

**Swan Hills Special Waste
Treatment Centre Human
Health Impact Assessment**

APPENDICES

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**Swan Hills Special Waste
Treatment Center
Human Health Impact Assessment
Volume 2: Technical Appendices**

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Prepared by
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Alberta Health
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Appendix A SHWTC Background Information

1. Site Description

1.1 Location

The BOVAR Waste Management system, Swan Hills Waste Treatment Centre (SHWTC) is located approximately 12 kilometres (km) northeast of the Town of Swan Hills, near the geographic centre of Alberta. A two-lane road provides access to the Centre from Highway 33. The operating facilities are bounded by a security fence.

2. Geographic Characteristics

The SHWTC site is situated on a centrally-located linear ridge trending northwest-southeast across the site [CSA 1989]. Surficial geologic materials comprise a clay loam textured glacial till mantle (average 10 cm thickness). The low hydraulic conductivity and limited surface runoff result in a near-surface perched water table. The Coutts and Saulteaux rivers nearby the site join and flow into the Akumu River, the Lesser Slave River and ultimately into the Athabasca River. The nearest lake is Chrystina Lake (Windey Lake), approximately 1.5 km northeast of the site. The heavy forest and underbrush growth give rise to a poorly-developed surface drainage.

Three types of soils occur in the SHWTC site and surrounding area [CSA 1989]. Shallow acidic forest soils (less than 50 cm) are called Eluviated Mesisols Brunisols which develop in well- or moderate-well-drained situations. This type of soils accounts for 45% of the surrounding area. The second type of soil, Rego-Humic Gleysols which develop in poor-drained situation, dominates in the site (70%) and the surrounding area (50%). Organic soils, Terric and Typic Mesisols, occur on scattered sites throughout the area.

1.3 Vegetation

The vegetation in the area is classified as the Lower Foothills Section of the Boreal Forest. There are five broad community types of vegetation in that area: (1) Aspen, Lodgepole Pine

and/or White Spruce-Fir/Reedgrass, (2) Lodgepole Pine/Moseberry/Feathermoss, (3) Black spruce/Labrador Tea/Feathermoss, (4) Black Spruce/Sedge-Cloudberry/Sphagnum, and (5) Sedge [CSA 1989]. The third and fourth community types dominate in the area. Labrador tea is extensively used as a medicinal plant by First Nations People in the surrounding area. This plant is selected for ecological monitoring.

1.4 Mammal

Forty-one species of mammals have been observed within the Swan Hills area [Penner and Associates, 1990]. The most common species for big game hunting are moose, deer, black bear and grizzly bear. The most common furbearing mammals include red squirrels, beaver, muskrat, weasel, coyote, marten, lynx, mink, fisher, and, in smaller numbers, otter, fox, wolf and wolverine. In addition, numerous small mammals and bird species are residents of the surrounding area. The Red-backed vole is the most common species and is regularly captured for ecological monitoring.

1.5 Fish

The data from the Northern River Basins study showed that the species of the sport fish harvest include walleye, northern pike, rainbow trout, lake whitefish, perch and bull Trout [MacLock and Thompson 1996]. First Nations People usually catch northern pike, walleye, lake whitefish, goldeye and lake trout. Eastern Brook trout from Chrystina Lake is selected for ecological monitoring.

1.6 Climate

Wind directions in the area are generally from the west or northwest. Southwest winds often occur under stable atmospheric conditions. The average wind speed is about 14 km/h. The annual mean total precipitation is about 520 mm, half of which occurs in June, July and August. The annual average lake evaporation is about 561 mm. The average temperature is

about -18 °C in January and +15 °C in July. Average frost free days number less than 80 days (after June 5 and before August 25).

2. General History

2.1 Background of SHWTC

The Swan Hills Waste Treatment Centre began operation in 1987 to treat and dispose of hazardous and special waste generated in Alberta and the rest of Canada. The SHWTC is owned by the BOVAR Waste Management System which is responsible for the identification of special waste, transport to SHWTC, and treatment and safe disposal. The facility is operated by Chem-Security (Alberta) Ltd., a wholly owned subsidiary of BOVAR, Inc.

The major responsibilities of SHWTC are waste reception, waste preparation, waste storage, transformer cleaning, incineration, physical and chemical treatment, stabilization of residues, deep well injection and secure landfill cells [CSA 1989]. In order to destroy the organic materials contained in the liquids, solid wastes and sludges, a rotary kiln and two rocking kiln incinerators are installed to treat the received wastes. Combustion by-products are scrubbed to remove particulate matter and acidic gases prior to being discharged to the ambient air through the stack. The SHWTC has disposed of over 120 million kilograms of PCB wastes since beginning operation.

2.2 The October 16 1996 Incident

Environmental monitoring is carried out by Chem-Security. Alberta Environmental Protection participates in meetings with the company and their consultants to review monitoring results annually. During 1996, several odour incidents, accidental emissions and spills were reported by the company. On October 16, 1996, a flue gas stack emission survey was conducted by the company, as a part of a non-routine investigation of a previous odour incident. A failure of an isolation flange and expansion joint that separated process gases from flue gases in the transformer furnace was discovered. The malfunction had caused the flow of a portion of

process gases containing polychlorinated biphenyls (PCBs), polychlorinated dibenzo-p-dioxins (PCDDs, dioxins) and polychlorinated dibenzofurans, (PCDFs, furans) into the flue gas stack. During the eight hour period of the stack survey, large quantities of the above compounds were released into the ambient air. It is not known for how long the malfunction may have been occurring. The furnace has been shut down since the incident.

2.3 Extent of Contamination by the Oct. 16, 1996 Incident

Stack Emission Test Results

Initial testing was performed by Environ-Test Laboratories (ETL). Subsequently, the company contracted a second analytical laboratory, Wellington Laboratories (WL) to conduct a verification analysis on the extract from the MM5 train sample. The results from WL showed a large discrepancy with PCBs, PCDDs and PCDFs emission rates originally provided by ETL. ETL re-analyzed the samples, and concluded that a dilution error had occurred. During the eight hour period of monitoring, a large quantity of PCBs, dioxins/furans had been found in stack samples.

Ground Level Concentrations

Predicted ground level concentrations using a Screen3 dispersion model were computed based on the October 16, 1996 meteorology and full screening meteorology. The use of full screening methodology results in significantly higher values.

Wildlife Monitoring Results

In November, 1996, wildlife samples (deer, moose, grouse and beaver) were taken by Alberta Environmental Protection, in the vicinity of the SHWTC, and analyzed for PCBs, PCDDs and PCDFs. The level of PCBs in deer muscle sample was high compared to a control deer.

Worker Monitoring Results

Blood concentrations of PCBs, PCDDs and PCDFs were measured in three workers approximately seven weeks following the accidental release of transformer furnace emissions on October 16, 1996. The levels of PCBs in blood were within medical guidelines proposed by Alberta Labour.

2.4 The Public Health Advisory by Alberta Health

On December 4, 1996 Alberta Health was officially notified by Alberta Environmental Protection of the October 16, 1996 incident. On December 6, 1996, the results of the stack survey and laboratory tests of wildlife in the SHWTC area were forwarded to Alberta Health.

Based on the estimated magnitude of the emissions and the elevated levels of PCBs, PCDDs and PCDFs in the tested deer, a Public Health Advisory was issued by the Provincial Officer of Health on December 13, 1996. The consumption advisory extended to wild-game and fish caught in an area within a 30 km radius of the SHWTC.

3. Land Use and Residence

3.1 Land Use

No agricultural activity occurs within the Swan Hills area. The major land uses in the Swan Hills area are forestry and oil and gas exploration. Outdoor recreational and traditional activities occur within the surrounding area. Hunting, trapping and fishing within the area are part of a traditional lifestyle for First Nations People.

Recreational activities occur at Chrystina Lake, Freeman Lake, and the Freeman River which are in the vicinity of the SHWTC. Chrystina Lake provides activities like camping, fishing, canoeing, hiking and swimming. Freeman Lake provides camping, fishing and canoeing. The Freeman River provides camping and fishing. Based on the data from the Northern River

Basin Study, there are 1 176 trips per year in Chrystina Lake, 2 249 trips per year in the Freeman Lake, 984 trips per year in the Freeman River and 1 205 trips per year in the Town of Swan Hills.

Hunting

Based on 1991 data reported by Fish and Wildlife Division, about 20% of licensed hunters in Alberta hunted big game in the Swan Hills area from 1985 to 1989 [Penner and Associates, 1991]. The average number of hunting days were 5.8. Moose is the major species sought by licenced hunters. Resident hunters typically pursue mule and white-tailed deer. Local First Nations People from Slave Lake, Wabasca and other reserves have the legal right to hunt and fish in the Swan Hills area without requiring a licence. Big game harvest by First Nations Peoples is not restricted by seasons and may occur through the year, especially in mid- and late-winter, March and April. Moose is the major big game species sought. Fish and Wildlife Officers estimate that hunting of moose by this group may be equal to those by resident hunters.

Trapping

There are 72 Registered Fur Management Areas in the drainage near the SHWTC. A total of 97 trappers were registered in 1990-1991. No data are recorded on trapping activity by First Nations People. Meat from furbearing animals may be occasionally used as food by trappers.

Fishing

Three fishing sites, Chrystina Lake, Freeman Lake and the Freeman River, are located within the Swan Hills area [MacLock and Thompsom 1996]. The Northern River Basins study showed that fishermen take an average of 10.8 trips per year (2 days per trip). Average consumption of fish by fishermen is 13.6 kilograms per year. About two-thirds of them eat less than 10 kg of fish per year. A total of 3% of fishermen eat more than 100 kg of fish per

year.

3.2 Residence

Swan Hills was incorporated as a town in 1967, and had a population of about 2 200 in 1996. The oil, natural gas, coal and timber resources and special waste treatment industry form the economic base of the town. The majority of residents are employees of these industries. Drinking water comes from the Freeman Lake which is located 11 km southwest of the town.

There are several larger communities at distances greater than 60 to 80 km to the south and north of the centre. Whitecourt is located approximately 70 km south on Highway 32. Fort Assiniboine is about 60 km south-east on Highway 33. Kinuso and Slave Lake are about 70 km north and 80 km north-east on Highway 2.

References

Chem-Security (Alberta) (CSA). Alberta Special Waste Treatment Centre: Environmental Protection Plan. Chem-Security (Alberta) Ltd., No. 170, 1989.

Penner and Associates Ltd. Inventory of Wildlife Resources in the Vicinity of Alberta Special Waste Treatment Centre, Swan Hills, Alberta. Section IV: Wildlife Monitoring Program Alberta Special Waste Treatment Centre. Penner and Associates Ltd, 1990.

Penner and Associates Ltd. Hunting and Trapping in the Swan Hills, A Review for the Alberta Special Waste Treatment Centre. Penner and Associate ltd, 1991.

AEP. Dec. 12, 1996 Memorandum. Chemical assessment & Management Division, Alberta Environmental Protection, File No. 1744-000-air.

MacLock RB, Thomposon JP. Characterization of Aquatic Users within the Peace, Athabasca and Slave Rivers. Northern River Basins Study synthesis Report No. 17, May 1996.

Appendix B Protocol for Fresh Deer Sampling

(1) Materials Needed

- Roll of wide polyethylene sheeting (shrink-wrap type)
- Wide-neck airtight glass jars (preferably amber, but clear glass is suitable if the samples are protected from light), with Teflon or aluminum foil-lined screw caps. Jars must be pre-cleaned and rinsed with distilled water, acetone (pesticide grade), and hexane, in that order.
- Labels, adhesive-backed.
- Transparent adhesive tape, to cover and protect label information.
- Knives and dissection equipment, pre-cleaned as for glass jars.
- Gel packs, dry-ice for cooling.
- Insulated storage chest.

(2) Transportation of the Carcass

If dissection or sampling of the meat and organ is not possible or convenient at the location where the animal was shot, the animal should be placed in large clean polyethylene bags (unused) or wrapped in polyethylene sheeting (e.g., shrink-wrap) prior to transportation of the carcass.

(3) Sample Labels

Each sample contained must be labeled with permanent ink and covered with adhesive tape for protection of the label information. Labels must include the following information: identification code for animal, location on carcass from which sample was obtained), date sample taken. Other useful information can include species (e.g. white-tail, mule), age and sex of the animal. Ages of the animals should be determined for each animal by examining an incisor using the tooth cementum technique.

(4) Dissection

Liver

Dissect out the whole organ within 1 hour of death and cut out a representative 500 gram sample. Store the sample in a previously-cleaned glass jar with Teflon-coated or aluminum foil liner between the contents and the screw cap. Minimum sample size: 500 g.

Fat

Dissect out the subcutaneous fat within 1 hour of death. Preferably, adipose tissue should be collected from one region of the carcass, but multiples sampling locations can be used if this is not feasible. Suitable sampling areas on the carcass include subcutaneous fat from the back, loin, or neck. For animals which do not have sufficient subcutaneous fat reserves, collect kidney or omentum fat. Store the sample in a previously-cleaned glass jar with Teflon-coated or aluminum foil liner between the contents and the screw cap. Minimum sample size: 500 g

Muscle

Cut out a section from a meaty portion of the deer carcass (e.g., rump). Store the sample in a previously-cleaned glass jar with Teflon-coated or aluminum foil liner between the contents and the screw cap. Label the container with information about the animal (age, sex), the sample-type (e.g. muscle) and the part of the animal from which the sample was cut. Minimum sample size: 500 g.

(5) Storage/Shipping

- Store meat, fat, and liver samples protected from light at -20° C prior to shipment to laboratory.
- Pack meat, fat, and liver samples in dry-ice, and ship to the laboratory using next-day courier delivery

Shipping address:

Dr. S. Ramamoorthy

MAXXAM

9331-48 Street

Edmonton, AB, T6B 2R4

Phone: (403)465-9877

(6) Control group

Data should be compared to control deer whose foraging range is well outside of the potentially-contaminated area.

MDL (muscle): <0.05 ng/kg (wet wt.)

MDL (adipose): <0.05 - 0.10 ng/kg (wet wt.)

MDL (liver): <0.1 ng/kg (wet wt.)

Appendix C Protocol for Freezer Meat Collection

1. Call the individuals identified for their Regional Health Authority and make an appointment to pick up the sample and to complete the sample submission form.

2. One sample per animal is required. A separate form and bag is required for each sample.

3. The owner's telephone number is used as the unique identifier. Identify each individual sample by marking the following on the zip-lock bag (a permanent black ink):

SWAN HILLS-MOOSE MEAT # - (OWNER'S TELEPHONE NUMBER)

SWAN HILLS-DEER MEAT # - (OWNER'S TELEPHONE NUMBER)

SWAN HILLS-MOOSE LIVER # - (OWNER'S TELEPHONE NUMBER)

4. The meat donors complete a form for each sample submission and mark the sampling location on a map in relation to the SHWTC site. The form contains the information on sample owner (name, date, address and telephone number) and description of sample (species, age, sex, sample weight, cut of meat, conditions of sample like fresh, frozen, thawed, date of the animal killed, location of kill site, and wildlife identification number, if applicable).

5. Each sample is shipped to:

Mr. Lawrence Roth

Food Laboratory

5th Floor O.S. Longman Building

6909-116 Street, Edmonton, Alberta, T6H 4P2

Phone: 427-4054

6. All the samples are stored frozen (at -18 °C) until shipping to the laboratory.

7. All the completed forms attached with map send to:

Mr. Kevin Mcleod, Manager

Environmental Health Service

Communicable Disease Control Branch

14th Floor Telus North Building

10025 Jasper Avenue

Edmonton, Alberta Health, T5J 2N3

Appendix D Protocol for Fish Sampling

1. Material need: contaminant free bags, label, dry ice, sturdy styrofoam coolers, duct tape
2. Immediately after the fish is taken from the water, fish must progress on the euthanized fish and tissue samples must be quick frozen between slabs of dry ice to avoid spoiling of tissue samples.
3. Total and fork length should be measured to the nearest mm. The fish should then be towed dry and weighed to nearest g.
4. Open the fish ventrally and cut the esophagus and lower intestine to allow total removal of the gastrointestinal tract, liver, kidney and gill.
5. Weight the carcass of the fish.
6. Place the fish carcass in a contaminant free bag, label and store on dry ice. Tissue samples should be placed between slabs of dry ice and liberal quantities of dry ice should be placed along the sides and top and bottom of each cooler.
7. All samples are to be shipped directly to:

Dr. S. Ramamoorthy
MAXXAM Laboratory
9331-48 Street
Edmonton, AB, T6B 2R4
Phone: (403)465-9877

Lab ID	Animal ID	Location	Distance	Tissue	% fat	PCB (µg/kg) ww	PCDD/F (ng/kg) ww	TEQ, PCDD/F (ng/kg) ww	Total TEQ (ng/kg) ww	PCB (µg/kg) lw	PCDD/F (ng/kg) lw
246-6	BV1	Swan Hills	0	Fat	95	550	336.9	120	135.66	578.947	142.8
246-7	BV1	Swan Hills	0	Muscle	3.4	13	13.8	3.8	4.63	382.353	136.176
246-8	BV1	Swan Hills	0	Liver	5.4	43	3807.9	1600	1730.14	796.296	32039.63
6417-58	4	Swan Hills	30	Muscle	1.5	0	0	0	0	0	0
6417-59	4	Swan Hills	30	Liver	4	8.6	22.2	2.776	2.886	215	72.153
6417-60	4	Swan Hills	30	Fat	82	0	8.6	0.418	0.418	0	0.51
6417-61	5	Swan Hills	20	Muscle	1.8	0	1	0.251	0.251	0	13.944
6417-62	5	Swan Hills	20	Liver	2.4	99.2	5001.7	208.319	208.319	4133.333	8679.958
6417-66	7	Swan Hills	10	Muscle	2.3	82	4.2	0.959	68.959	3565.217	2998.217
6417-66dup	7	Swan Hills	10	Muscle	2.3	73.1	4.6	1.02	67.02	3178.261	2913.913
6417-67	7	Swan Hills	10	Liver	3.2	143.7	564	171.026	291.026	4490.625	9094.563
6417-68	7	Swan Hills	10	Fat	75	209.3	49	15.163	62.163	279.067	82.884
396-2	BV2	Control	.	Muscle	2.6	0	150.4	0.54	0.556	0	21.385
396-3	BV2	Control	.	Fat	83	0	302.2	2.7	2.748	0	3.311
396-4	BV2	Control	.	Liver	5.2	0	40.9	1.1	1.27	0	24.423
6417-51	1	Control	.	Muscle	3	4.9	0	0	0.085	163.333	2.833
6417-52	1	Control	.	Liver	2.7	3.7	1.7	0.002	0.072	137.037	2.656
6417-53	1	Control	.	Fat	83	0	5.5	0.463	0.463	0	0.558
6417-54	2	Control	.	Muscle	3.3	7.2	0	0	0.11	218.182	3.333
6417-55	2	Control	.	Liver	2.8	5	1	0.001	3.086	178.571	110.214
6417-56	3	Control	.	Muscle	0.66	3.2	20.5	0.238	0.238	484.848	36.106

6417-56dup	3	Control	.	Muscle	0.66	3.3	0	0	0	500	0
6417-57	3	Control	.	Liver	4.7	3.3	0	0	0.1	70.213	2.128
6417-63	6	Control	.	Muscle	3.6	0	15.7	0.097	0.097	0	2.708
6417-64	6	Control	.	Liver	5.3	80.6	1359.6	42.759	42.844	1520.755	808.383
6417-65	6	Control	.	Fat	60	0	8.2	0.517	0.517	0	0.861
6417-69	8	Control	.	Muscle	1.7	0	0	0	0	0	0
6417-70	8	Control	.	Liver	2.4	65.3	1	0.951	6.981	2720.833	290.875
6417-71	8	Control	.	Fat	86	23.5	9.1	0.169	6.169	27.326	7.173
6417-72	9	Control	.	Muscle	1.5	0	0	0	0	0	0
6417-73	9	Control	.	Liver	3.5	0	8.7	0.97	0.97	0	27.714
6417-74	9	Control	.	Fat	90	0	2.5	0.001	0.001	0	0.002
6417-75	10	Control	.	Muscle	0.86	0	0	0	0	0	0
6417-76	10	Control	.	Liver	1.3	0	19.2	0.173	0.173	0	13.277
6417-77	11	Control	.	Muscle	0.43	17.4	0	0	0	4046.512	0
6417-78	11	Control	.	Liver	2.9	1.3	14.8	0.536	0.536	44.828	18.479
6417-79	12	Control	.	Muscle	0.83	1.3	20.8	0.762	0.762	156.627	91.759
6417-80	12	Control	.	Liver	4	6.3	17.8	0.614	0.614	157.5	15.35
6417-81	12	Control	.	Fat	80	36.2	0.8	0	0.065	45.25	0.081
6417-81dup	12	Control	.	Fat	80	35.3	0.8	0	0.075	44.125	0.094
6417-82	13	Control	.	Muscle	1.2	7.7	0	0	0	641.667	0
6417-83	13	Control	.	Liver	3.1	20.3	21.7	1.386	1.386	654.839	44.71
6417-84	13	Control	.	Fat	87	173.9	1.7	0.002	0.002	199.885	0.002
6417-85	14	Control	.	Muscle	1	0	5.7	0.011	0.011	0	1.1
6417-86	14	Control	.	Liver	4.9	0	353.3	4.265	4.265	0	87.037

