.

Julia Beatty Spence, R.P.Bio.
Head, Environmental Assessment Section
BC Ministry of Environment, Lands & Parks
Kootenay Region
(250) 354-6752 (wk)
(250) 354-6367 (fax)
jbeatty@nelson.env.gov.bc.ca

From: Smithson, Kate
Sent: Friday, May 08, 1998 3:29 PM
To: McDonald, Dennis; Beatty Spence, Julia; Stent, Peter; Dabrowski, Alex; Wilhelm, Beth
Subject: Cadmium Spill at Cominco May 3

13 - 14 kg of Cadmium spilled into the Columbia river from the Cominco Smelter May 3. Cadmium is highly toxic, and staff say this amount is the approximately the equivalent of a 45 gallon drum.Staff say due to flows in the Columbia river right now, impact on drinking water and fish habitat downstream from the spill are likely minimal. The spill is under investigation.

We had a media call from Colville, Washington at 2:30 pm May 8, asking for an explanation of what happened. Julia Beatty Spence provided this information, and dealt with the call.

Copied to Peter Stent April 19/00 PE-2753

BC Environment

ENVIRONMENTAL EMERGENCY INCIDENT REPORT
Dangerous Goods

DGI# 70159

Incident Date: 18 04 00 (Day Mon Yr)

Incident Time: 1700 - 1777 (24 hour)

CATEGORY: (see over) Non-Urgent (Code I) ☐ Urgent (Code II) ☑

SPILLER: Cominco Ltd.

LOCATION: Cominco Smelter Operations Trail

MATERIAL(s): Undetermined at time of Report — Low pH alarm on Combined outfall #3 - Initial report did not indicate pH level

AMOUNT(s): Reported as a Permit exceedance ie. pH lower than limits set out in permit PE-02753 pH later determined to have dropped to ≈ 2.0

RECEIVED FROM: A: Rodger Hamilton MOE (Williams Lake) ⇐ B: MEP Victoria ⇐ C: Howie Byers Cominco Waste Control (250) 364-4518

TIME RECEIVED: (24 hour) 1915

RECEIVED BY: Ed Stockerl DATE: 18/04/00 (Day/ Mon/ Yr) TIME: 1920 (24 hour)

AFFECTED ENVIRONMENT: Marine ___ Ground ___ Groundwater ___ Lake ___ Stream ✓ Columbia River Atmosphere ___ Other ___ (Specify)

TYPE: Slick ___ LUST ___ Dumping ___ Other Plant Upset (Specify)

ACCIDENTS: MVA ___ Other Transport ___ (Specify) Non-Transport ___ (Specify)

SECTOR: Industrial ✓ Commercial ___ Crown ___ Public ___ Unknown ___ Other ___ (Specify)

CAUSE: Cause under investigation.

Cont'd ☐

RESPONSE: Sampled Outfall III and Waneta (Columbia R.) 24 hr samp. 24 sampler
- samples to be analyzed by early PM April 19/00 & results to be reported to MOE Nelson
1936 hrs ECS called Cominco to confirm details - no one available. Left message for Howie Byers / 2110 hrs - Howie returned call (SEE OVER) Cont'd ☑

PEP ZONE	ENV. REG.
SE	4

See Over

JURISDICTION: Federal ✓ Provincial ✓ Other ___ (Specify)

NOTIFICATION:

		Paged	Answered
ESPO	Ed Stockerl	Time: 1920	1920
EESB		Time:	
EPS		Time:	
PEP		Time:	
Other (Specify)		Time:	

TASK NUMBER: 510424
ISSUED TO: Rodger Hamilton

AMOUNT: 50.00

FAXED TO EESB: ___ Date Time

PE-2753

BRITISH COLUMBIA

DGIR INLAND

Dangerous Goods Incident Report

DGIR 20159

Category : Code I ☐ Code II ☒

Incident Date/Time : 18/04/2000 17:00

MCTS # :

Spiller :
COMINCO

Location :
#3 COMBINED OUTFALL TO COLUMBIA RIVER - PERMIT EXCEEDENCE

Area TRAIL PEP Region : SEA MELP Region Kootenay Reg

Material (s) : LOW PH ALARM

Amount (s) : 1700 TO 1723

Received from :

Caller A :	Caller B :	Caller C :
Org : ENV DEPT - COMINCO	Org :	Org :
Phone : (250)365-4318	Phone :	Phone :
Time :	Time :	Time :

Received at PEP by Duty Officer : BERNIE When Received : 18/04/2000 19:07

Affected Environment : ☐ marine ☐ ground ☐ groundwater ☐ lake ■ stream ☐ atmosphere ☐ other (specify) :

Type of Spill : ☐ slick ☐ LUST ☐ dumping ■ other (specify) : Process upset

Accidents : ☐ MVA ☐ other transport (specify) : ☐ non-transport (specify) :

Sector : ■ industrial ☐ commercial ☐ crown ☐ public ☐ unknown ☐ other

Cause :
Had a low PH alarm on 3 combined. Samples taken at 3 combined, and down at Waneta. Alarm stopped at 1723. Assay results will be available tomorrow.

Response :

Jurisdiction : ☐ Federal ■ Provincial ☐ Other (specify) :

Task # : 510424 Amount : $ 50 Issued to : HOWIE BYERS

Notifications :

Date and Time	Action	Agency / Contact Person	Details / Additional Information
18/04/2000 19:13	Paged	MELP RO	
18/04/2000 19:17	Briefed	MELP Rodger Hamilton	Code 2 - faxed
18/04/2000 19:20	Faxed	MELP Nelson - Ed Stockrel	
18/04/2000 19:23	Paged	Ginny, RM	
18/04/2000 19:26	Paged	EPS	
18/04/2000 19:28	Briefed	Washington State	Faxed

Provincial Emergency Program

printed at: 18/04/2000 19:38

Emergency Coordination Centre
phone: 1-800-663-3456
fax: (250) 952-4872

BRITISH COLUMBIA

Incident Update Report

DGIR 20159
UPDATE # 1

TYPE : DGIR INLAND
Subject : LOW PH ALARM
TASK # : 510424 **ASE # :**
Area : TRAIL

Original Entry Logged : 18/04/2000 19:07
PEP Region : SOUTHEAST REGION
MELP Region : Kootenay Region

Location : #3 COMBINED OUTFALL TO COLUMBIA RIVER - PERMIT EXCEEDENCE

Caller : ED STOCKERL
Agency : MELP
Phone # :

This Update Logged : 18/04/2000 21:28
PEP DO : BERNIE

Details :

PH Factor dropped as low as 2.0 at some points during the 23 minutes and averaged about 3.4. Hope to have results of analysis by mid afternoon tomorrow, to include composite sample from the Colunmbia River at Waneta, 24 hour composite sample at combined outfall III and grab samples from the sewer itself.

Response :

Problems :

Notification :

Date / Time	Action	Agency / Contact	Details / Additional Information
18/04/2000 21:34	Faxed	MELP Ed Stockerl	
18/04/2000 21:35	Paged	EPS	
18/04/2000 21:35	Briefed	Ginny, RM	
18/04/2000 21:37	Faxed	MCTS / MELP HQ	
18/04/2000 21:38	Briefed	Wash State EMO - Theresa	Faxed
18/04/2000 22:15	Briefed	EPS Chris LaRock	Faxed

Provincial Emergency Program

This report printed at : 18/04/2000 22:19

Emergency Coordination Centre
phone: 1-800-663-3456
fax: (250) 952-4872

BRITISH COLUMBIA

Incident Update Report

DGIR 20159
UPDATE # 2

TYPE : DGIR INLAND
Subject : LOW PH ALARM
TASK # : 510424 **ASE # :**
Area : TRAIL

Original Entry Logged : 18/04/2000 19:07
PEP Region : SOUTHEAST REGION
MELP Region : Kootenay Region

Location : #3 COMBINED OUTFALL TO COLUMBIA RIVER - PERMIT EXCEEDENCE

Caller : GARY GAWRYLETZ
Agency : COMINCO
Phone # : 250-364-4731

This Update Logged : 19/04/2000 15:17
PEP DO : SUE

Details :

The analytical results from the 24 hour composite are well below permit limits.