Lab ID	Animal ID	Distance	Species	Tissue	% fat	PCB (µg/kg) ww	PCDD/F (ng/kg) ww	PCDD/F TEQ (ng/kg) ww	Total TEQ (ng/kg) ww	PCB (µg/kg) lw	PCDD/F (ng/kg) lw
6417-1	ZX5	Within 20 Km	Moose	Muscle	1.23	1.6	0	0	0	130.081	0
6417-1dup	ZX5	Within 20 Km	Moose	Muscle	1.23	1.7	0	0	0	138.211	0
6417-10	Z32	Within 20 Km	Deer	Liver	2.5	0	241.2	26.656	26.656	0	1066.24
6417-12	Z22	Within 20 Km	Moose	Muscle	0.4	171	0	0	130.11	42750	32526.25
6417-13	Z19	Within 20 Km	Moose	Muscle	0.59	156	0	0	72	26440.7	12203.39
6417-16	Z17	Within 20 Km	Moose	Muscle	4.2	0	1.1	0.001	0.001	0	0.026
6417-18	Z18	Within 20 Km	Moose	Muscle	1.4	0	0	0	0	0	0
6417-2	ZX6	Within 20 Km	Moose	Liver	1.8	0	0	0	0	0	0
6417-22	Z8	Within 20 Km	Deer	Muscle	1.8	1.1	10.9	0.029	0.029	61.111	1.583
6417-22dup	Z8	Within 20 Km	Deer	Muscle	1.8	1.2	10.9	0.029	0.044	66.667	2.417
6417-25	Z1	Within 20 Km	Moose	Muscle	1.6	0	0	0	0	0	0
6417-26	Z5	Within 20 Km	Moose	Muscle	1	2	27.9	0.701	0.701	200	70.07
6417-27	Z5	Within 20 Km	Moose	Liver	3.6	1.5	42.4	0.061	0.061	41.667	1.689
6417-28	Z5	Within 20 Km	Moose	Kidney	2.7	11.5	10.9	0.029	0.029	425.926	1.056
6417-29	Z2	Within 20 Km	Moose	Muscle	1.1	0.5	23.4	0.071	0.071	45.455	6.418
6417-3	ZX4A	Within 20 Km	Moose	Muscle	0.49	3.6	0	0	0	734.694	0
6417-31	ZX3	Within 20 Km	Moose	Muscle	1.1	17.8	27.3	0.71	0.735	1618.18	66.782
6417-32	Z15	Within 20 Km	Deer	Muscle	3.2	1.85	0.1	0	0	57.813	0.003
6417-33	Z28	Within 20 Km	Moose	Muscle	1.35	0	0	0	0	0	0
6417-33dup	Z28	Within 20 Km	Moose	Muscle	1.35	0	0	0	0	0	0
6417-35	Z27	Within 20 Km	Moose	Fat	89	0	3.2	0.561	0.561	0	0.631

6417-36	Z27	Within 20 Km	Moose	Muscle	1.7	42.2	0	0	14.015	2482.35	824.412
6417-37	Z27	Within 20 Km	Moose	Liver	3.8	10	11.2	2.331	2.331	263.158	61.339
6417-39	Z3	Within 20 Km	Moose	Muscle	1.1	0	0	0	0	0	0
6417-40	Z3	Within 20 Km	Moose	Liver	2.5	4.6	0	0	0	184	0
6417-48	Z25	Within 20 Km	Moose	Muscle	0.87	0	0	0	0	0	0
6417-5	Z33	Within 20 Km	Deer	Muscle	0.92	0	0	0	0	0	0
6417-6	Z33	Within 20 Km	Deer	Liver	2.3	3	4.8	2.4	2.4	130.435	104.348
6417-7	Z34	Within 20 Km	Moose	Liver	1.6	5.3	962.7	39.507	39.527	331.25	2470.438
6417-8	Z34	Within 20 Km	Moose	Muscle	0.48	0	0	0	0	0	0
6417-9	Z32	Within 20 Km	Deer	Muscle	1.2	1.7	2.1	0.002	0.002	141.667	0.175
6417-96	Z45	Within 20 Km	Moose	Muscle	0.76	0	0	0	0	0	0
6417-97	Z44	Within 20 Km	Deer	Muscle	1.3	0	0	0	0	0	0
6417-98	T41	Within 20 Km	Moose	Muscle	1.3	0	0	0	0	0	0
6417-100	Z42	Outside 20 Km	Moose	Muscle	0.74	0	0	0	0	0	0
6417-101	Z49	Outside 20 Km	Moose	Muscle	1.7	0	0	0	0	0	0
6417-102	Z43	Outside 20 Km	Moose	Muscle	0.71	0	0	0	0	0	0
6417-11	Z20	Outside 20 Km	Moose	Muscle	0.47	0	0	0	0	0	0
6417-14	Z21	Outside 20 Km	Moose	Muscle	1.1	0	0	0	0	0	0
6417-15	Z16	Outside 20 Km	Moose	Muscle	0.6	0	6.5	0.013	0.013	0	2.2
6417-17	T2	Outside 20 Km	Moose	Muscle	14	0	2.9	0.002	0.002	0	0.014
6417-19	T1	Outside 20 Km	Moose	Muscle	1.1	0	0	0	0	0	0
6417-20	Z9	Outside 20 Km	Moose	Muscle	1.2	0	0	0	0	0	0
6417-21	Z39	Outside 20 Km	Moose	Muscle	0.98	0	0	0	0	0	0
6417-23	Z38	Outside 20 Km	Deer	Muscle	2.1	0.7	1.5	0.001	0.001	33.333	0.029
6417-24	ZX1	Outside 20 Km	Deer	Muscle	3.4	1.4	0.5	0	0	41.176	0
6417-30	ZX2	Outside 20 Km	Moose	Muscle	2.6	0.4	6.3	0.685	0.685	15.385	26.338

6417-34	Z26	Outside 20 Km	Moose	Muscle	1.6	0	0	0	0	0	0
6417-38	Z10	Outside 20 Km	Moose	Muscle	1.5	0	0	0	0	0	0
6417-4	ZX4B	Outside 20 Km	Deer	Muscle	0.56	2.9	1	0.001	0.001	517.857	0.179
6417-41	Z36	Outside 20 Km	Moose	Muscle	0.55	0	0	0	0	0	0
6417-42	Z37	Outside 20 Km	Deer	Muscle	2.8	0	0	0	0	0	0
6417-43	Z37B	Outside 20 Km	Deer	Muscle	6.6	1.3	0	0	0	19.697	0
6417-44	Z29	Outside 20 Km	Moose	Muscle	1	1.47	0	0.032	0.032	147	3.17
6417-45	Z30	Outside 20 Km	Moose	Muscle	1.4	0	7.16	2.335	2.335	0	166.75
6417-46	Z31	Outside 20 Km	Deer	Muscle	3.6	0	0	0	0	0	0
6417-47	Z24	Outside 20 Km	Moose	Muscle	1.9	0	0	0	0	0	0
6417-49	Z23	Outside 20 Km	Deer	Muscle	0.88	0	0	0	0	0	0
6417-50	Z35	Outside 20 Km	Moose	Muscle	1.1	0	0	0	0	0	0
6417-93	Z47	Outside 20 Km	Moose	Liver	2.9	7.2	2.3	0.351	0.351	248.276	12.117
6417-94	Z46	Outside 20 Km	Moose	Muscle	1.1	10.1	3	0.003	0.023	918.182	2.091
6417-95	Z48	Outside 20 Km	Moose	Muscle	2.2	0	0	0	0	0	0
6417-99	Z40	Outside 20 Km	Moose	Muscle	5.2	0	0	0	0	0	0

Appendix G Levels of PCBs and PCDD/Fs in Fish Composite Samples

Table 1

7871-1

7871-2

7871-3

7871-4

7871-5

7871-6

7871-7

7871-8

7871-9

7871-10

7871-11

7871-12

7871-13

7871-14

7871-15

7871-16

7871-17

7871-18

7871-19

7871-20

7871-21

7871-22

7871-23

7871-24

7871-25

7871-26

7871-27

7871-28

7871-29

7871-30

Lab ID	Tissue	Fat %	Roche Lake (n. pike)			Chrystina Lake (BKTR)			Chip Lake (n. pike)		
			PCB	PCDD/F	TEQ	PCB	PCDD/F	TEQ	PCB	PCDD/F	TEQ
7655-1	muscle	0.18	.33	1.1	.0056						
7655-2	muscle	0.44	.54	.8	.0105						
7655-3	muscle	0.66	2.79	1.1	.9537						
7655-4	muscle	1.1	.38	.7	.0092						
7655-5	liver	0.24	5.57	1.4	1.9						
7655-6	liver	6.4	10.27	2.1	4.9						
7655-7	liver	8.0	14.02	1.1	5.5						
7655-8	liver	2.7	1.19	0	.7183						
7655-9	muscle	0.15				27.14	30.6	19.3			
7655-10	muscle	0.45				18.03	25.7	16.1			
7655-11	muscle	0.66				16.53	19.0	8.5			
7655-12	muscle	0.16				9.71	12.0	5.8			
7655-13	liver	NA				116.6	155.7	107.2			
7655-14	liver	NA				52.2	344.0	44.9			
7655-15	liver	NA				70.0	351.7	70.08			
7655-16	liver	NA				41.3	54.5	24.1			
7655-17	muscle	0.09							.04	1.2	.0061
7655-18	muscle	0.77							.26	1.2	.0052
7655-19	muscle	0.21							.07	1.0	.001
7655-20	muscle	0.14							.18	0.0	.0
7655-21	muscle	0.24							.69	0.0	.0065
7655-22	liver	3.9							3.08	8.3	1.2
7655-23	liver	4.2							3.49	0.0	.96
7655-24	liver	4.8							4.19	18.7	1.28
7655-25	liver	3.3							3.07	4.6	1.8
7655-26	liver	1.8							18.1	5.7	7.2

Note: PCB is summation of measures from 44 congeners, $\mu\text{g}/\text{kg}$, whole weight; PCDD/F is summation of measures from 17 congeners, ng/kg , whole weight; TEQ is total TEQ values summarized from PCDD/F TEQ and PCB TEQ values, ng/kg , whole weight.

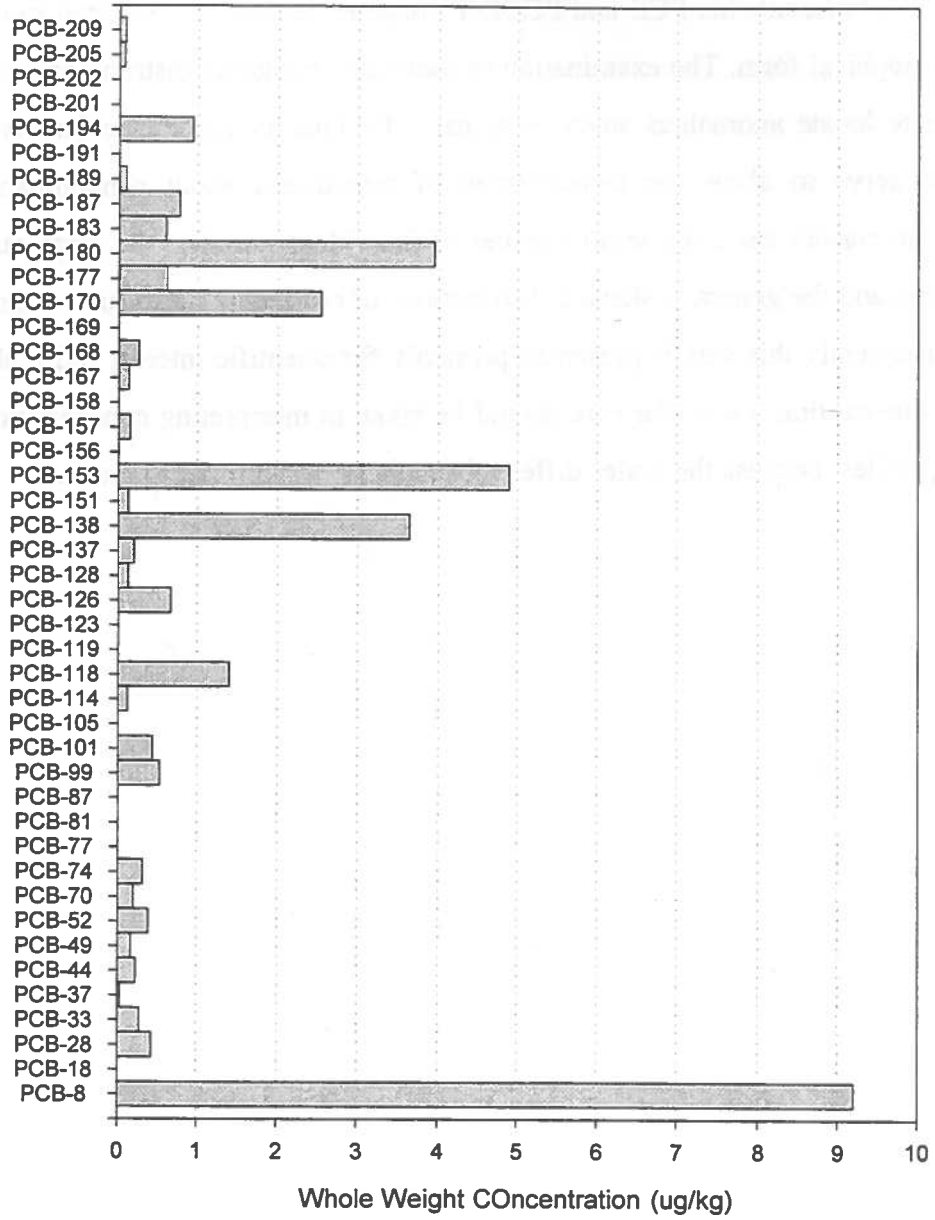
Appendix H Congener Profiles for Deer and Fish Samples

The following table provides a summary of the congener profiles for deer and fish samples. The data is organized by sample type and location. The table includes columns for the sample ID, the location, and the congener profile. The congener profile is represented by a series of numbers indicating the relative concentrations of various congeners. The table is presented in a tabular format with columns for sample ID, location, and congener profile.

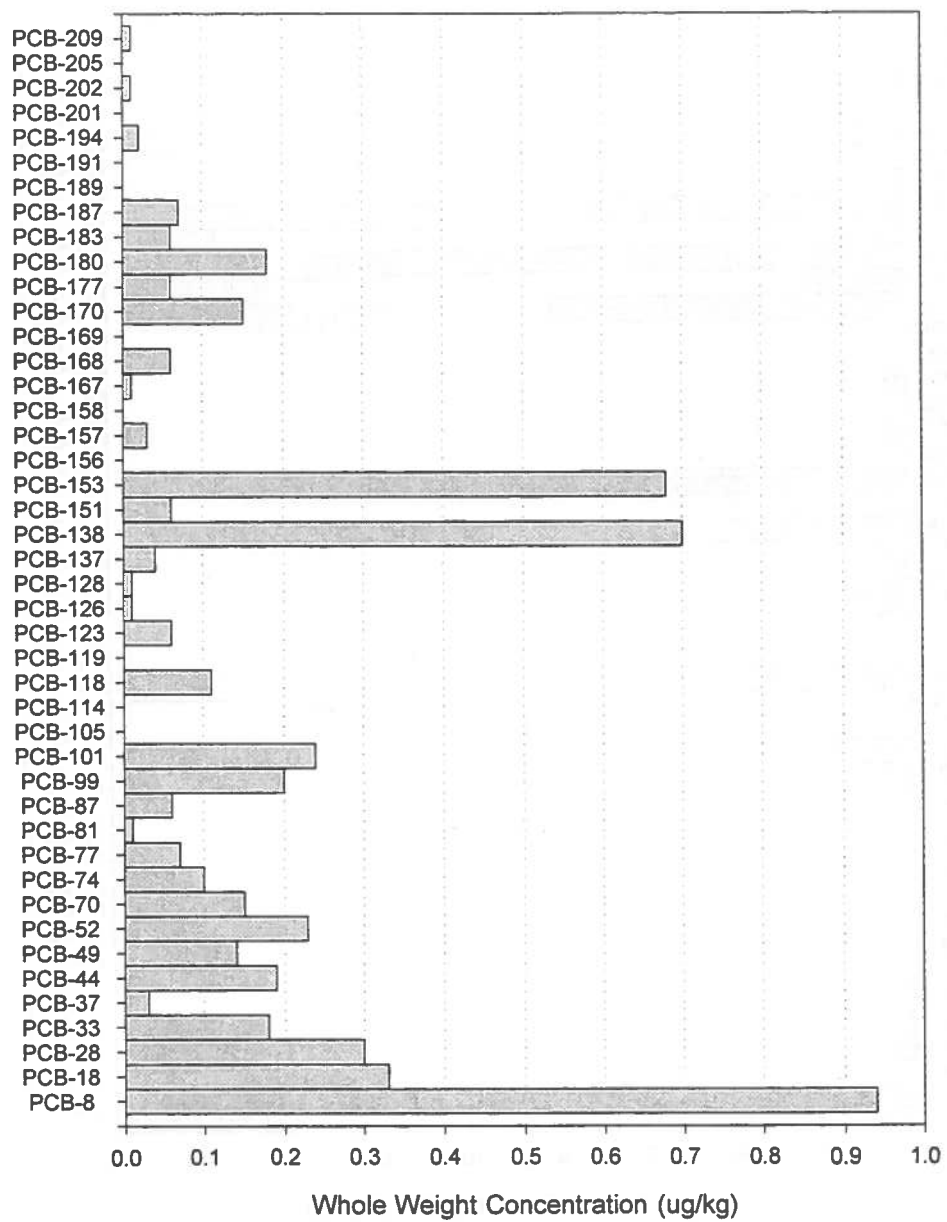
Sample ID	Location	Congener Profile
1	Deer	...
2	Fish	...
3	Deer	...
4	Fish	...
5	Deer	...
6	Fish	...
7	Deer	...
8	Fish	...
9	Deer	...
10	Fish	...

The current appendix presents the PCB and PCDD/F congener patterns for selected samples and sample types in graphical form. The examination of individual congener distributions can, in the ideal case, serve to locate anomalous analyses as part of a Quality Assurance/Quality Control process and can serve to allow the development of hypotheses about contaminant source localization. In the current case, the small number of individual samples, the large number of congener variables, and the generally skewed distributions of congeners make such examinations speculative. Consequently this data is presented primarily for scientific interest and it should be interpreted with due caution. Particular care should be taken in interpreting concentration levels across different profiles, because the scales differ substantially from profile to profile.