Response :

Problems :

Notification :

Date / Time	Action	Agency / Contact	Details / Additional Information
19/04/2000 15:20	Paged	MELP RO	
19/04/2000 15:26	Briefed	MELP RO, Ed Stockerl	Ed advised no exceedence of permit limits applicable to zinc, cadmium and PH. Faxed MELP Nelson.
19/04/2000 15:27	Faxed	EPS/MCTS/MELP HQ	
19/04/2000 15:31	Advised	Linda, A/Admin	Faxed SEA for Ginny, RM
19/04/2000 15:31	Faxed	Washington State, EMO	

Provincial Emergency Program

This report printed at : 19/04/2000 15:32

Emergency Coordination Centre
phone: 1-800-663-3456
fax: (250) 952-4872

Cominco Ltd.
Trail Operations
Trail, B. C.
V1R 4L8

FAXCOM COVER SHEET

Xerox Telecopier 3010

Date: April 19, 2000

Fax No: (250) 354-6367
To: Mr. Carl Johnson
Firm: Ministry of Environment
City: Nelson B.C.

From: Garry Gawryletz
Environmental Group Leader
P.O. Box 1000
Cominco Limited, Trail Operations
Trail B.C.
V1R 4L8
Telephone: (250) 364-4731
Fax: (250) 364-4384
e-mail garry.gawryletz@Trail.Cominco.Com

TOTAL NUMBER OF PAGES INCLUDING THIS COVER PAGE IS 04
If you did not receive all pages, please call (250) 364-4731

Carl, regarding the C-III low pH which occurred April 18th at 1700 hours. I sending you the initial 24 hour composite assay results. The pH was not completed, but I'm sending you the 24 hour pH instrument average. I've left you a couple of phone message explaining this and the source of the problem. An inhouse investigation will be conducted followed up with a CA to track the problem. If you would like to discuss further, please contact Mark or myself.

Thanks

Garry J. Gawryletz
Group Leader Environmental Monitoring
E-mail: garry.gawryletz@trail.cominco.com
Tel: (250)364-4731 Fax: (250)364-4384

**** WC ********** GARRY ********** 04/1..00 15:26:35 ****

__ Comments Reports Documents reSelect Extra Print Help
IMM1802B Plant Logsheet System Wednesday 19 April 2000
Input Log Sheet 236 Daily Enviro Report 15:26
Plant ENV Environmental Monitoring More: -+
Action Limits Date 2000/04/19 Time 11 00

		Lower	Upper	UOM	19Apr 07:00	18Apr 07:00	17Apr 07:00	16Apr 07:00	15Apr 07:00
O	Flow C-II	0	125000	M3/DAY	81699	81088	63498	96335	94128
					18Apr 24:00	17Apr 24:00	16Apr 24:00	15Apr 24:00	14Apr 24:00
O	pH - C II	6.50	8.50	PH	7.90	7.70	8.00	7.80	7.70
O	C II Sus/Slds	0.0	1925.0	KG/DAY	245.1	324.4	127.0	770.7	376.5
O	C II T/Pb	0.00	100.00	KG/DAY	0.41	3.24	1.27	6.74	4.71
O	C II Diss/Zn	0.00	1.40	MG/L	0.16	0.41	0.40	0.38	0.42
O	C II Diss/Zn	0.00	75.00	KG/DAY	13.07	33.25	25.40	36.61	39.53
O	C II Diss/Cd	0.000	0.060	MG/L	<0.010		<0.010		0.005
O	C II Diss/Cd	0.000	2.750	KG/DAY	0.408		0.317		0.471
O	C II T/As	0.00	5.00	KG/DAY	0.41	0.41	0.32	0.48	0.47
O	C II T/Cu	0.00	6.00	KG/DAY	0.41	0.41	0.32	0.48	0.47
O	C II T/Hg	0.0000	0.1500	KG/DAY	Unvlbl	0.0041	0.0032	0.0048	0.0047
					19Apr 07:00	18Apr 07:00	17Apr 07:00	16Apr 07:00	15Apr 07:00
	OUTFALL III				Apr 18				
O	C III Flow	0	140000	M3/DAY	93138	89443	64900	88988	97904
					18Apr 24:00	17Apr 24:00	16Apr 24:00	15Apr 24:00	14Apr 24:00
O	C III pH	6.50	9.50	PH	8.20	8.60	8.50	8.60	8.50

Readings in white have comments attached. More..
Enter F1=Help F3=Exit F5=Refrsh F7=Bkwd F8=Fwd F10=Actions
F12=Cancel F19=Left F20=Right