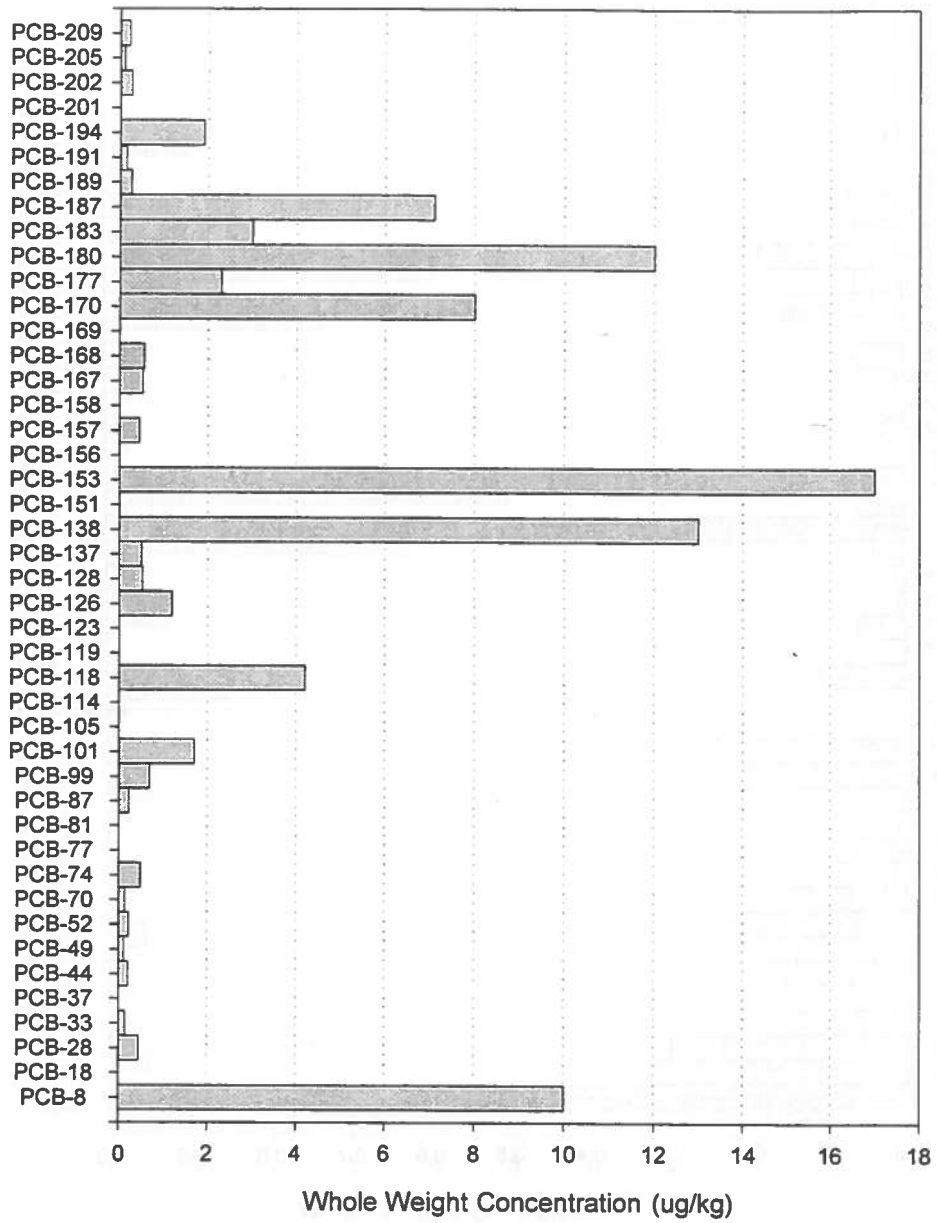
PCB Congeners: Fresh Deer Muscle 10km (N=1)



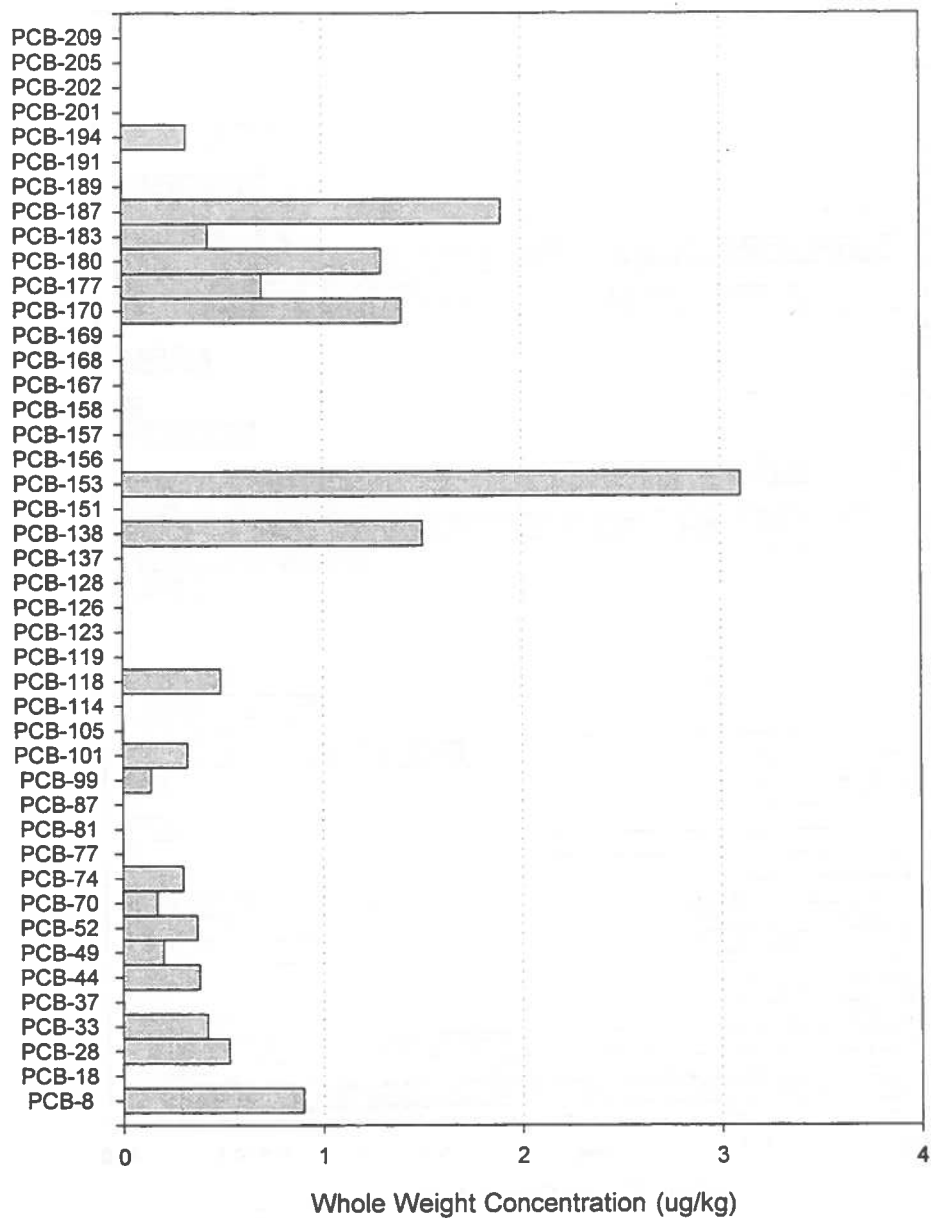
Fresh Deer Liver Control (N=11)



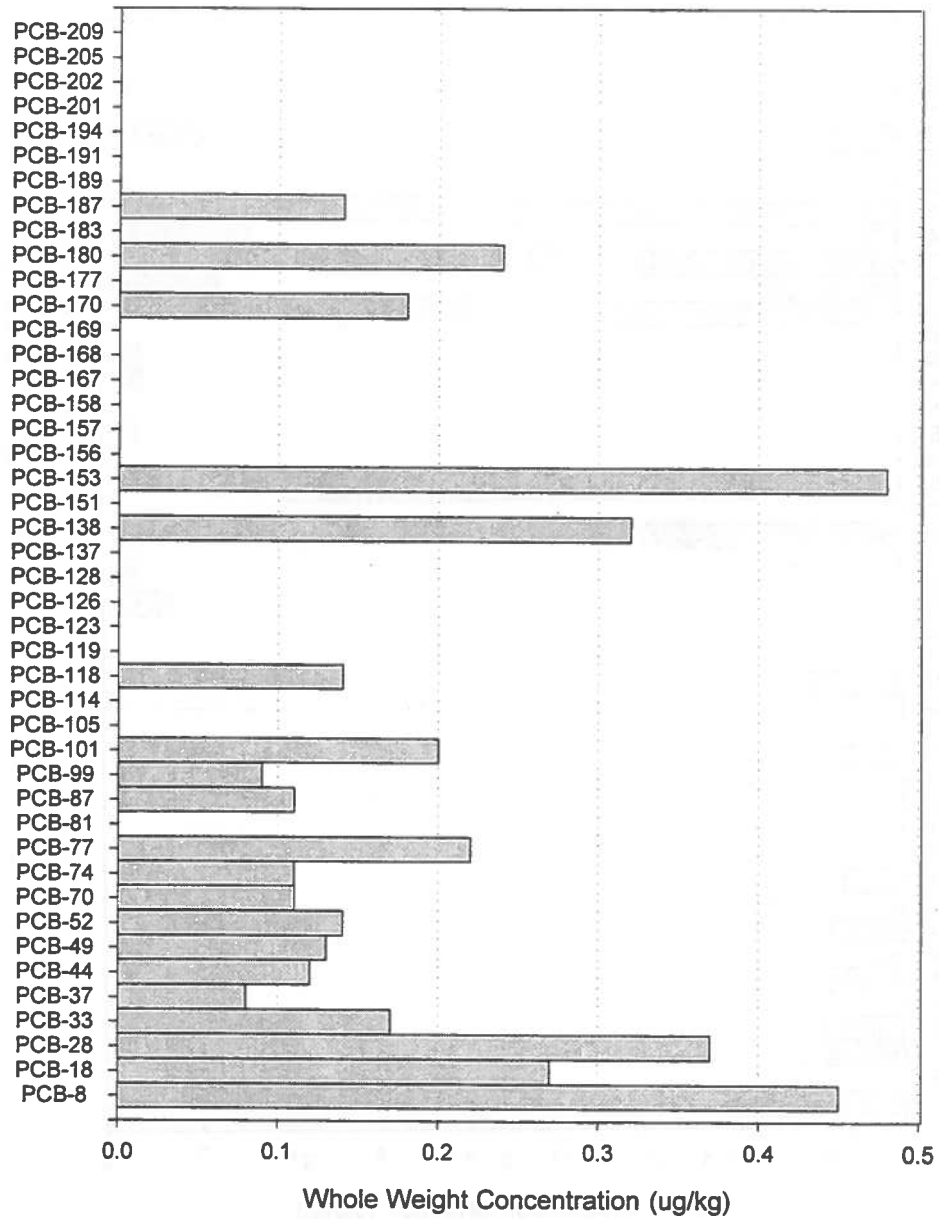
Fresh Deer Liver 10 km (N=1)



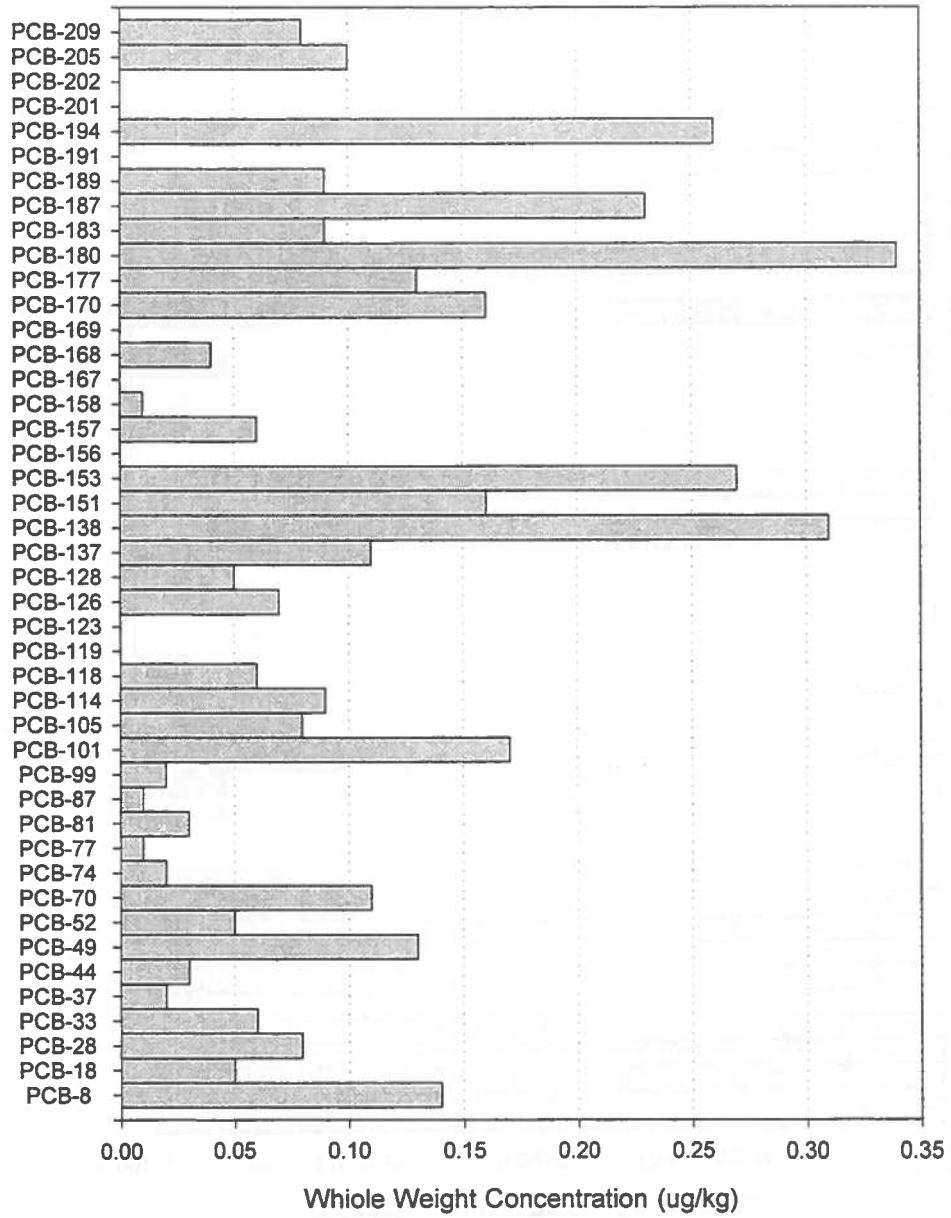
Fresh Deer Liver 20 km (N=1)



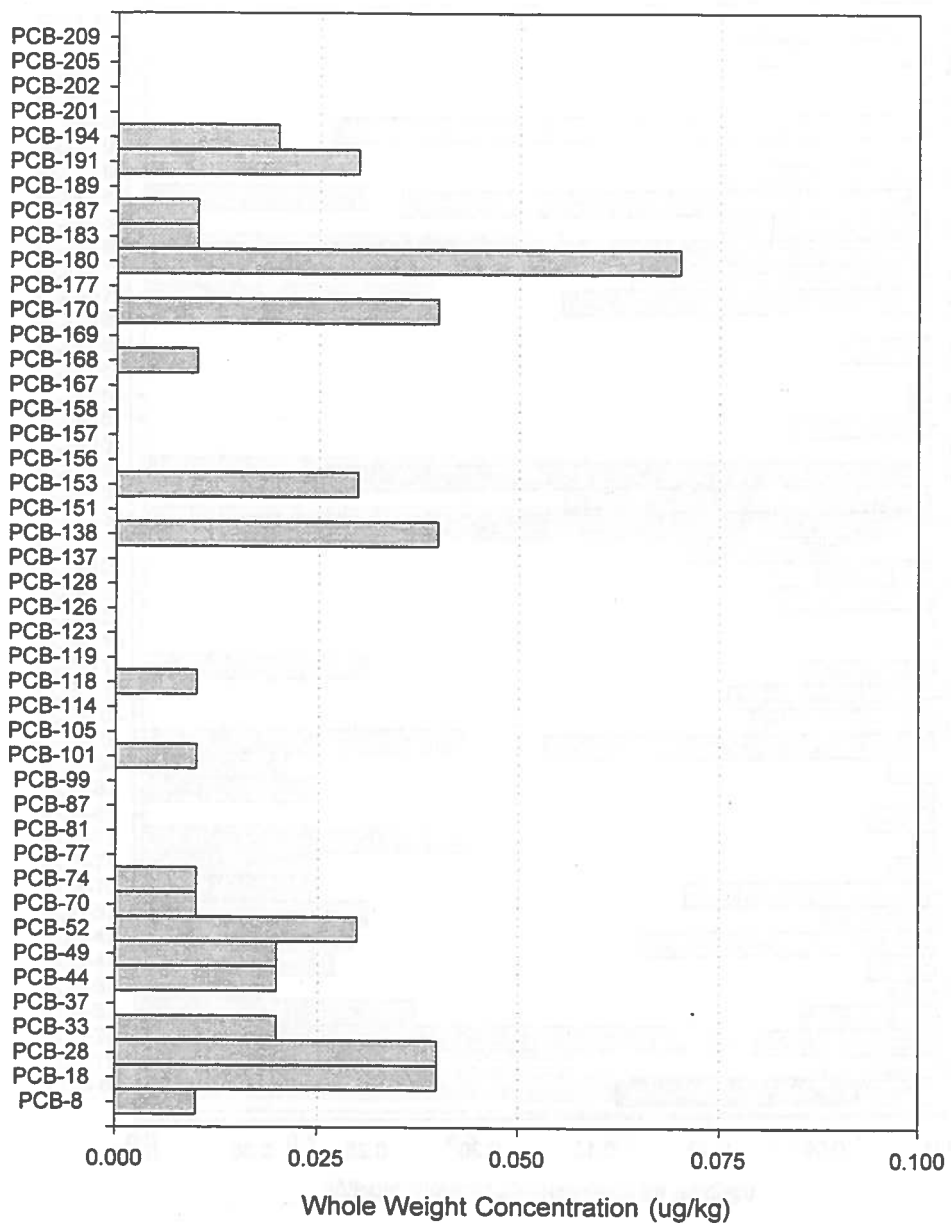
Fresh Deer Liver 30 km (N=1)



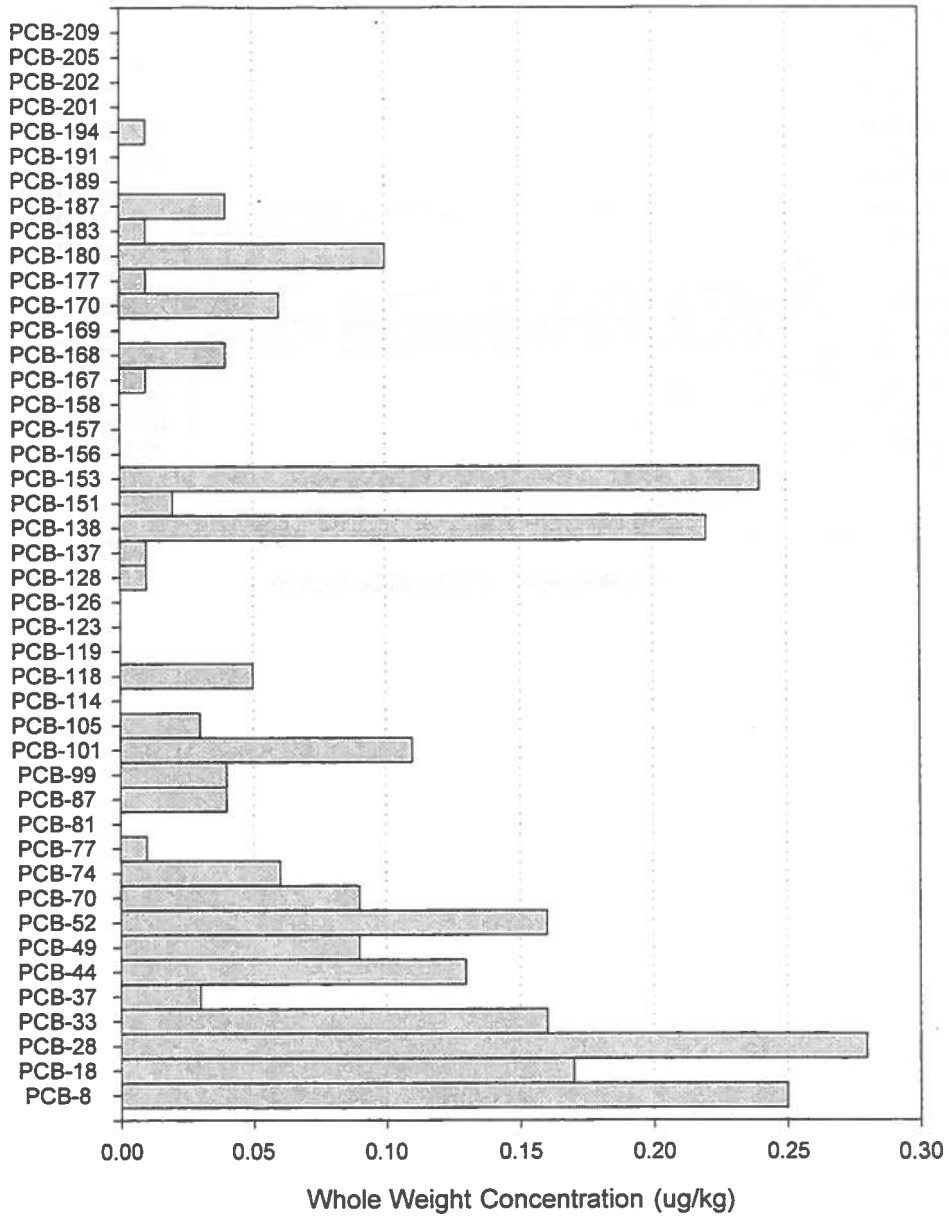
Freezer Meat Muscle Within 20 km (N=21)



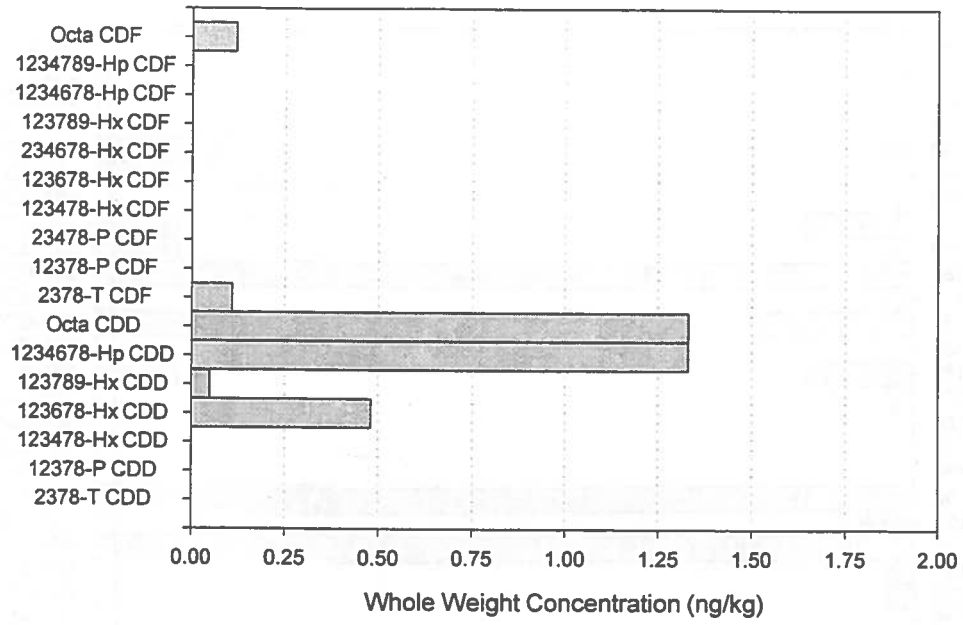
Freezer Meat Muscle Outside 20 km (N=28)