**** WC ********** GARRY ********** 04/1. J0 14:41:53 ****

__ Comments Reports Documents reSelect Extra Print Help
IMM1802B Plant Logsheet System Wednesday 19 April 2000
Input Log Sheet 236 Daily Enviro Report 14:41
Plant ENV Environmental Monitoring More: -+

Action Limits Date 2000/04/19 Time 11 00

		Lower	Upper	UOM	18Apr 24:00	17Apr 24:00	16Apr 24:00	15Apr 24:00	14Apr 24:00
O	C III Sus/Slds	0.0	2000.0	KG/DAY	Unvlbl	178.9	129.8	533.9	489.5
O	C III T/Pb	0.00	100.00	KG/DAY	Unvlbl	5.37	3.89	8.90	9.79
O	C III Diss/Zn	0.00	0.90	MG/L	0.35	0.13	0.16	0.13	0.17
O	C III Diss/Zn	0.00	90.00	KG/DAY	32.60	11.63	10.38	11.57	16.64
O	C III Diss/Cd	0.000	0.030	MG/L	<0.010		<0.010		0.002
O	C III Diss/Cd	0.000	3.000	KG/DAY	0.466		0.324		0.196
O	C III T/As	0.00	15.00	KG/DAY	Unvlbl	0.45	0.32	0.44	0.49
O	C III T/Cu	0.00	8.00	KG/DAY	Unvlbl	0.45	0.32	0.44	0.98
O	C III T/Tl	0.00	30.00	KG/DAY	Unvlbl	4.47	3.24	8.90	29.37
O	C III T/Hg	0.0000	0.5500	KG/DAY	Unvlbl	0.0358	0.0195	0.0356	0.0098
					19Apr 07:00	18Apr 07:00	17Apr 07:00	16Apr 07:00	15Apr 07:00
	OUTFALL IV								
O	C-IV Flow	0	97000	M3/DAY	25745	27430	18967	26239	24879
					18Apr 24:00	17Apr 24:00	16Apr 24:00	15Apr 24:00	14Apr 24:00
O	C-IV ph	6.00	8.00	PH		7.40	7.60	7.60	7.50
O	C-IV Diss/Zn	0.00	50.00	KG/DAY	4.63	9.05	5.88	8.40	11.44
O	C-IV D/NH3/N	0.00	25.00	MG/L	8.00	5.00	8.00	10.00	13.00
O	C-IV D/NH3/N	0.00	1500.0	KG/DAY	205.96	137.15	151.74	262.39	323.43

Readings in white have comments attached. More..
Enter F1=Help F3=Exit F5=Refrsh F7=Bkwd F8=Fwd F10=Actions
F12=Cancel F19=Left F20=Right

**** ACS ********** GARRY ********** 04/1 /00 14:41:28 ****

HARP RETRIEVAL DISPLAY PAGE 01

DATE/TIME	CWC AI9006 PH -010	
04/17/00 06:54	7.6599	
04/18/00 06:54	7.8471	
04/19/00 06:54	7.7706	-> AVG 7 AM Apr 18 - 7 AM Apr 19

PF10 RETURN TO MENU

PE-2753

ENVIRONMENTAL PROTECTION
MAY 14 1998
NELSON, B.C.

Cominco

Mr. Carl Johnson, P.Eng.
Head, Industrial Section
Ministry of Environment, Lands & Parks
#401 - 333 Victoria Street
Nelson, B.C.
V1L 4K3

Re: April 7th, 1998 Report of Granulated Slag Discharge - Permit PE-02753

Dear Sir:

Pursuant to reporting requirements in Effluent Permit PE-02753, I am submitting the following information pertaining to the Slag discharge to Columbia River.

The following is a brief description of the incident:

On April 8th, 1998 Cominco reported to PEP a discharge of Barren Slag from Cominco's Lead Smelter to the Columbia River. The incident occurred April 7th at 1 P.M., and lasted approximately 5 minutes.

The incident occurred while emptying solution from the Granulated Slag tank using a Vacuum Truck. The solution was transferred via the vacuum truck from the Granulated Slag tank to the "flue" tunnel. (Solution fed into the flue tunnel eventually is processed in the Effluent Treatment Plant). A number of transfers were conducted without incident. However, during the last transfer, some barren slag was picked up from the bottom of the tank and transferred into the vacuum truck. Dumping of this slag into the flue tunnel would have caused downstream equipment and process problems. Therefore, the solution in the vacuum truck was decanted into the flue tunnel and the remaining slag was unloaded in the slag unloading area, which has some containment.

It was believed that all solution had been decanted from the vacuum truck before the slag was unloaded. However, due to the truck's storage design, with multiple compartments, it is difficult to judge the quantity of contents. When the slag was unloaded the non-visible solution remaining in the vacuum truck was also unloaded. Some of this slurry over-flowed the contained area and flowed into 05 sewer to the Columbia River. An approximate estimate of the amount of slag to the river is between 1 and 1.5 tonnes. Analytical results of material: Cu 0.38%, Zn 3.0%, Pb 0.01%, Fe 31.4%, S 0.1%

The following action plans are a result of our internal environmental investigation:

Slurry from this tank will only be unloaded where the overflow will go to our Effluent Treatment plant.
No vactor trucks or trucks containing unknown amounts of water or solution will be unloaded at the slag unloading area.
A documented procedure will be established for transferring solution from the Granulated Slag tank to the Effluent Treatment plant.
The impact to the environment of this incident and the procedure for proper transfer to the environment will be communicated to all employees involved in the movement of this material.

Please contact me if you require additional information.

Yours truly

G.J. Gawryletz
Group Leader, Environmental Monitoring

.cc DHM, MTM, NMB, GFK, WVB, GMB, PCP, LBG, RHF, CAV

BRITISH COLUMBIA

File: 19990657

September 13, 2000

Doug Magoon,
General Manager
Cominco Ltd.
Box 1000
Trail, BC V1R 4L8

Dear Doug Magoon:

Re: PE-05309 discharge of Aqua-Ammonia to the Columbia River via Outfall IV on March 28, 2000

On March 28, 2000, contractors of CEDA Mechanical of Sherwood Park, Alberta, while trying to repair a section of line at Cominco, caused the release of up to 1.9 tonnes of aqua-ammonia solution to the Columbia River. This release was not reported to the Provincial Emergency Program until well after the incident which violates Section 12(5) of the Waste Management Act.

After considering all available information and contributing circumstances, including the high risk to employee and public safety, it has been decided to **warn Cominco Ltd. of this violation.**

I must advise you that Cominco is required to comply with all permit conditions and that any future violation may be dealt with in a more severe manner.

If you have any questions about this issue, please call.

Sincerely,

Peter Stent
Conservation Officer

PS:ds

cc: R. Crozier

attachment: WAR **49232**

Ministry of Environment, Lands and Parks
Environment and Lands
Kootenay Region
Mailing/Location Address:
401 - 333 Victoria Street
Nelson BC VIL 4K3
Telephone: (250) 354-6333
Facsimile: (250) 354-6332
PP Facsimile: (250) 354-6367

PE - 02751

BRITISH COLUMBIA

Ministry of Environment, Lands and Parks

FAXED April 14/00

Environment and Lands
Kootenay Region

FAX SHEET

Date:	Friday, April 14, 2000	# of pages (including this sheet)	3
To:	**John Carlton**	Fax #	**(360) 902-2946**
Office:	Washington Dept. of Fish & Wildlife	Phone #	(360) 902-2622
From:	**Ed Stockerl, R.P. Bio.** Kootenay Region - Region 4	Phone #	(250) 354-6358
		Fax #	(250) 354-6367
Re:	Spills to Columbia River from Cominco Ltd. Operations at Trail, British Columbia		

SPECIAL INSTRUCTIONS:

Hi John;

As per your telephone request in late March, I have forwarded a brief summary of spill events which have occurred at Cominco Ltd. operations located at Trail, BC. Only spills, which resulted in discharge to the Columbia River, are included in the summary. Note that only the spill events indicated by bold type were reported to the Provincial Emergency Program (PEP). These are the only spill incidents, which would have been passed on to the EMO office in Olympia, Washington.

I trust that the attached information satisfies your informational needs. If you have any questions, don't hesitate to call me at (250) 354-6358.

Yours truly,

Ed Stockerl, R.P. Bio.
Environmental Safety Officer
Pollution Prevention
Nelson

URGENT: No CONFIDENTIAL: No ORIG. IN MAIL: No

Material contained in this fax transmission may be confidential, and should only be delivered to the addressee. If you do not receive all pages, please call (250) 354-6355.