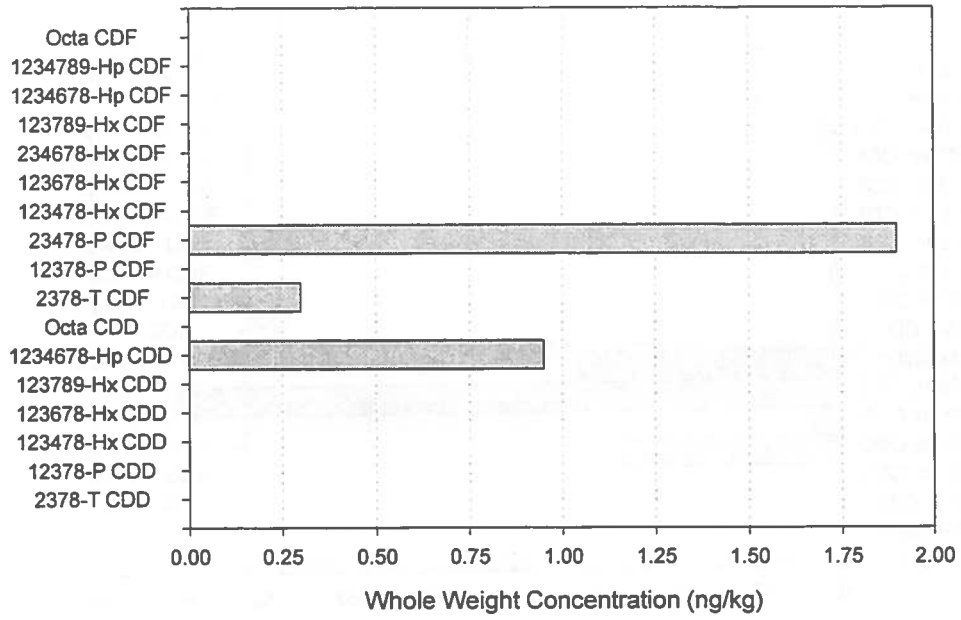
Freezer Meat Liver (N=7; 6 within 20 km)



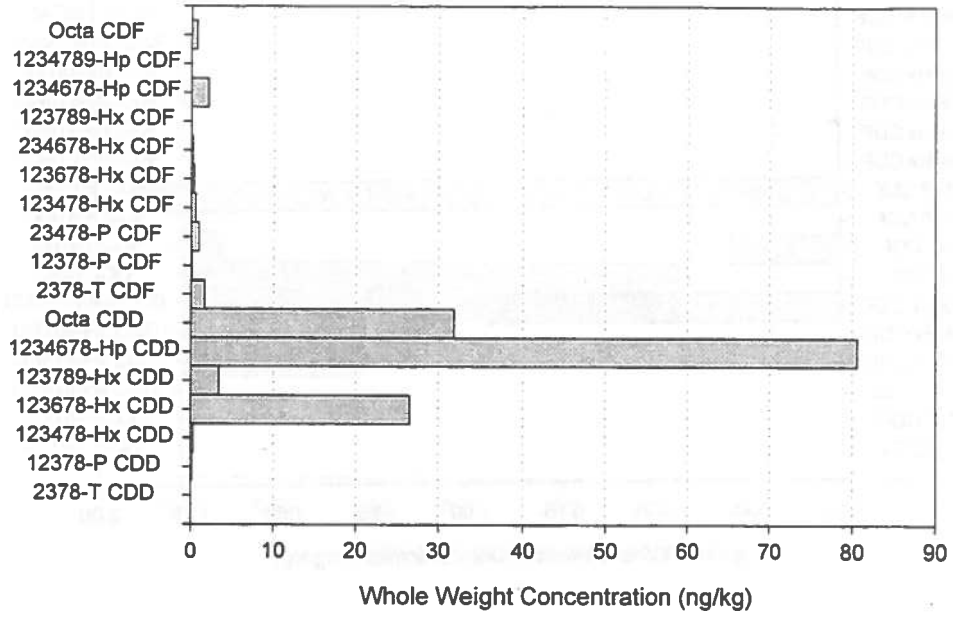
Fresh Deer Muscle Control (N=11)



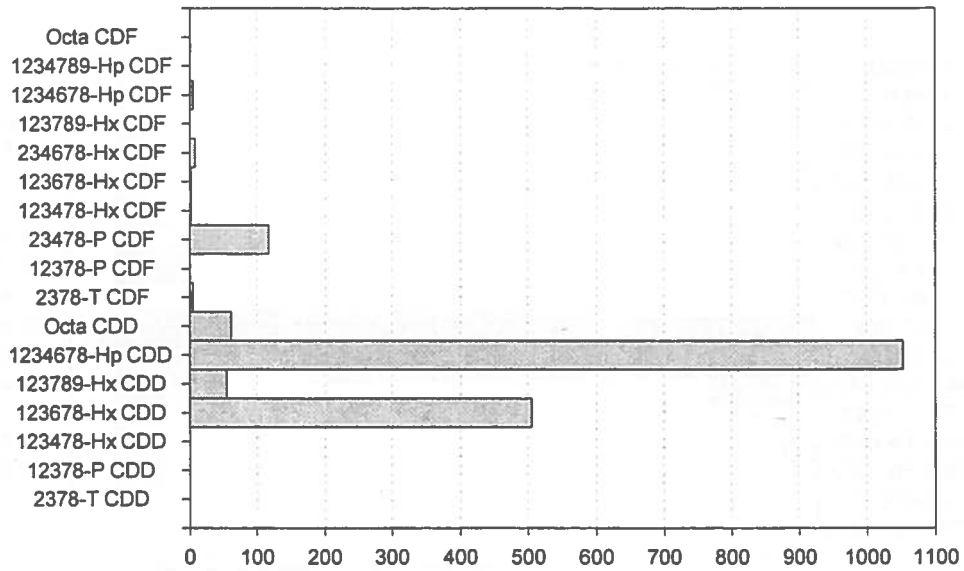
Fresh Deer Muscle 10 km (N=1)



Fresh Deer Liver Control (N=11)

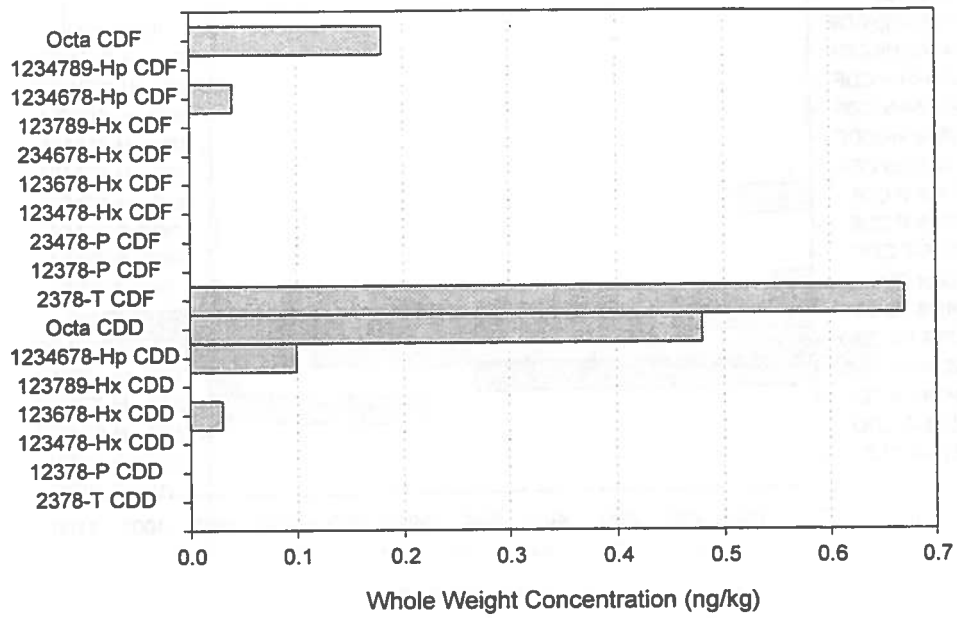


Fresh Deer Liver Within 30 km (N=3)

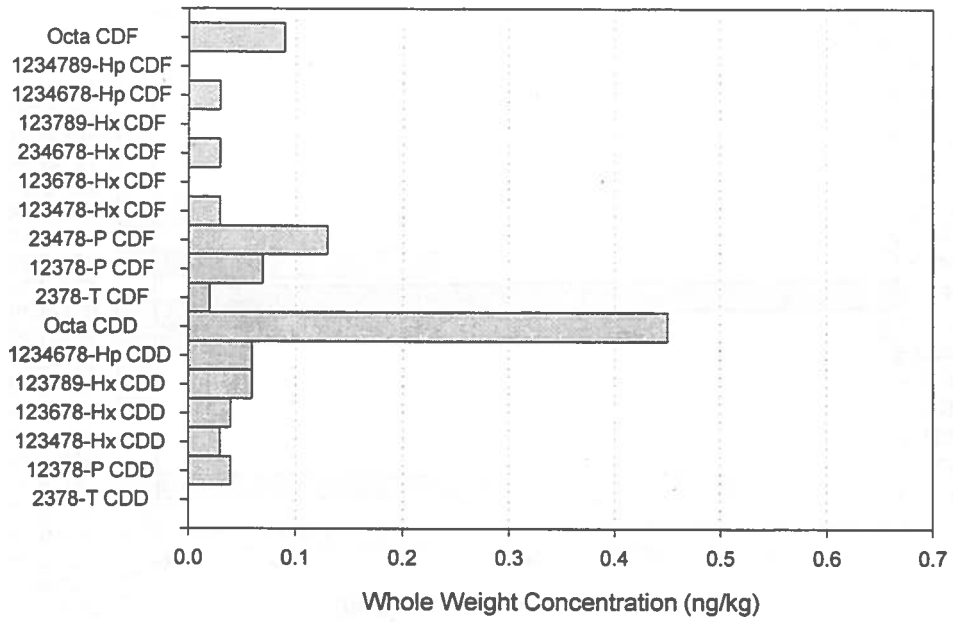


Whole Weight Concentration (ng/kg)

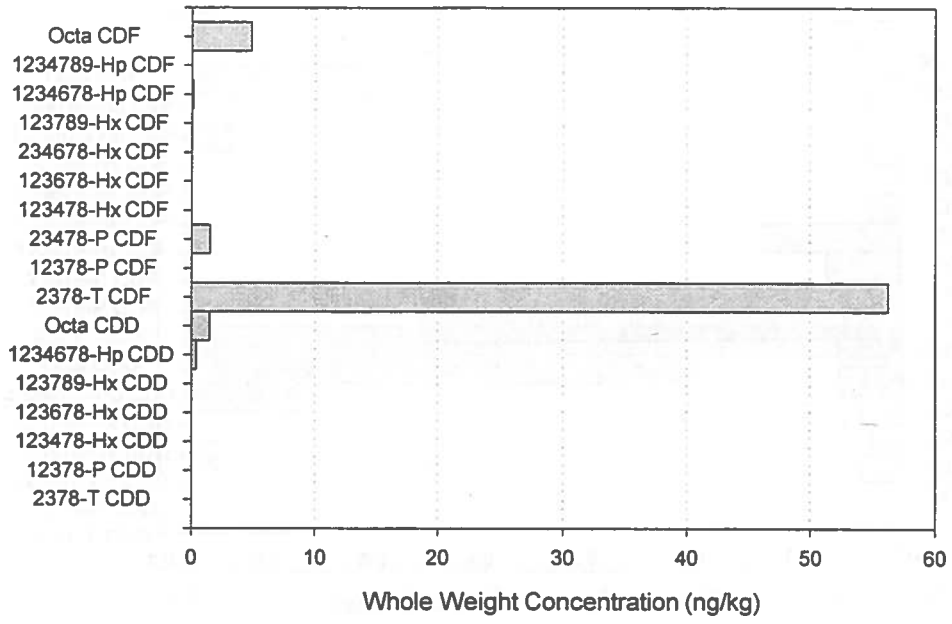
Freezer Meat Muscle Within 20 km (N=21)



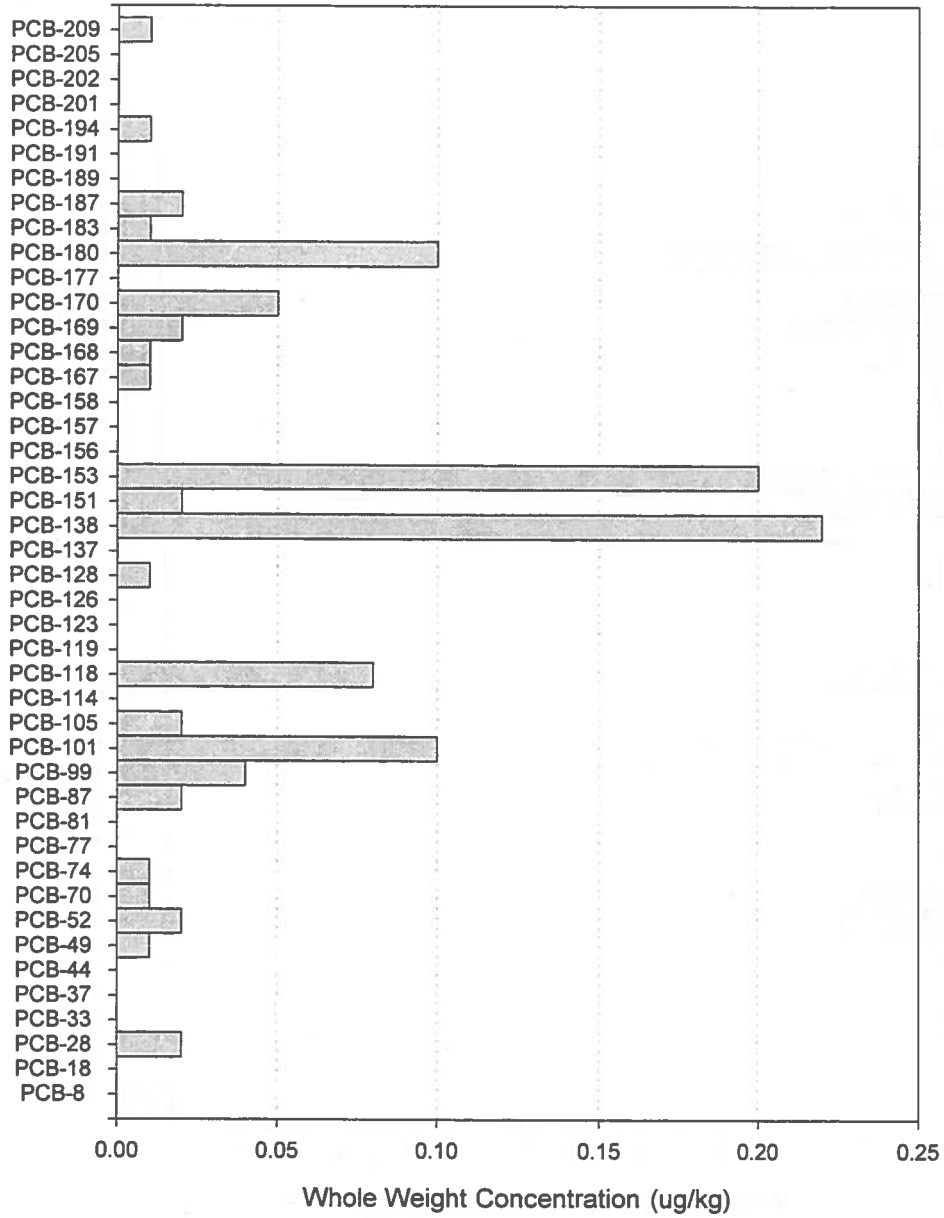
Freezer Meat Muscle Outside 20 km (N=29)



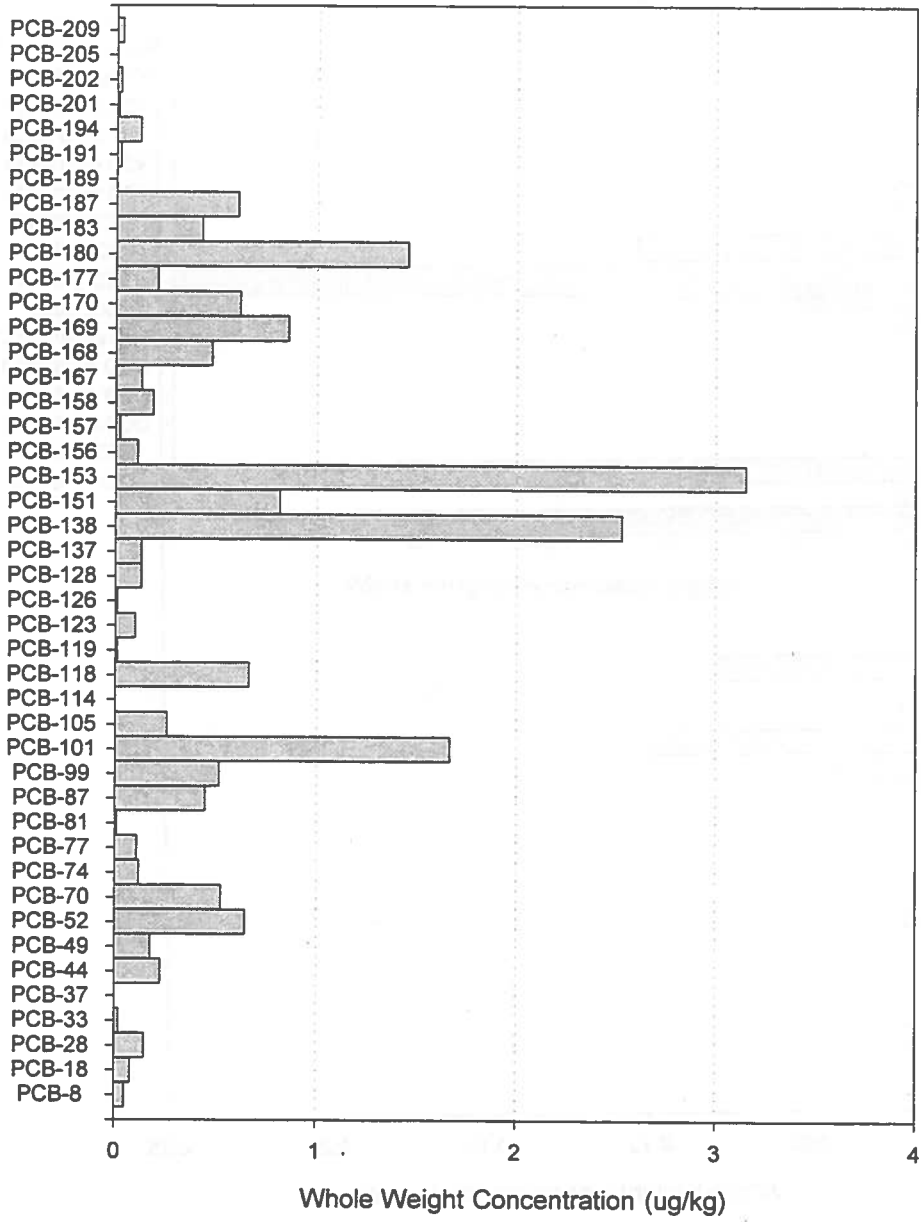
Freezer Meat Liver (N=7; Within 20 km=6)



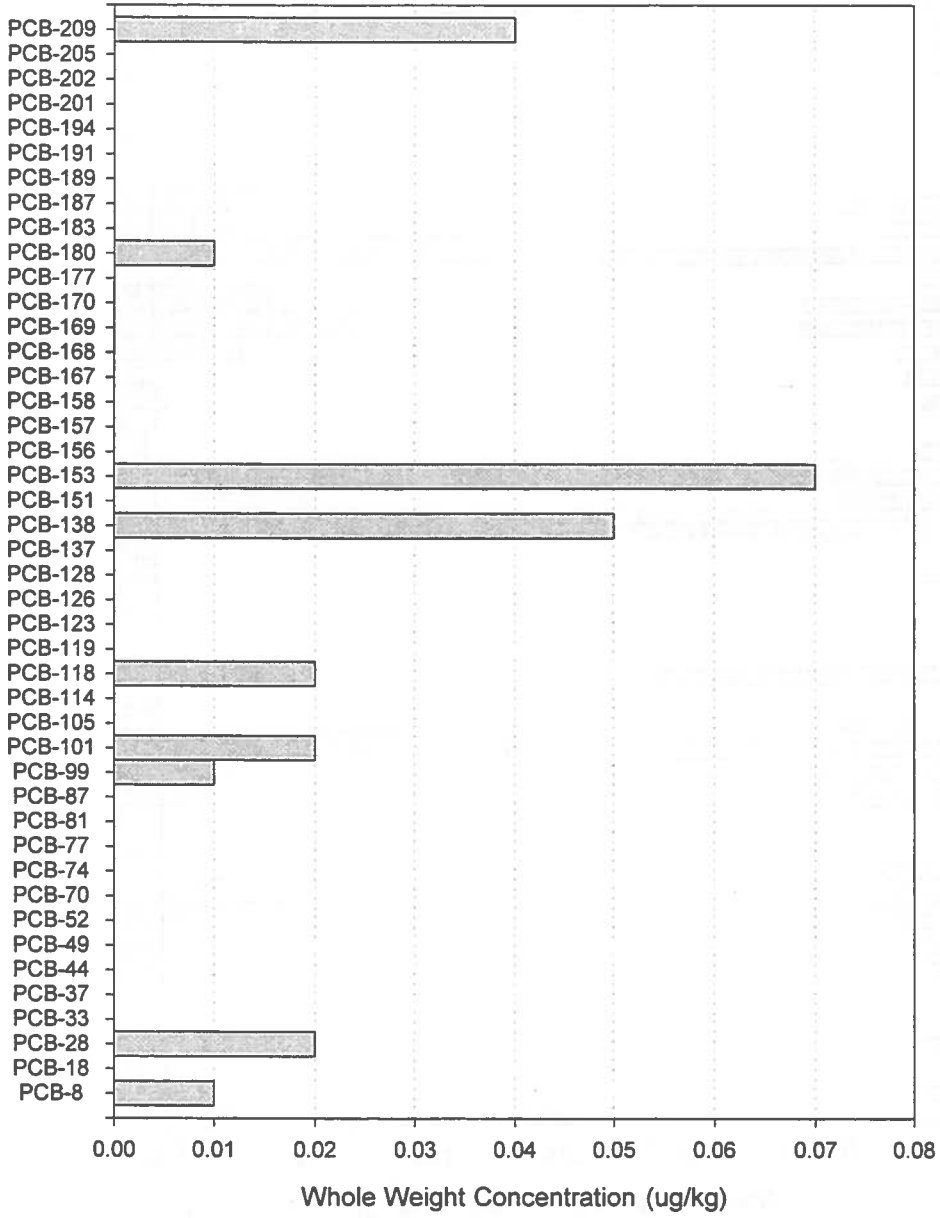
Northern Pike Muscle Roche Lake



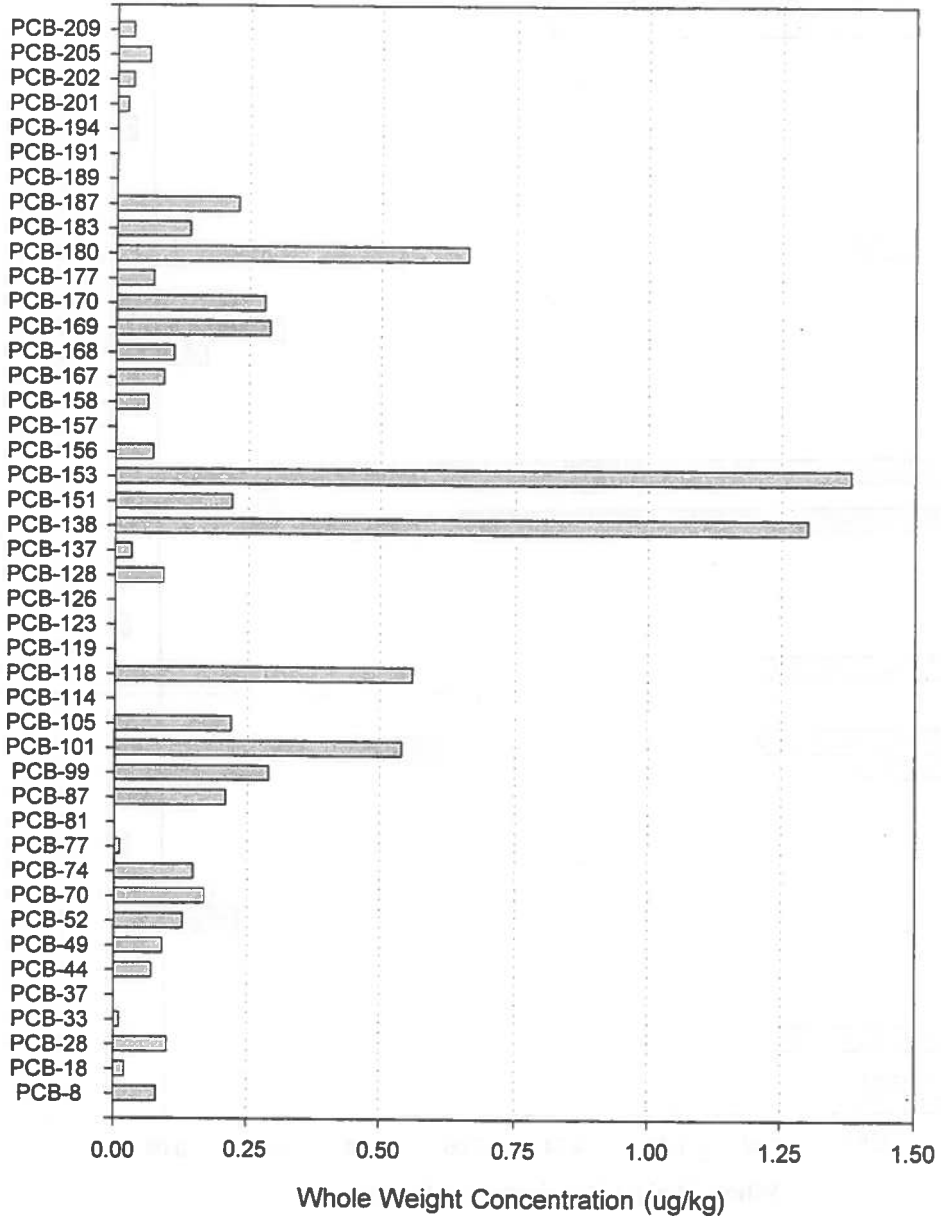
Brook Trout Muscle Chrystina Lake



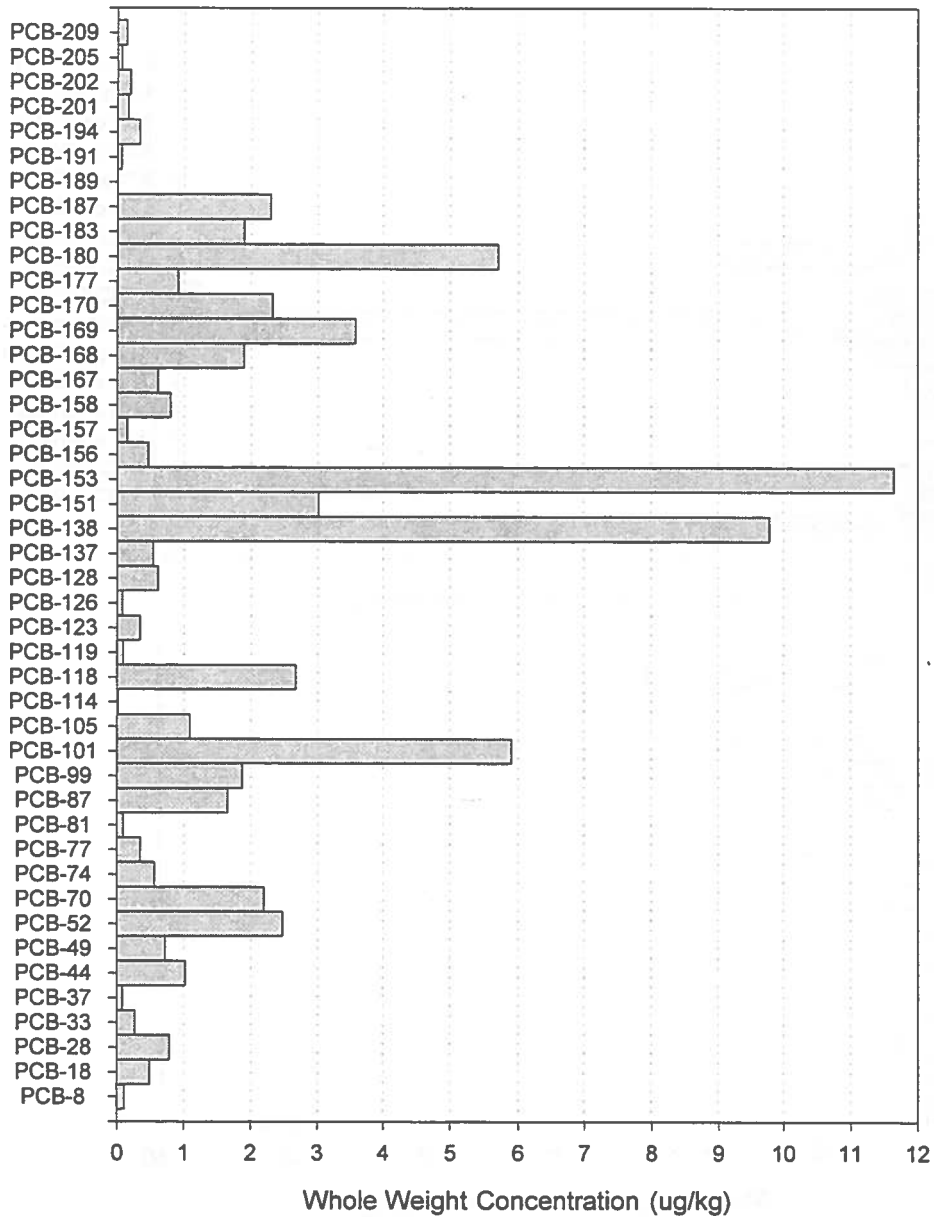
Northern Pike Muscle Chip Lake



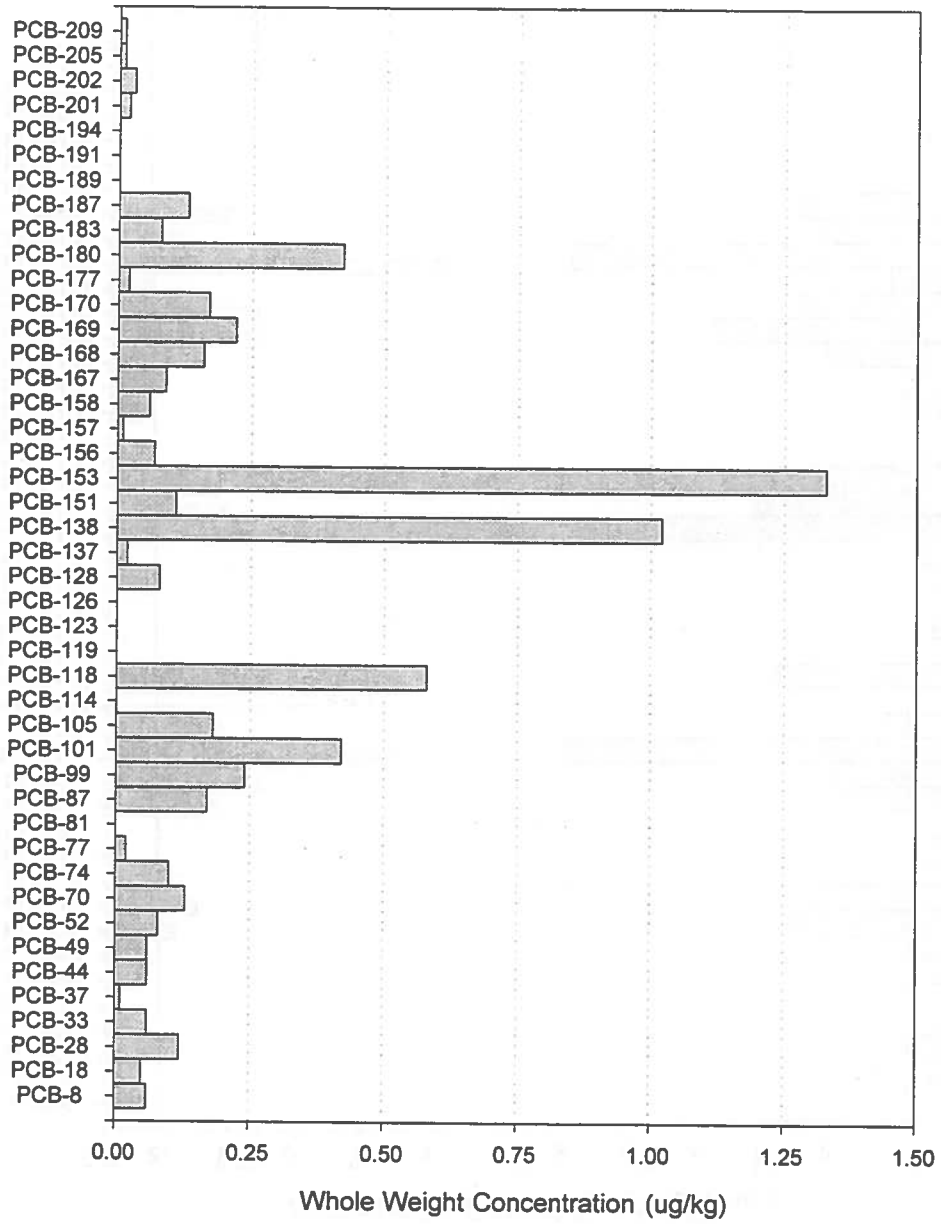
Northern Pike Liver Roche Lake



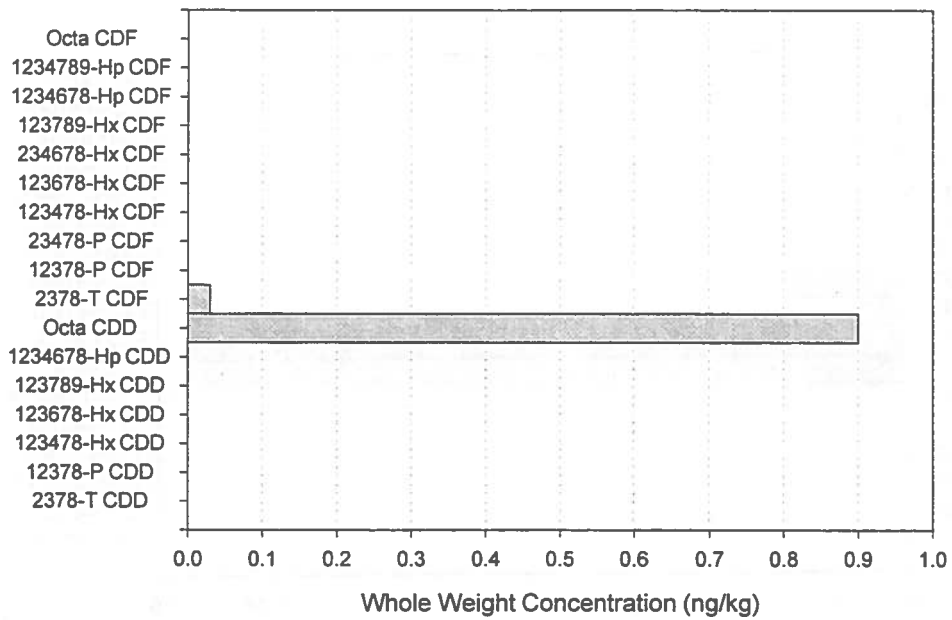
Brook Trout Liver Chrystina Lake



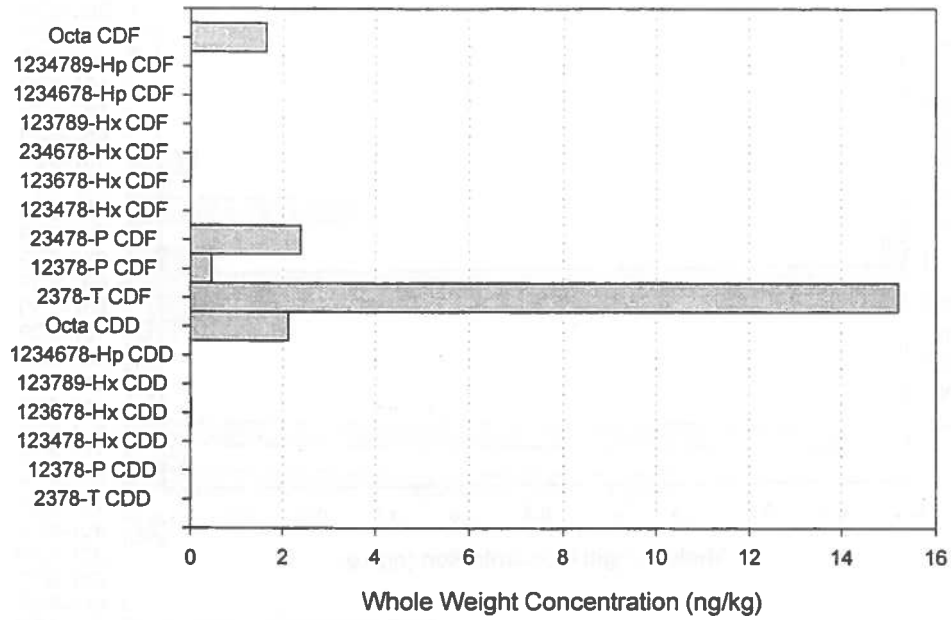
Northern Pike Liver Chip Lake



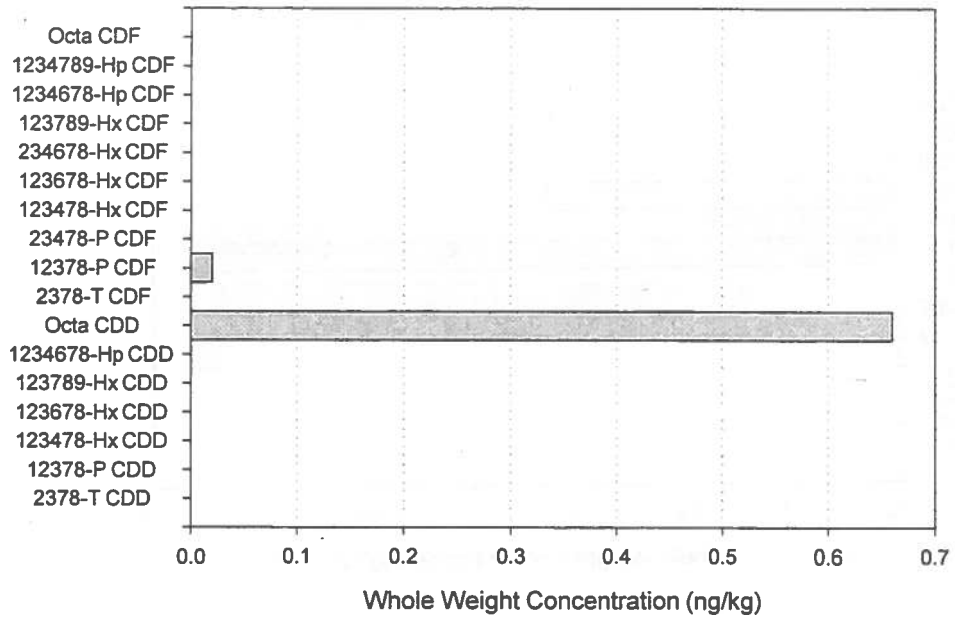
Northern Pike Muscle Roche Lake



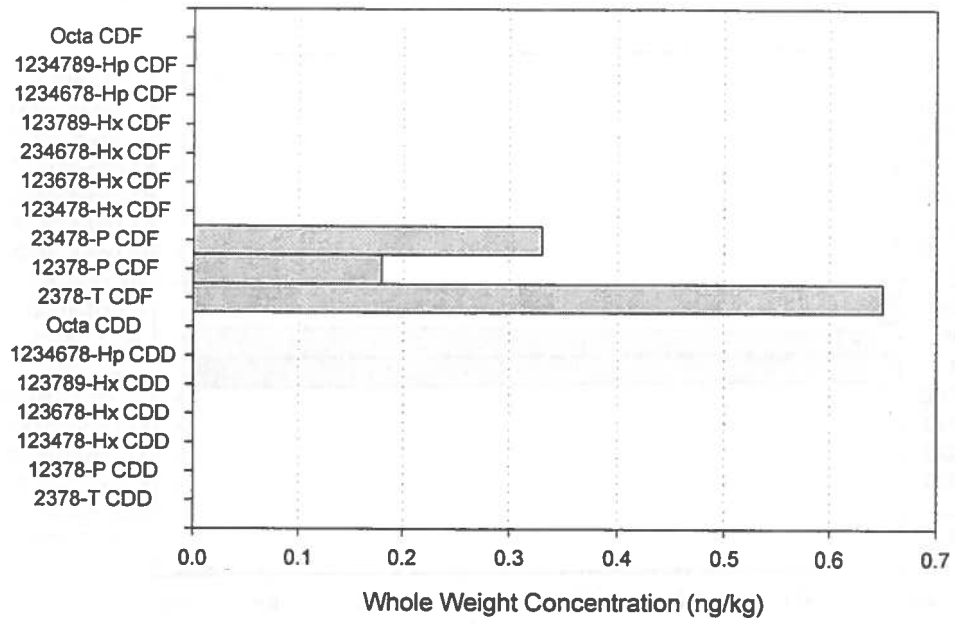
Brook Trout Muscle Chrystina Lake



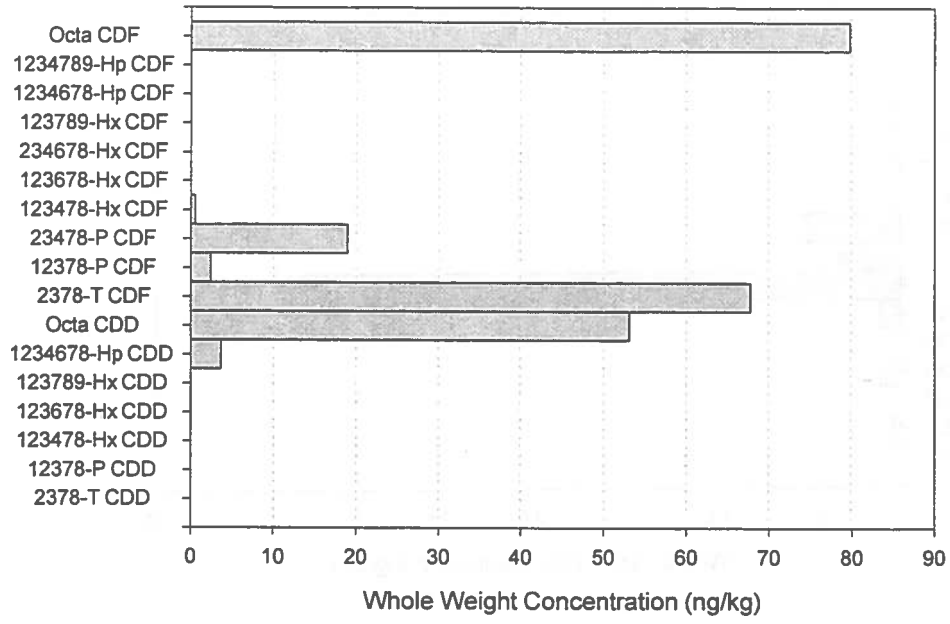
Northern Pike Muscle Chip Lake



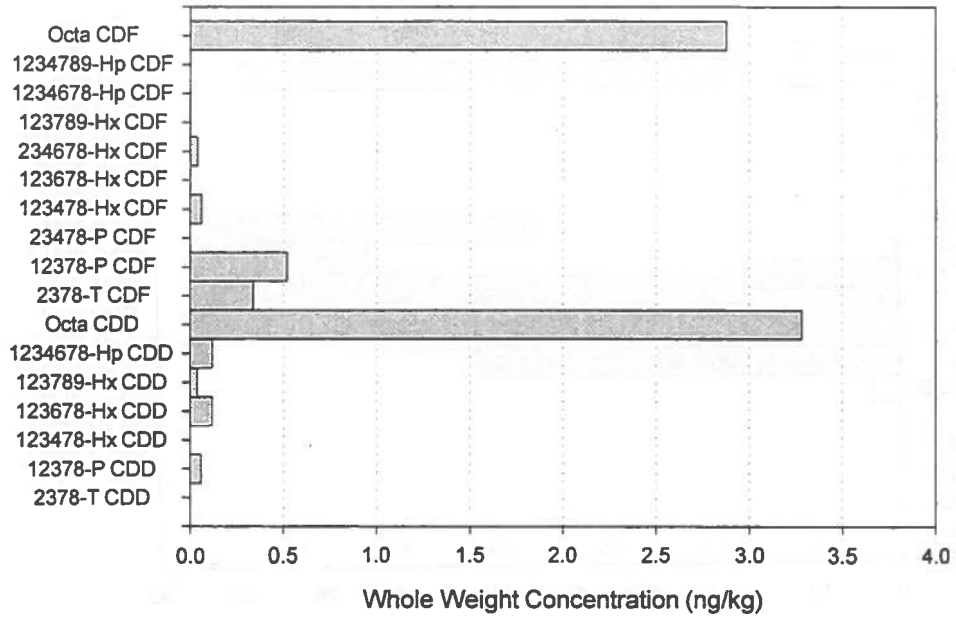
Northern Pike Liver Roche Lake



Brook Trout Liver Chrystina Lake



Northern Pike Liver Chip Lake



Appendix I Protocol for Human Blood Monitoring

Alberta Health

- select random sample of residents
- conduct initial telephone contact to identify potential participants
- select a sample of residents who consume high quantity of wild game from list of potential participants
- conduct food consumption survey by telephone to determine amount of wild game consumed
- obtain verbal consent to participate and provide blood sample from eligible participants by telephone
- inform consenting participants about process, volume of blood required and specimen banking
- mail out consent form, list of contact names and locations for RHA blood sampling sites

Regional Health Authority

Medical Officer of Health:

- reviews process with laboratory managers

Designated hospital laboratory:

- receives prepared vials and transportation materials from Chemex laboratory
- distributes prepared vials and transportation materials to healthcare centres as required

Participant:

- contacts designated health care center manager to make appointment
- takes consent form provided by Alberta Health to health care center
- signs consent form

Health Care Centre Manager:

- requests appropriate number of prepared vials from designated hospital laboratory
- ensures participant has consent form with preassigned identification number provided by Alberta Health
- reviews consent form with participant (ensure participant has read and understood consent)
- witnesses signing of consent form
- transfers participant ID number from consent form to shipping list and labels for blood samples
- collects and prepares serum samples according to the attached protocol; all collected serum specimens must be stored frozen prior to shipping
- obtains transportation materials (leak-proof container packed with dry ice) from hospital laboratory after all samples have been collected
- sends all serum specimens to laboratory in Edmonton for chemical analysis via next-day courier using courier service identified by Alberta Health
- compiles a shipping list of participants using attached form to include with each shipment
- mails the completed consent form and a copy of shipping list to:

Kevin McLeod, Manager

Environmental Health Service

Communicable Disease Control Branch

14th Floor, Telus North Building

10025 Jasper Avenue, Edmonton T5J 2N3

Phone: (403) 427-8118

MAXXAM Laboratory

prepare the glass vials, lids and leak-proof containers

- ship the above materials to designated hospitals for redistribution

- receive all serum specimens from health care centers
- remove 5 ml serum from each vial into another vial for specimen banking. Ensure each vial is appropriately labelled with identification code
- send unacidified serum (5 ml) to the following address for specimen banking:

Dr. S. C. Chan

Center for Toxicology

Heritage Research Building

University of Calgary

Faculty of Medicine

3330 Hospital Drive N.W.

Calgary T2N 4N1

Phone: (403)220-551

- complete serum acidification
- conduct chemical testing for PCB, PCDDs and PCDFs
- send test results to an independent toxicologist for an independent review and validation

Toxicology Laboratory (Calgary)

- store serum specimens for long-term monitoring and research purposes

Participant Name: _____

Participant Study Number: _____

Participant Consent Form

I understand that Alberta Health is engaged in an evaluation of people's exposure to PCBs, dioxins and furans in the Swan Hills area. This study is being conducted in order to measure the blood levels of the selected substances, and is limited to the purpose stated. The study is being conducted in collaboration with the Aspen Regional Health Authority.

I do hereby freely consent to participate in this study and understand that my participation will consist of providing a sample of blood, and answers to questions related to my health and diet. I agree to arrange to give a blood sample at one of the approved health care centres on the attached list within one week of receiving this consent form. I understand that my blood sample will only be used for the Swan Hills Environmental Exposure Assessment Study and for no other purposes. I also understand that some of my blood sample may be kept in storage and used at a later date for further research for the study.

My name will be kept confidential and will not be disclosed, except to the manager of the health care centre. My test results will not be referred to in any way except in statistical formats required by the study. I understand that participation in this study may result in no direct benefits to me, other than the results of my own blood test which I will receive after Alberta Health receives all test results. I am free to withdraw from the study at any time. It has been explained to me that there are no significant risks to me from participation in this study. I further understand that while participating in this study I will be free to ask any questions concerning the study or results of the study, subject always to the confidentiality rights of the other participants. If I have any further questions about the project, I know that I am free to contact:

Susan Shaw
Study Co-ordinator
Alberta Health
427-4518

My name is: _____

My Personal Health Number is:

My birth date is:

and I reside at: _____

I hereby release the Minister of Health, his employees and agents, from any and all claims whatsoever which may arise as a result of the study. I further understand that:

- C the information will be kept in a secure location and will not be made available to any other party except without my prior written authorization; and
- C refusal to consent will not adversely impact any rights, benefits or services currently being provided to me by Alberta Health or Aspen Regional Health Authority.

Participant: _____