BRITISH COLUMBIA

Ministry of Environment, Lands and Parks

Environment and Lands
Kootenay Region

MEMORANDUM

To: File 32926-20/025
(Spills/Cominco)

Date: April 14, 2000

File: PE-02753

Re: Summary of Discharges to the Columbia River from Spill and Plant Upset Incidents at Cominco Operations, Trail, BC – 1998 to April 13, 2000

I have recently reviewed file information concerning Cominco spills and/or plant upsets. The following is a brief summary of incidents which resulted in uncontrolled discharges to the Columbia River from the Company's Trail, BC operations. Note that this summary addresses two categories of discharges. The first category relates to discharges deemed to be reportable to PEP under requirements of *the Spill Reporting Regulation* (B.C. Reg.263/90) of the *Waste Management Act*. These incidents are highlighted below in bold. The second category of discharge relates to plant upsets where the reporting of discharges to PEP is otherwise exempted by provisions of permit allowances or approved spill management plan. For instance, the discharged volume may not exceed daily loading limits set out in operational permits. While reported to this office, these incidents would not be reportable to PEP. Discharges fitting in this category are noted below in italic. A Chronology is provided for the period of January 1, 1998 to April 1, 2000. Indicated dates pertain to the date of occurrence and/or the date incident was reported. Note that on numerous occassions, spill incidents at Cominco are not identified until analytical results are available for 24-hour composite samples collected each day from specific sewer outfalls.

March 7/98 - Arsenic (total) discharge (23 kg loading for day) to Columbia River from Copper Products Plant via effluent treatment plant. An additional 34 kg had been contained within the plant.

April 14/98 - Barren Slag discharge (approx. 1 ton) from Lead Plant - most went to ground - some loss to Columbia River.

May 5/98 - Cadmium discharge (approx. 13 kg loading for day) from Cadmium plant via failed heat exchanger – discharged to Columbia River. River sampling at Waneta conducted on date of discharge determined total cadmium concentration (0.0002 mg/L) was considerably below drinking water standard of 0.005 mg/L.

June 2/98 - Arsenic (total) discharge (20.36 kg loading for day) to Columbia River via Effluent Treatment Plant (ETP). Report indicated source was spill of sodium arsenate solution from the Lead Copper Products plant. Subsequent inspection determined a leak had developed in a filter. Spill entered ETP from filter sump due to improperly set valve.

July 21/98 - Thallium discharge (129 kg loading for day) to Columbia River via combined outfall III. Incident was discovered from analytical results of sewer III 24-hour composite

sample.

July 30/98 - Copper discharge (15 kg loading for day) to Columbia River via combined outfall II. Incident discovered from analytical results of 24-hour composite sample. Cause of incident was heavy rains and capture of smelter site residues within surface runoff which subsequently entered sewer outfall II.

August 20/98 - Slag and effluent containing lead, zinc, water. Source was Kivcet granulation area of lead smelter. Majority of discharge to river was effluent (25, 000 litres). Containment provisions prevented most of slag from reaching the river. River water samples did not indicate any measureable environmental impact.

November 24/98 - Arsenic discharge from Copper Products Plant. Discharge was initially estimated as 15-20 kg. However, based on analysis of 24 hr. composite sewer samples, discharge was later confirmed to be only 2.55 kg. This volume is well below permit allowance and would not have required reporting to PEP.

December 26/98 - Cadmium and Zinc discharge (6.5 kg. of cadmium and 177 kg. of zinc) to Columbia River. Incident occurred during pumping of the Zinc Sulphide Leach Plants North Pond to the Effluent Treatment Plant Lagoon.

March 24, 25 & 27/99 - Dissolved Cadmium discharge (3.53, 4.01, 3.32 kg/day respectively) from Zinc Fume Leach Plant.

July 24/99 - Zinc fume contaminated wash water discharge (approx. 450 L) to ground and Columbia River. An estimated 180 litres entered the river. Water from washing of walls overflowed a containment berm. Contaminant issues involved dissolved lead and zinc.

September 24/99 - Cadmium discharge (5.8 kg - total loading for day) from Zinc Fume Leach Plant.

February 9/00 - Cadmium loss (3.7 kg dissolved) to Columbia River from failed heat exchanger at Sulphide Leach Plant.

February 20/00 - Dissolved zinc (350 kg) and dissolved cadmium (10.5 kg) discharge to Columbia River as result of cracked pipe at Lead – Zinc operations.

Ed Stockerl, R.P. Bio.
Environmental Safety Officer
Pollution Prevention
Nelson

BRITISH COLUMBIA

Your File: PA-2690,91,92; PE-2753,5309
Our File: PA-2690,91,92; PE-2753,5309

August 10, 2000

Cominco Ltd.
Box 1000
Trail, BC V1R 4L8

Attention: Gawryletz, Group Leader Monitoring

Dear Garry:

Re: April 2000 Data Submission

This will acknowledge the submission of monitoring data required by the above noted permits.

The toxic nature of Outfall III is noted at LC50 of 14%. You are reminded of the company's commitment to achieve non-acutely toxic effluent by December 31, 2000.

When the data associated with the toxicity testing is examined in detail it appears that there may be some problem with the reporting or analysis.

Mar 31, III, Zn is reported as 693 ug/l (no units are provided but these are correct I believe) and after testing for toxicity on April 4 III Zn is reported as 1810 ug/l. Is it possible that the metals content can go up?

Similarly;
Mar 31, III, Cd is reported as 24.4 ug/l and after testing for LC 50 the sample shows 14.7 ug/l – is there that much precipitation occurring during the 4 days of testing?

I also question why mercury was not analyzed for II and III Outfalls only for IV.

Yours truly,

Carl Johnson, PEng
Industrial Section Head

Ministry of Environment, Lands and Parks
Environment and Lands
Kootenay Region
Mailing/Location Address:
401 - 333 Victoria Street
Nelson BC VIL 4K3
Telephone: (250) 354-6333
Facsimile: (250) 354-6332
PP Facsimile: (250) 354-6367

Mr. Carl Johnson, P.Eng.
Head, Industrial Section
Ministry of Environment, Lands & Parks
#401 - 333 Victoria Street
Nelson, B.C.
V1L 4K3

Re: March 6th, 1998 Report of Total Arsenic - Permit PE-02753

Dear Sir:

On March 7th. 1998 Cominco reported to PEP a discharge of material to the Columbia River. The following information explains the events which occurred up to and during the incident.
At 12:30 on March 6th. 1998 at the Copper Products plant, approximately 11m3 of Caustic Autoclave feed spilled from a ruptured tank and flowed into the basement. The area sump which pumps to the ETP lagoon was immediately shut down, also a berm was built, both were done to try and contain the solution to the plant. Some solution escaped via a trough to an exterior sump and was pumped into the ETP lagoon. Approximately 7 m3 were contained in the plant, allowing approximately 4 M3 to end up in the lagoon, the plume was seen to extend into the middle of the lagoon.

Analysis of solution was:
25% caustic, assaying : (Total /As 75 g/l, Total/Sb 100g/l)

ETP Operations immediately reduced flow to C-III and added extra Fe to lagoon (Fe co-precipitates As).

Combined-III sample analysis was received March 7th at 1700 hours, approximately 23 kg/day of T/As went to the river, Permit Limit is 15.0 kg/day. The incident was reported to PEP March 7th.

An internal investigation will be conducted.

Regards

Gary Gawryletz
Environmental Group leader
Cominco Ltd.
Trail B.C.

76750-40/Cominco/E.E.F.

Cominco

Regional Manager
Environmental Protection
#401 - 333 Victoria Street
Nelson, B.C.
V1L 4K3

ENVIRONMENTAL PROTECTION
APR 18 2000
NELSON, B.C.

April 7, 2000

Attention: **Mr. Carl Johnson, P. Eng.**
Head Industrial Section

Reference: **Permits PE-02753 PE-05309**

Dear Sir:

In accordance with the monitoring programs associated with Effluent Permits PE-02753, PE-05309, I am submitting the required effluent and receiving water data for February 2000.

The following monitoring data in report format is included in this submission:

- NAPS schedule 24-hour composite sample results for Outfall II, Outfall III and Outfall IV.
- NAPS schedule grab sample results from Topping (Stoney) Creek.
- Monthly grab sample results from the Columbia river.

Computer coded monitoring results have been E-mailed to your office.