Dated this _____ day of _____, 1997

Witness: (Print) _____
(Signature)

Appendix J Protocol for Serum Sampling (Study Group)

For each participant:

1. Arrange the following materials provided by health care centers:
 - ▶ 5 vacuum-collection tubes (10 ml tube) containing no additives, e.g. ARed top@ Vacutainers⁷.
 - ▶ disposable glass pipet
 - ▶ **unpowdered** gloves
2. Arrange the following materials obtained from the designated hospital laboratory:
 - ▶ one 40 ml clean glass vial (which has been prepared by Chemex laboratory)
 - ▶ lid (which has been prepared by Chemex laboratory)
3. Using the participant ID number obtained from the consent form, label each tube for identification purposes
4. Label the 40 ml vial using the same participant ID number. Leave sufficient space after the participant ID number for additional labelling by Chemex laboratory.
5. Obtain 50 ml (5 tubes) of venous blood from each participant (or as close to 50 ml as possible)
6. Do not shake or mix tubes. Allow blood to clot in an upright position for 30 minutes at room temperature prior to centrifugation
7. Separate serum from all 5 tubes by centrifugation at 1500 x g (mostly 2000 rpm) for 15 to 20 minutes (referring to the manufacture guidelines for centrifugation speeds and time). Blood specimens should be centrifuged within 60 -120 minutes after collection
8. Transfer the separated serum from each tube with a disposable pipet to the 40 ml glass vial
9. Dispose of left-over portions of blood
10. Cap each vial with lid prepared by Chemex laboratory. Ensure lid is tightly secured
11. Cool all serum specimens for one hour at normal refrigerator temperature and then freeze, store frozen until ready to ship to lab

After all specimens have been collected:

12. Telephone designated hospital laboratory to obtain leak-proof containers packed with dry ice
13. Wrap each tube with bubble plastic and tape to secure. Ensure entire length of tube is protected with bubble plastic
14. Place all specimens in leak-proof container packed with dry ice for transport. Ensure all specimens are packed to reduce agitation and will remain in an upright position during transportation. Specimens can be taped together in groups of ten to reduce agitation.

Enclose one copy of the shipping list identifying the samples in the container

15. Contact Purolator Courier at 1-800-387-3027 and request pick up for next-day courier service. Charge courier service fee to account # 016661035.
16. Send the specimens to the following address:

Dr. S. Ramamoorthy

MAXXAM Laboratory

9331-48 Street

Edmonton, AB, T6B 2R4

Phone: (403)465-9877

Appendix K Protocol for Pooled Serum Sampling (Control Group)

1. Arrange all materials
 - disposable glass pipet
 - unpowdered gloves
 - 40 ml clean glass vials (which have been prepared by MAXXAM laboratory)
 - lid (which has been prepared by MAXXAM laboratory)
 - leak-proof containers packed with dry ice
2. Identify 25 samples for each age- and gender-specific group. Six groups are required as follows:
 - male 17-35,
 - male 35-55,
 - male 55+,
 - female 17-35,
 - female 35-55, and
 - female 55+
3. Complete the pooled sample shipping list as attached, including birthday of each blood donor.
4. Label two vials for each sample group (for a total of twelve 40 ml vials) as follows:

<u>Sample group</u>	<u>Label</u> (leave sufficient space after each code for additional numbering by MAXXAM laboratory)
males 17-35	AH-P-01A AH-P-07A
males 35-55	AH-P-02A AH-P-08A
males 55+	AH-P-03A AH-P-09A
females 17-35	AH-P-04A AH-P-10A
females 35-55	AH-P-05A AH-P-11A
females 55+	AH-P-06A AH-P-12A

Pre-numbered labels have been attached for your convenience.

5. For each sample group, transfer 1 ml serum from each individual's serum sample using a disposable glass pipet into one 40 ml vial. Transfer an additional 1 ml to the other 40ml vial labelled for that sample group. The total amount of serum in each pooled sample should be 50 ml, with 25 ml of serum in each vial.
6. Cap each vial with lid provided by MAXXAM Laboratory.
7. Cool all serum specimens for 1 hour at normal refrigerator temperature, freeze and then store frozen prior to shipping.
8. Wrap each tube with bubble plastic and tape to secure. Ensure entire length of tube is protected with bubble plastic.
9. Place all specimens in leak-proof container packed with dry ice for transport. Ensure all specimens are packed to reduce agitation and will remain in an upright position during transportation. Specimens can be taped together to reduce agitation.
10. Enclose one copy of shipping list identifying the samples enclosed.
11. Send the specimens to the following address via next-day courier:

Dr. S. Ramamoorthy
MAXXAM Laboratory
9331-48 Street Edmonton, AB, T6B 2R4
Phone: (403)465-9877

12. Mail a duplicate copy of shipping list to:

Susan Shaw
Alberta Health
Health Surveillance
9th Floor, 10025 Jasper avenue
Telus Plaza North Tower
Box 1360
Edmonton T5N 2N3
Phone: (403)427-4518

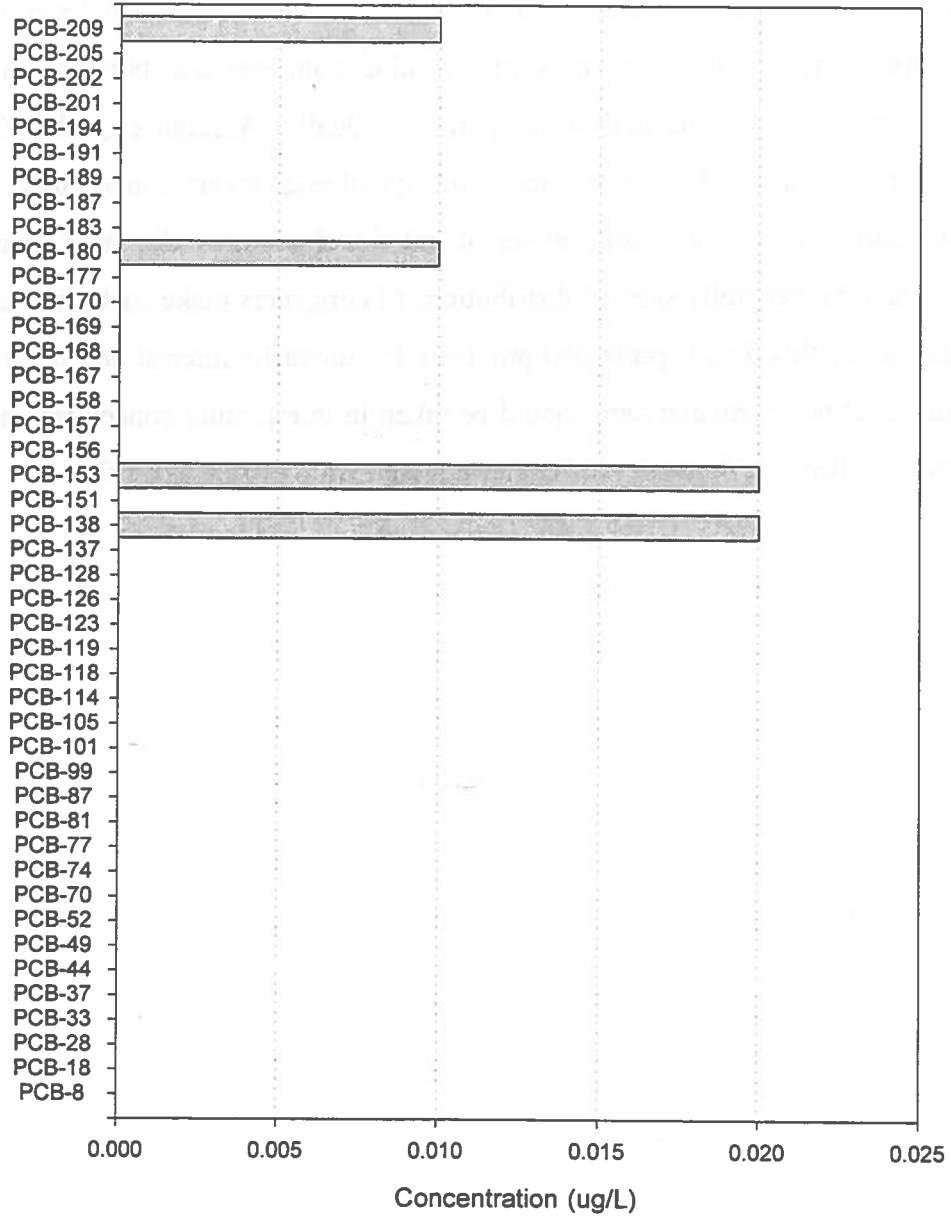
Shipping List for Pooled Samples Date:

Birthday (AH-P-01A)	Birthday (AH-P-02A)	Birthday (AH-P-03A)	Birthday (AH-P-04A)	Birthday (AH-P-05A)	Birthday (AH-P-06A)
S1	S1	S1	S1	S1	S1
S2	S2	S2	S2	S2	S2
S3	S3	S3	S3	S3	S3
S4	S4	S4	S4	S4	S4
S5	S5	S5	S5	S5	S5
S6	S6	S6	S6	S6	S6
S7	S7	S7	S7	S7	S7
S8	S8	S8	S8	S8	S8
S9	S9	S9	S9	S9	S9
S10	S10	S10	S10	S10	S10
S11	S11	S11	S11	S11	S11
S12	S12	S12	S12	S12	S12
S13	S13	S13	S13	S13	S13
S14	S14	S14	S14	S14	S14
S15	S15	S15	S15	S15	S15
S16	S16	S16	S16	S16	S16
S17	S17	S17	S17	S17	S17
S18	S18	S18	S18	S18	S18
S19	S19	S19	S19	S19	S19
S20	S20	S20	S20	S20	S20
S21	S21	S21	S21	S21	S21
S22	S22	S22	S22	S22	S22
S23	S23	S23	S23	S23	S23
S24	S24	S24	S24	S24	S24
S25	S25	S25	S25	S25	S25

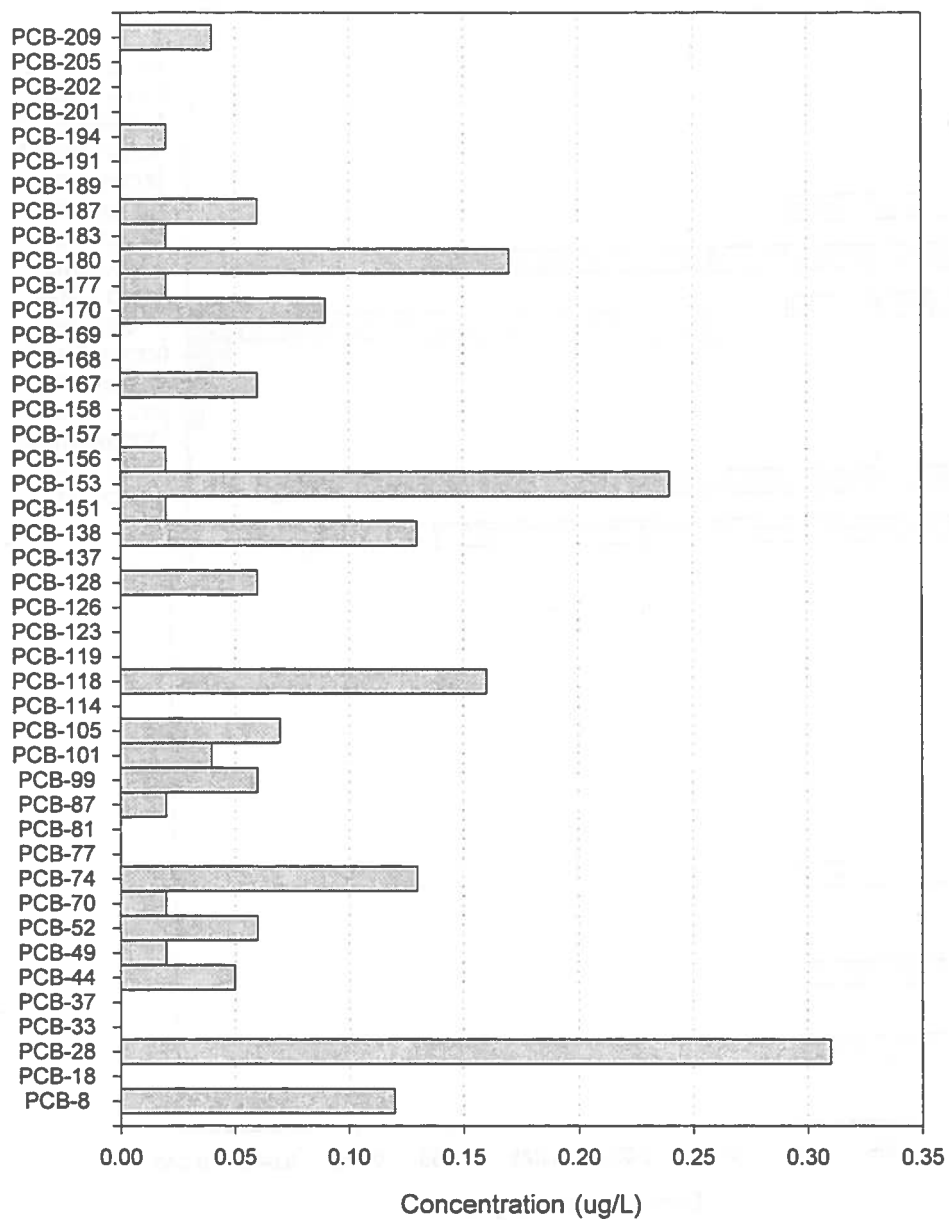
Appendix L Congener Profiles for Human Blood Samples

The current appendix presents the PCB and PCDD/F congener patterns for selected samples and sample types in graphical form. The examination of individual congener distributions can, in the ideal case, serve to locate anomalous analyses as part of a Quality Assurance/Quality Control process and can serve to allow the development of hypotheses about contaminant source localization. In the current case, the small number of individual samples, the large number of congener variables, and the generally skewed distributions of congeners make such examinations speculative. Consequently this data is presented primarily for scientific interest and it should be interpreted with due caution. Particular care should be taken in interpreting concentration levels across different profiles, because the scales differ substantially from profile to profile.

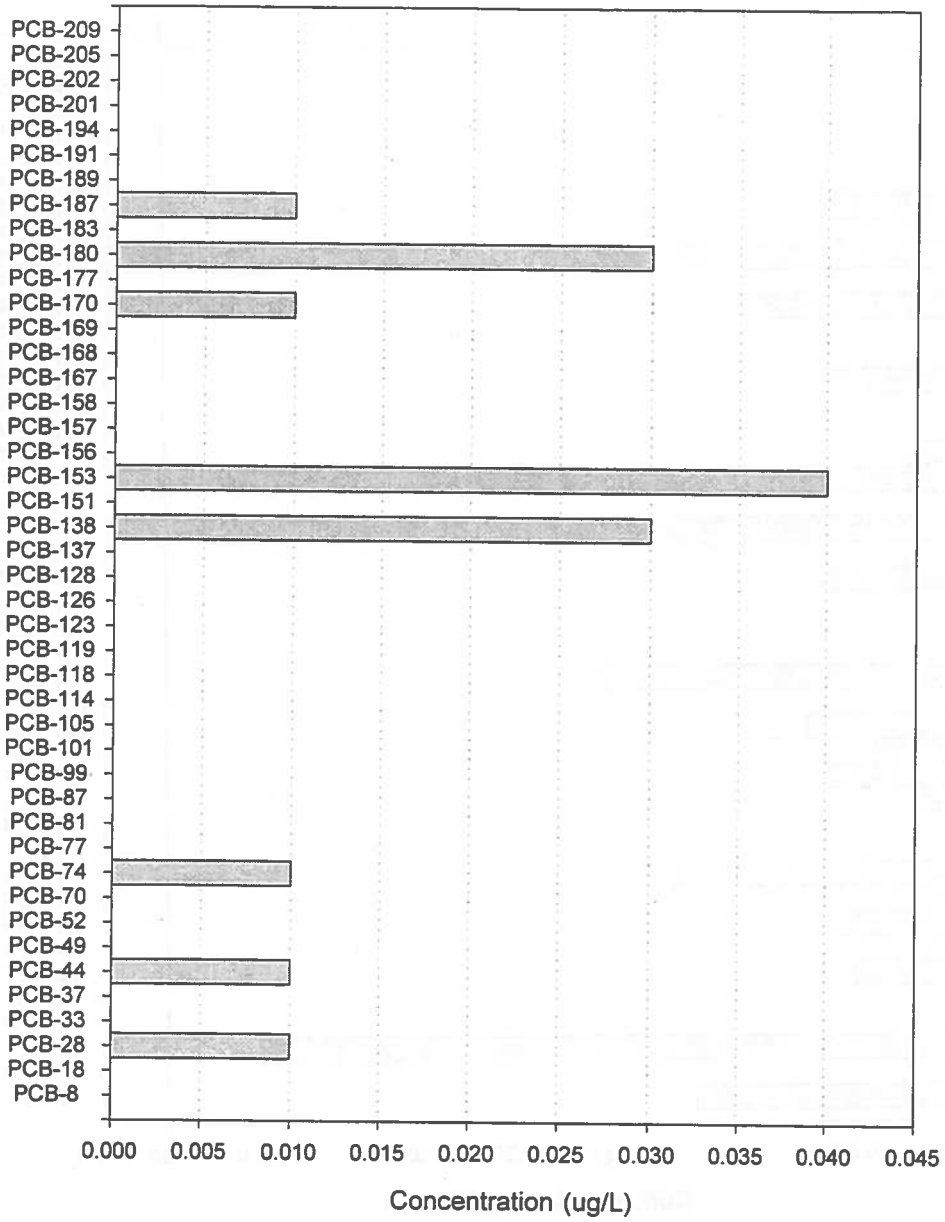
Human Blood Community Sample



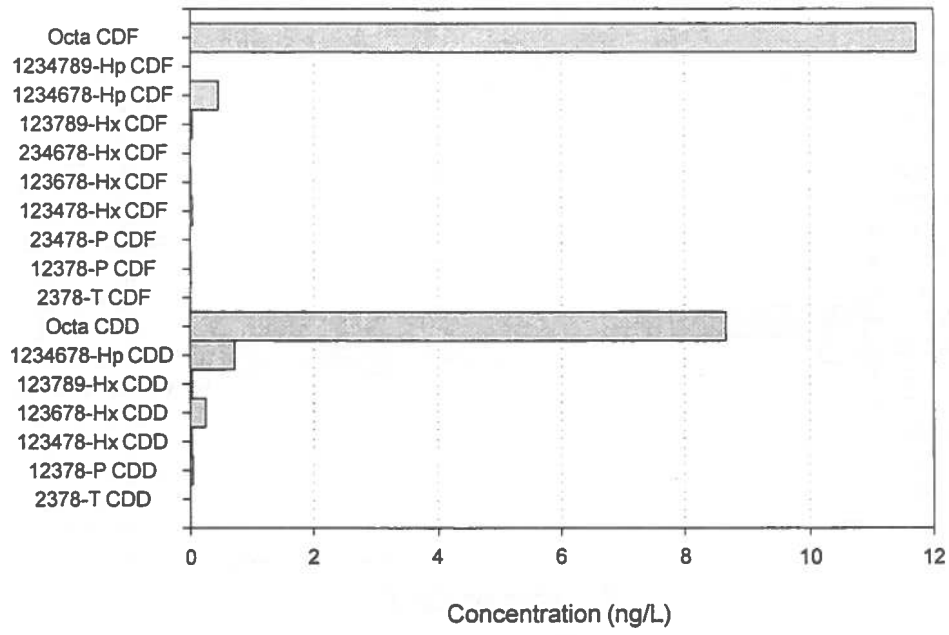
Human Blood SHWTC Employees



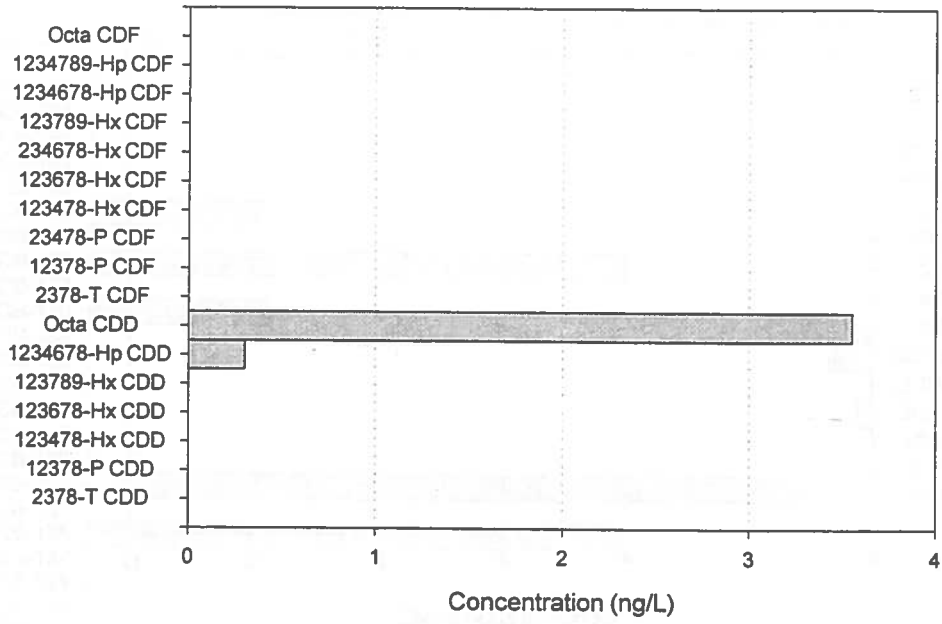
Human Blood Pooled Samples



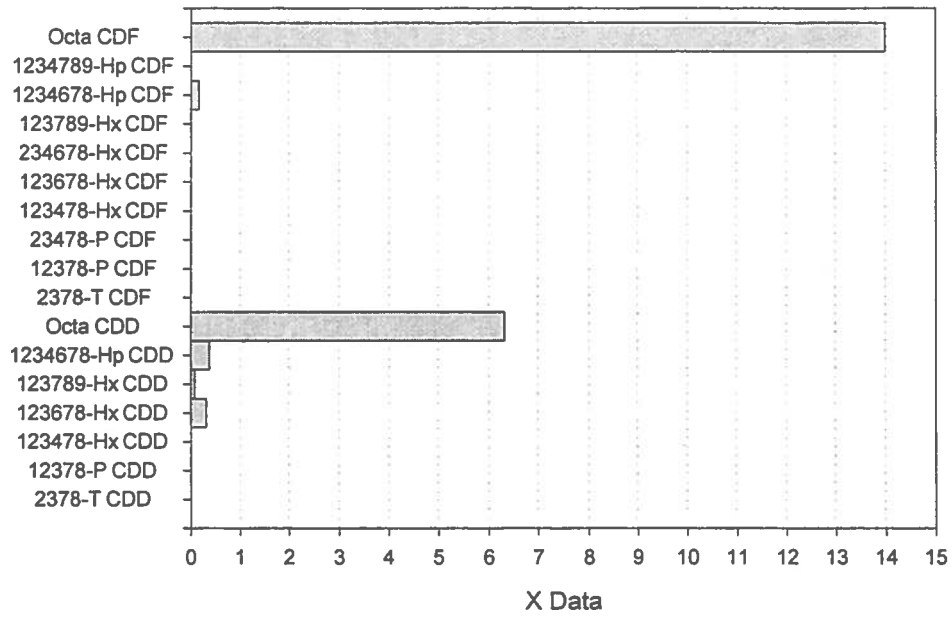
Human Blood Community Sample



Human Blood SHWTC Employees



Human Blood Pooled Samples



Appendix M Initial Questionnaire

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Diet and Outdoor Activities

(Coding in FoxPro database: no=0, yes=1, g=good, wrong#=wrong number, out of ser=out of service. Specific codes will be marked in the questionnaire)

Hello, my name is _____ from Alberta Health. I am calling to inform you about a study we are doing. This study is to evaluate any possible impacts of an incident at the Swan Hills Special Waste Treatment Center that occurred last fall. On Oct. 16, 1996, a mechanical failure of a transformer furnace at the treatment center was identified. Were you aware that on Dec. 13, last year, the Provincial Health Officer recommended that local residents avoid eating wild game and fish taken from the Swan Hills area because of this failure?

NO? Residents of the Swan Hills area have been advised to avoid eating wild game and fish taken from the area until the outcome of a health risk assessment is known. At that point we will advise the public if they can resume eating wild fish and game. The advisory and health assessment are precautionary measures. There is no immediate health risk to you. Would you be willing to participate in the health risk assessment?

YES? When the outcome of a health risk assessment is known, we will advise residents of the Swan Hills area if they can resume eating wild fish and game. The advisory and health assessment are precautionary measures. There is no immediate health risk to you. As a follow up to this advisory, Alberta Health is conducting a study to determine the level of exposure to PCB's, dioxins, and furans to residents of the Swan Hills Area. Would you be willing to participate in the health risk assessment?

No? Okay, thank you very much for your time.

Yes? Okay, I have a few questions I need to ask you for preliminary screening.

1a) Do you ever go hunting or fishing in the Swan Hills Area?

hunting: no yes

fishing: no yes

b) What about trapping in this area?

no yes

c) Do you ever swim or hike in this region?

swim: no yes

hike: no yes

d) Do you go camping or canoeing around Swan Hills?

camping: no yes

canoeing: no yes

e) Do you ever go snowmobiling in the Swan Hills region?

no yes

2a) Do you normally eat any wild meat such as moose or deer meat that is taken from the Swan Hills area?

no yes

b) If yes, for how many years have you eaten this wild meat?

< one year one year

two to five years > five years

c) How frequently did / do you normally eat wild meat?

_____ times daily _____ times monthly

_____ times weekly _____ rarely

d) How much of this meat do you usually eat for a single meal? (note: 4 oz = one McDonald's 1/4 pounder)

4 oz less than 4 oz more than 4 oz

e) Did you stop eating wild meat as a result of the health advisory issued on Dec. 13 of last year?

no yes

3a) Do you normally eat any fish such as trout, whitefish, or jack that have been caught in the Swan Hills area?

no yes

b) If yes, for how many years have you eaten these caught fish?

< one year one year
 two to five years > five years

c) How frequently do you normally eat caught fish?

_____ times daily _____ times monthly
_____ times weekly _____ rarely

d) How much of these fish do you usually eat for a single meal? (note: 4 oz = one fish fillet)

4 oz less than 4 oz more than 4 oz

e) Did you stop eating these fish as a result of the health advisory issued on December 13, last year?

no yes

Thank you for answering those questions. They were designed to help us with the first phase of the study.

Once we have completed the preliminary screening, we will be calling some people back to see if they would be willing to participate in the next phase of the study. To participate in that part of the study, people will be asked to provide a blood sample and to answer a few more questions about their health and diet.

In that phase of the study we would require a sample of blood because testing blood samples is the best way of determining the actual amount of the contaminants that may be present. We would also like to know a little bit about your diet because many foods people eat everyday have small amounts of PCB's, dioxins, and furans in them. The blood sample you would be asked to provide will be tested for the selected substances and for no other purposes. Would you be willing to participate in the second phase of the study?

No? Comments? _____

Thank you very much for your time.

Yes? If you are selected to participate further in the study, I will contact you. What time are you usually available to answer the phone? time _____

Thank you for all your cooperation.

Appendix N Second Questionnaire (Consumer Version)

DIET AND ACTIVITY SURVEY FOR FISH AND GAME CONSUMERS

(Coding in FoxPro database: no=1, yes=2, ✓=1 (yes in). Specific codes will ne marked in the Questionnaire)

Hello, this is _____ from Alberta Health. We've spoken before about the Environmental Exposure Assessment of the Swan Hills area. Do you remember our conversation?

NO? The last time we spoke I explained to you that Alberta Health was doing a study to evaluate the impact of an incident at the Swan Hills Special Waste Treatment Centre on residents of the Swan Hills area. *(continue onto "yes" paragraph)*

YES?

The first time I called you, you participated in the initial phase of our study which involved answering a short questionnaire. At that time, I explained that we would be calling some people back to participate in the second phase. You stated that you would be willing to participate in the second phase. This involves a detailed questionnaire that will take about 15 minutes to conduct over the phone with you right now and a blood sample from you. Are you still willing to participate in the second phase?

NO? Comments? _____

Thank you very much for your participation in the first phase.

YES? We'll start with the questionnaire and then I will give you more information about the blood sample. *(go to questionnaire)*

As you know, the purpose of this study is to assess levels of exposure to some chemicals from food, water and air. This questionnaire will tell us about your diet, daily activities, residence, occupation and the environment in which you live.

The information recorded in this questionnaire will be held in the strictest confidence and will be used only for assessment of the effects of environmental factors on human health. We are asking the same questions of each participant in this study. No information about individual persons will be released. While you are not required to respond, your cooperation is needed to make the results of this survey comprehensive, accurate, and timely.

1. Where do you live?

2. How long have you lived at the present address?

_____ years

3. When did you move to the Swan Hills area?

19____ or born in the area

4a. When were you born?

____/____/____

day month year

4b. To what ethnic group do you belong?

Caucasian African-Canadian

First Nations Asian

Métis East Indian

Other (specify) _____

5. How tall are you?

_____feet _____inches / _____centimetres

6. How much do you weigh?

_____pounds / _____kilograms

7. Do you have a paid job outside of the home?

- yes
- no, self-employed in the home
- no, a full-time student
- no, full-time homemaker
- no, out of work for now, but usually employed
- no, retired or disabled
- no, other - please specify: _____

8. Where do you work or attend school?

9. If employed, what is your occupation? (If participant is a student: What program or training are you taking?) _____

10. How many people live in your household? _____

11. How many people in your household are under eighteen years old? _____

12. Did any woman who lives in your household have a baby in 1996?

- no
- yes

13. Is any woman in your household breast-feeding now?

- no
- yes

14a. Thinking about a typical weekday, can you estimate how much of your time is usually spent outdoors?

indoor _____ outdoor

14b. Thinking about a typical day during the weekend, can you estimate how much of your time is usually spent outdoors?

indoor _____ outdoor

The last time we spoke, you indicated that you participate in the following activities in the Swan Hills area (*check all that apply*):

15a. Can you estimate how many times you participated in each activity during the past year (*check answer in column*)?

15b. Can you estimate about how much time you spend on a typical outing when you are doing each activity (*check answer in column*)?

15c. How close to the waste treatment plant do you usually do these activities?

Activity	Number of Trips Last Year	Duration at Activity Per Trip	Distance from Waste Treatment Plant (km)
<input type="checkbox"/> hunting	<input type="checkbox"/> 1 trip <input type="checkbox"/> 2 - 6 trips <input type="checkbox"/> > 6 trips	<input type="checkbox"/> 1 hour <input type="checkbox"/> 2-4 hours <input type="checkbox"/> 4-12 hours <input type="checkbox"/> 1 day <input type="checkbox"/> 2 - 4 days <input type="checkbox"/> > 4 days	<input type="checkbox"/> <10 <input type="checkbox"/> 10 - 30 <input type="checkbox"/> >30
<input type="checkbox"/> fishing	<input type="checkbox"/> 1 trip <input type="checkbox"/> 2 - 6 trips <input type="checkbox"/> > 6 trips	<input type="checkbox"/> 1 hour <input type="checkbox"/> 2-4 hours <input type="checkbox"/> 4-12 hours <input type="checkbox"/> 1 day <input type="checkbox"/> 2 - 4 days <input type="checkbox"/> > 4 days	<input type="checkbox"/> <10 <input type="checkbox"/> 10 - 30 <input type="checkbox"/> >30
<input type="checkbox"/> trapping	<input type="checkbox"/> 1 trip <input type="checkbox"/> 2 - 6 trips <input type="checkbox"/> > 6 trips	<input type="checkbox"/> 1 hour <input type="checkbox"/> 2-4 hours <input type="checkbox"/> 4-12 hours <input type="checkbox"/> 1 day <input type="checkbox"/> 2 - 4 days <input type="checkbox"/> > 4 days	<input type="checkbox"/> <10 <input type="checkbox"/> 10 - 30 <input type="checkbox"/> >30
<input type="checkbox"/> swimming	<input type="checkbox"/> 1 trip <input type="checkbox"/> 2 - 6 trips <input type="checkbox"/> > 6 trips	<input type="checkbox"/> 1 hour <input type="checkbox"/> 2-4 hours <input type="checkbox"/> > 4 hours	<input type="checkbox"/> <10 <input type="checkbox"/> 10 - 30 <input type="checkbox"/> >30
<input type="checkbox"/> hiking	<input type="checkbox"/> 1 trip <input type="checkbox"/> 2 - 6 trips <input type="checkbox"/> > 6 trips	<input type="checkbox"/> 1 hour <input type="checkbox"/> 2-4 hours <input type="checkbox"/> 4-12 hours <input type="checkbox"/> 1 day <input type="checkbox"/> 2 - 4 days <input type="checkbox"/> > 4 days	<input type="checkbox"/> <10 <input type="checkbox"/> 10 - 30 <input type="checkbox"/> >30
<input type="checkbox"/> camping	<input type="checkbox"/> 1 trip <input type="checkbox"/> 2 - 6 trips <input type="checkbox"/> > 6 trips	<input type="checkbox"/> 2 days <input type="checkbox"/> 4 days <input type="checkbox"/> > 4 days	<input type="checkbox"/> <10 <input type="checkbox"/> 10 - 30 <input type="checkbox"/> >30
<input type="checkbox"/> canoeing/ boating	<input type="checkbox"/> 1 trip <input type="checkbox"/> 2 - 6 trips <input type="checkbox"/> > 6 trips	<input type="checkbox"/> 1 hour <input type="checkbox"/> 2-4 hours <input type="checkbox"/> 4-12 hours <input type="checkbox"/> 1 day <input type="checkbox"/> 2 - 4 days <input type="checkbox"/> > 4 days	<input type="checkbox"/> <10 <input type="checkbox"/> 10 - 30 <input type="checkbox"/> >30
<input type="checkbox"/> snowmobiling / quadding	<input type="checkbox"/> 1 trip <input type="checkbox"/> 2 - 6 trips <input type="checkbox"/> > 6 trips	<input type="checkbox"/> 1 hour <input type="checkbox"/> 2-4 hours <input type="checkbox"/> 4-12 hours	<input type="checkbox"/> <10 <input type="checkbox"/> 10 - 30 <input type="checkbox"/> >30

16. Where do you get drinking water when you are doing these outdoor activities? Do you:

- take bottled water with you,
- boil water from nearby lakes or rivers,
- use a commercial filtering system to filter water from nearby lakes or rivers, or
- drink the water from nearby lakes or rivers without filtering or boiling it?