Yours truly,

G.J.Gawryletz
Group Leader, Environmental Monitoring
Cominco Ltd.

Attachments:

Effluent Permit PE-02753: Combined Outfall II
All NAPS required sampling results are under permit limits for February except for 18 February we exceeded the permit limits for Dissolved Cadmium concentration and loading. For further information, please refer to letter sent to MOE c/o Carl Johnson dated March 27th 2000.
A second Cadmium exceedance occurred on a non NAPS day, February 9th. Again for further information, please refer to letter sent to MOE c/o Carl Johnson dated March 27th 2000.

Effluent Permit PE-02753: Combined Outfall III
All NAPS required sampling results are under permit limits for February.

Permit PE-05309 - Combined Outfall IV
All NAPS required sampling results are under permit limits for February.

Cominco Ltd. Trail Operations Combined Outfall II
Waste Management Branch Effluent Permit PE-02753
2000 Compliance Monitoring

Date: 04/07/2000

(Tributaries T-1, T-3, T-4, T-5 & T-6)

Sample Date	Flow (m3/day)	TMax Deg C	TMin Deg C	TAvg Deg C	pH	Sus/Slds (kg/day)	T/Pb (kg/day)	Diss/Pb (kg/day)	T/Zn (kg/day)	Diss/Zn (mg/l)	Diss/Zn (kg/day)	T/Cd (kg/day)	Diss/Cd (mg/l)	Diss/Cd (kg/day)	T/As (kg/day)	Diss/As (kg/day)	T/Cu (kg/day)	Diss/Cu (kg/day)	T/Hg (kg/day)
02/06/2000	86429	20.2	17.3	18.8	7.70	43.2	0.43	0.43	64.0	0.44	38.0	2.07	0.021	1.82	0.43	0.43	0.43	0.43	.0086
02/12/2000	98228	20.3	16.9	18.7	7.80	49.1	0.98	0.49	49.1	0.29	28.5	0.196	0.002	0.196	0.49	0.49	0.49	0.49	.0049
02/18/2000	87208	21.6	18.7	20.1	7.50	43.6	1.74	0.44	349	4.00	349	10.46	0.120	10.46	0.44	0.44	0.87	0.44	.0087
02/24/2000	100287	18.7	16.9	18.1	7.80	50.1	0.50	0.50	35.1	0.22	22.06	0.201	0.002	0.201	0.50	0.50	0.50	0.50	.0100

Cominco Ltd. Trail Operations Combined Outfall III

Date: 04/07/2000

Waste Management Branch Effluent Permit PE-02753

2000 Compliance Monitoring

(Tributaries T-8, T-9, T-10)

Sample Date	Flow (m3/day)	TMax Deg C	TMin Deg C	TAvg Deg C	pH	Sus/Slds (kg/day)	T/Pb (kg/day)	Diss/Pb (kg/day)	T/Zn (kg/day)	Diss/Zn (mg/l)	Diss/Zn (kg/day)	T/Cd (kg/day)	Diss/Cd (mg/l)	Diss/Cd (kg/day)	T/As (kg/day)	Diss/As (kg/day)	T/Cu (kg/day)	Diss/Cu (kg/day)	T/Hg (kg/day)	T/Tl (kg/day)	DissTl (kg/day)	Diss/F (kg/day)	T/NH3/N (kg/day)
Feb/06/00	95571	22.2	20.9	21.4	8.00	47.8	3.82	2.87	15.29	0.13	12.42	0.765	0.007	0.669	0.48	0.48	0.48	0.48	.0096	4.78	4.78	287	95.6
Feb/12/00	96160	22.1	20.3	21.3	8.20	48.1	2.88	1.92	13.46	0.12	11.54	0.769	0.007	0.673	0.48	0.48	0.48	0.48	.0192	4.81	4.81	260	192
Feb/18/00	89784	22.0	17.7	20.6	8.30	44.9	3.59	1.80	16.16	0.16	14.37	0.628	0.007	0.628	0.90	0.90	0.90	0.45	.0539	4.49	4.49	251	269
Feb/24/00	93401	21.2	18.9	20.1	8.00	46.7	3.74	2.80	16.81	0.14	13.08	0.747	0.007	0.654	1.87	1.87	2.80	1.87	.2242	4.67	4.67	234	93.4