Check here if participant eats wild game, as indicated in initial questionnaire, if not go to question #20a.

17. During the last conversation we had, you told me that you sometimes eat wild game taken from the Swan Hills area. Let's get more specific about your wild game consumption: please tell me the type of wild meat, such as moose, deer, and/or elk, that you eat, which parts of the animal you typically eat, how much you usually eat for a meal, and how often you eat that specific meat. Let's start with moose.

Type of Wild Game Meat:	Medium Serving:	Amount per Meal:			Frequency:			
		small	med	large	daily	weekly	monthly	rarely/ never
NOTE: A three ounce (100 gm) portion of cooked meat is approximately the size of a deck of cards or a little smaller than a MacDonald's Quarter Pounder								
Moose:								
Muscle (steak, roast) Trim fat off? <input type="checkbox"/> yes <input type="checkbox"/> no	50 - 100gms (2-3 oz)							
Liver	50 - 100gms (2-3 oz)							
Other Organs specify: a. _____	50 - 100gms (2-3 oz)							

b. _____	50 - 100gms (2-3 oz)							
Sausages: add fat (ie. pork fat) to sausages? <input type="checkbox"/> yes <input type="checkbox"/> no	2 links (smokies) or 4 slices of salami							
Deer								
Muscle (steak, roast) Trim fat off? <input type="checkbox"/> yes <input type="checkbox"/> no	50 - 100gms (2-3 oz)							
Liver	50 - 100gms (2-3 oz)							
Other Organs specify: a. _____	50 - 100gms (2-3 oz)							
b. _____	50 - 100gms (2-3 oz)							

Type of Wild Game	Medium Serving:	Amount per Meal:			Frequency:			
		small	med	large	daily	weekly	monthly	rarely/ never
Sausages: add fat (ie. pork fat) to sausages? <input type="checkbox"/> yes <input type="checkbox"/> no	2 links (smokies) or 4 slices of salami							
Elk:								
Muscle (steak, roast) Trim fat off? <input type="checkbox"/> yes <input type="checkbox"/> no	50 - 100gms (2-3 oz)							
Liver	50 - 100gms (2-3 oz)							
Other Organs specify: a. _____	50 - 100gms (2-3 oz)							
b. _____	50 - 100gms (2-3 oz)							
Sausages: add fat (ie. pork fat) to	2 links (smokies) or 4 slices of salami							

sausages? <input type="checkbox"/> yes <input type="checkbox"/> no									
Other Mammals:									
a. _____	50 - 100gms (2-3 oz)								
b. _____	50 - 100gms (2-3 oz)								
c. _____	50 - 100gms (2-3 oz)								
Wild Birds:									
Duck Specify type: _____	50 - 100gms (2-3 oz)								
Duck Specify type: _____	50 - 100gms (2-3 oz)								
Goose	50 - 100gms (2-3 oz)								
Grouse	50 - 100gms (2-3 oz)								
Other wild birds: a. _____	50 - 100gms (2-3 oz)								
b. _____	50 - 100gms (2-3 oz)								

18. How do you usually cook the wild game?

- baked fried
 broiled stewed
 other, _____

19. Where do you usually prefer to hunt?

Indicate how close these locations are to the Swan Hills Special waste Treatment Plant

- site a: _____ <10 km 10 - 30 km 30 - 50 km > 50 km
site b: _____ <10 km 10 - 30 km 30 - 50 km > 50 km
site c: _____ <10 km 10 - 30 km 30 - 50 km > 50 km

☐ check here if participant eats fish, as indicated on initial questionnaire, if not go to question #22a.

Last time we talked, you indicated that you consume fish that have been caught in the Swan Hills area.

I'd like to know a few more specific details about the fish you eat.

20a. What part of the fish do you usually eat?

- fillet
- liver
- whole fish
- other organs

20b Please list all the kinds of fish you normally eat.

- pike
- brook trout
- walleye
- lake whitefish
- bull trout
- perch
- rainbow trout
- mountain whitefish
- goldeye
- arctic grayling
- other _____

20c. Thinking back, can you remember where you typically catch fish?

- Freeman Lake
- Edith Lake
- Roche Lake
- Ethel Lake
- Lesser Slave Lake
- Other, specify: _____

21. How do you usually cook the fish?

- fry
- broil
- bake
- other, _____

22a. Do you ever eat any wild fruit, berries, vegetables, or herbs that have been gathered from the Swan Hills area ?

- no
- yes

22b If yes to above, what types of wild berries, fruit, vegetables, or herbs to you usually eat?

_____ how much? _____ how often? _____
_____ how much? _____ how often? _____

22c. How close to the waste treatment plant do you usually pick berries, vegetables, or herbs?

- <10 km
- 10 - 30 km

30 - 50 km

> 50 km

23. These next few questions will tell me about the other foods you normally eat. I'm going to list various foods and I would like you to think back over the past year and tell me how often you ate them and how much you normally ate at each meal. I will give you an example of a medium sized serving of the food item and I would like you to tell me if your portion is usually the same as a medium portion, larger or smaller than a medium portion. Then, I would like you to tell me how often, that is, daily, weekly, or monthly, that you eat the food item. Let's start with hamburger and meat loaf. If I say that a medium serving is one patty or slice, can you estimate how much hamburger you would typically eat for one meal? -About a medium serving, less than a medium serving, or more than a medium serving? And about how frequently do you eat hamburger or meatloaf? Would you say that you eat it daily, weekly or monthly? How many times per "week"?

Types of Food Items From Grocery Mart	Medium Serving:	Amount per Meal:			Frequency:		
		< med	med	>med	daily	weekly	monthly
Ground Beef	4oz or 1 patty						
Roasts	4 oz						
Beef steaks	4 oz						
Veal	4 oz						
Fresh pork, including pork chops and cured pork	2 chops or 4 oz						
Chicken or turkey, roasted, stewed or broiled	2 sm or 1 lg sandwich						
Organ meats	4 oz						
Shell fish	4 oz						
Canned fish	4 oz or 1 sandwich						
Fresh water fish	4 oz						
Eggs	2 eggs						
Cheese	2 slices or 2 oz						
Cheese spreads, not including cottage	2 oz						
Cottage Cheese	2 oz						
Instant breakfast (ie. Carnation)	1 envelope						

Ice Cream (regular, not diet)	1 cup						
Cream	1 cup						
Margarine	2 tbs						
Butter	2 tbs						
Cooking fats (oil), salad dressing (in oil form)	2 tbs						
Locally grown vegetables	1/2 cup						

The next few questions will tell me a little bit more about your lifestyle and health. They are important questions to give me a better idea of your overall health.

24a. Do you ever drink beer, wine, or hard liquor?

- no yes

24b If yes, how often do you drink alcohol?

- once a month once a week
 2 - 3 times weekly daily

24c. How much do you drink on these occasions?

_____ oz / glasses / bottles

Daily Cigarette Equivalent:

- 1 oz tobacco = 25 cigarettes
1 small cigar = 2 cigarettes
1 large cigar = 5 cigarettes

25a. Do you smoke?

- no yes

25b If yes, how much do you smoke per day?

- 1 to 10 11 to 20
 21 to 30 31 to 40
 > 40

25c. How long have you been smoking this amount?

- < one year two to four years
 four to six years > six years

26. Do you have any long term health conditions such as:

- High cholesterol Cancer, type _____
 Liver Problems, specify _____ Other _____

27. How did you find out about the health advisory?

28. Do you think that the health advisory provided enough information to enable you to make an informed decision about whether or not to stop eating wild meat and fish?

- yes no, why not? _____

Check here if participant chose to continue eating wild fish and game after Health Advisory was issued as indicated in initial questionnaire. If participant DID stop eating wild fish and game, go to question #30

29a. Last time we spoke, you indicated that you did not follow the health advisory. What was the most important reason that influenced your decision?

- b. Did the physical quality of the wild fish or game suggest that it was okay to eat?
 yes no
- c. Did you continue to eat wild fish and game because they are your main food source?
 yes no
- d. Are you waiting for more information from current studies before making a decision to stop eating wild fish and game?
 yes no
30. If guidelines created by using the results of our study recommended decreasing the amount of food from the local area (ie. berries, vegetables, wild fish and game) consumed in order to limit exposure to these chemicals, would you be willing to follow the guidelines and reduce your consumptions of wild fish and game?
 yes no

Thank you for answering those questions. They are designed to help us with the second phase of the study by identifying all the potential sources of contaminants to which you might be exposed.

I will be sending you a letter containing a consent form and a list of approved health care centers where you can give your blood sample. Read the consent form carefully but, please, do not sign it. Pick the health care center that is nearest to you from the list and make an appointment for your blood sample to be taken. Try to make this appointment within a week of receiving this letter. At the clinic, the manager will go over the consent form with you and will ask you to sign it at that point. Then a technician or nurse will take a sample of your blood. We require 50 millilitres of blood (which is 5 tubes) in order to test for these contaminants. The blood sample will then be sent directly to the lab and the results will be sent to Alberta Health. Again, your blood sample will only be tested for the selected substances. After all the test results have been received from the lab and compiled, we will contact you to discuss your test results with you. Do you have any questions or comments?

Comments? _____

Could you please tell me your complete address so I can send you the consent form and list of approved health care centers to you. Could you also spell your name for me for clarification.

Address:

This will probably be the last time we speak on the phone. If you have any questions, please call 427-4518 and ask for _____. I want to thank you for all the cooperation and time you've given to our study.

Appendix O Second Questionnaire (Non-consumer version)

DIET AND ACTIVITY SURVEY FOR NON FISH AND GAME CONSUMERS

As you know, the purpose of this study is to assess levels of exposure to some chemicals from food, water and air. This questionnaire will tell us about your diet, daily activities, residence, occupation and the environment in which you live.

The information recorded in this questionnaire will be held in the strictest confidence and will be used only for assessment of the effects of environmental factors on human health. We are asking the same questions of each participant in this study. No information about individual persons will be released. While you are not required to respond, your cooperation is needed to make the results of this survey comprehensive, accurate, and timely.

1. Where do you live?

2. How long have you lived at the present address?

_____ years

3. When did you move to the Swan Hills area?

19____ or born in the area

4. When were you born?

____ / ____ /

day month year

4b. To what ethnic group do you belong?

Caucasian African-Canadian

First Nations Asian

Métis East Indian

Other (specify) _____

5. How tall are you?

_____ feet _____ inches / _____ centimetres

6. How much do you weigh?

_____ pounds / _____ kilograms

7. Do you have a paid job outside of the home?

yes

no, self-employed in the home

no, a full-time student

no, full-time homemaker

no, out of work for now, but usually employed

no, retired or disabled

no, other - please specify: _____

8. Where do you work or attend school?

9. If employed, what is your occupation? (If participant is a student: What program or training are you taking?) _____

10. How many people live in your household? _____

11. How many people in your household are under eighteen years old? _____

12. Did any woman who lives in your household have a baby in 1996?

no

yes

13. Is any woman in your household breast-feeding now?

no

yes

14a. Thinking about a typical weekday, can you estimate how much of your time is usually spent outdoors?

indoor _____ outdoor

14b. Thinking about a typical day during the weekend, can you estimate how much of your time is usually spent outdoors?

indoor _____ outdoor

The last time we spoke, you indicated that you participate in the following activities in the Swan Hills area (*check all that apply*):

15a. Can you estimate how many times you participated in each activity during the past year (*check answer in column*)?

15b. Can you estimate about how much time you spend on a typical outing when you are doing each activity (*check answer in column*)?

15c. Can you estimate, on average, what distance you were from the treatment plant during these activities?

Activity	Number of Trips Last Year	Duration at Activity Per Trip	Distance from Treatment Plant (km)
<input type="checkbox"/> hunting	<input type="checkbox"/> 1 trip <input type="checkbox"/> 2 - 6 trips <input type="checkbox"/> > 6 trips	<input type="checkbox"/> 1 hour <input type="checkbox"/> 2-4 hours <input type="checkbox"/> 4-12 hours <input type="checkbox"/> 1 day <input type="checkbox"/> 2 - 4 days <input type="checkbox"/> > 4 days	<input type="checkbox"/> <10 <input type="checkbox"/> 10 - 30 <input type="checkbox"/> >30
<input type="checkbox"/> fishing	<input type="checkbox"/> 1 trip <input type="checkbox"/> 2 - 6 trips <input type="checkbox"/> > 6 trips	<input type="checkbox"/> 1 hour <input type="checkbox"/> 2-4 hours <input type="checkbox"/> 4-12 hours <input type="checkbox"/> 1 day <input type="checkbox"/> 2 - 4 days <input type="checkbox"/> > 4 days	<input type="checkbox"/> <10 <input type="checkbox"/> 10 - 30 <input type="checkbox"/> >30
<input type="checkbox"/> trapping	<input type="checkbox"/> 1 trip <input type="checkbox"/> 2 - 6 trips <input type="checkbox"/> > 6 trips	<input type="checkbox"/> 1 hour <input type="checkbox"/> 2-4 hours <input type="checkbox"/> 4-12 hours <input type="checkbox"/> 1 day <input type="checkbox"/> 2 - 4 days <input type="checkbox"/> > 4 days	<input type="checkbox"/> <10 <input type="checkbox"/> 10 - 30 <input type="checkbox"/> >30
<input type="checkbox"/> swimming	<input type="checkbox"/> 1 trip <input type="checkbox"/> 2 - 6 trips <input type="checkbox"/> > 6 trips	<input type="checkbox"/> 1 hour <input type="checkbox"/> 2-4 hours <input type="checkbox"/> > 4 hours	<input type="checkbox"/> <10 <input type="checkbox"/> 10 - 30 <input type="checkbox"/> >30
<input type="checkbox"/> hiking	<input type="checkbox"/> 1 trip <input type="checkbox"/> 2 - 6 trips <input type="checkbox"/> > 6 trips	<input type="checkbox"/> 1 hour <input type="checkbox"/> 2-4 hours <input type="checkbox"/> 4-12 hours <input type="checkbox"/> 1 day <input type="checkbox"/> 2 - 4 days <input type="checkbox"/> > 4 days	<input type="checkbox"/> <10 <input type="checkbox"/> 10 - 30 <input type="checkbox"/> >30
<input type="checkbox"/> camping	<input type="checkbox"/> 1 trip <input type="checkbox"/> 2 - 6 trips <input type="checkbox"/> > 6 trips	<input type="checkbox"/> 2 days <input type="checkbox"/> 4 days <input type="checkbox"/> > 4 days	<input type="checkbox"/> <10 <input type="checkbox"/> 10 - 30 <input type="checkbox"/> >30
<input type="checkbox"/> canoeing/ boating	<input type="checkbox"/> 1 trip <input type="checkbox"/> 2 - 6 trips <input type="checkbox"/> > 6 trips	<input type="checkbox"/> 1 hour <input type="checkbox"/> 2-4 hours <input type="checkbox"/> 4-12 hours <input type="checkbox"/> 1 day <input type="checkbox"/> 2 - 4 days <input type="checkbox"/> > 4 days	<input type="checkbox"/> <10 <input type="checkbox"/> 10 - 30 <input type="checkbox"/> >30
<input type="checkbox"/> snowmobiling / quadding	<input type="checkbox"/> 1 trip <input type="checkbox"/> 2 - 6 trips <input type="checkbox"/> > 6 trips	<input type="checkbox"/> 1 hour <input type="checkbox"/> 2-4 hours <input type="checkbox"/> 4-12 hours	<input type="checkbox"/> <10 <input type="checkbox"/> 10 - 30 <input type="checkbox"/> >30

16. Where do you get drinking water when you are doing these outdoor activities? Do you:

- take bottled water with you,
- boil water from nearby lakes or rivers,
- use a commercial filtering system to filter water from nearby lakes or rivers, or
- drink the water from nearby lakes or rivers without filtering or boiling it?

17a. Do you ever eat any wild fruit, berries, vegetables, or herbs that have been gathered from the Swan Hills area ?

no

yes

17b If yes to above, what types of wild berries, fruit, vegetables, or herbs do you usually eat?

_____ how much? _____ how often? _____

_____ how much? _____ how often? _____

17c. How close to the waste treatment plant do you usually pick berries, vegetables, or herbs?

<10 km

10 - 30 km

>30 km

specific area, if stated, _____

18. These next few questions will tell me about the other foods you normally eat. I'm going to list various foods and I would like you to think back over the past year and tell me how often you ate them and how much you normally ate at each meal. I will give you an example of a medium sized serving of the food item and I would like you to tell me if your portion is usually the same as a medium portion, larger or smaller than a medium portion. Then, I would like you to tell me how often, that is, daily, weekly, or monthly, that you eat the food item. Let's start with hamburger and meat loaf. If I say that a medium serving is one patty or slice, can you estimate how much hamburger you would typically eat for one meal? -About a medium serving, less than a medium serving, or more than a medium serving? And about how frequently do you eat hamburger or meatloaf? Would you say that you eat it daily, weekly or monthly? How many times per "week"?

Types of Food Items From Grocery Mart	Medium Serving:	Amount per Meal:			Frequency:		
		< med	med	>med	daily	weekly	monthly
Ground beef	4 oz or 1 patty						
Roasts	4 oz						
Beef steaks	4 oz						
Veal	4 oz						
Fresh pork, including pork chops and cured pork	2 chops or 4 oz						
Chicken or turkey, roasted, stewed or broiled	2 sm or 1 lg sandwich						
Organ meats	4 oz						
Shell fish	4 oz						
Canned fish	4 oz or 1 sandwich						
Fresh water fish	4 oz						
Eggs	2 eggs						
Cheese	2 slices or 2 oz						
Cheese spreads, not including cottage	2 oz						
Cottage Cheese	2 oz						
Instant breakfast (ie. Carnation)	1 envelope						
Margarine	1 tbs						
Butter	1 tbs						
Ice cream (regular, not diet)	1 cup						
Cream	1 cup						
Cooking fats (oil), salad dressing (in oil form)	2 tbs						
.Locally grown vegetables	1/2 cup						

The next few questions will tell me a little bit more about your lifestyle and health. They are important questions to give me a better idea of your overall health.

19a. Do you ever drink beer, wine, or hard liquor?

- no yes

19b. If yes, how often do you drink alcohol?

- once a month once a week
 2 - 3 times weekly daily

19c. How much do you drink on these occasions?

_____ oz / glasses / bottles

Daily Cigarette Equivalent:

- 1 oz tobacco = 25 cigarettes
1 small cigar = 2 cigarettes
1 large cigar = 5 cigarettes
-

20a. Do you smoke?

- no yes

20b. If yes, how much do you smoke per day?

- 1 to 10 11 to 20
 21 to 30 31 to 40
 > 40

20c. How long have you been smoking this amount?

- < one year two to four years
 four to six years > six years

21. Do you have any long term health conditions such as:

- High cholesterol Cancer, type _____
 Liver Problems, specify _____ Other, _____

22. How did you find out about the health advisory?

23. Do you think that the health advisory provided enough information to enable you to make an informed decision about whether or not to stop eating wild meat and fish?

yes

no, why not? _____

24. If guidelines created using results of our study recommended decreasing the amount of food from the local area (ie. berries, vegetables, wild fish and game) consumed in order to limit exposure to these chemicals, would you be willing to follow the guidelines and reduce your consumptions of wild fish and game?

yes

no

Appendix P Public News Release (December, 1996)

Public Health Advances

Edmonton, December 13, 1996

Public Health Advisory

Alberta's Provincial Health Officer, Dr. John Waters, today issued a public health notice advising against eating wild game taken from the Swan Hills area.

The advisory is based on preliminary test results received by Alberta Health from Alberta Environmental Protection regarding initial animal tissue samples collected in the Swan Hills area. This information indicates **no immediate threat to human health**. However, the studies are not yet complete and more information is required before a final determination can be made.

The tissue samples were collected as a result of an air emissions release containing Poly Chlorinated Biphenyls (PCBs), dioxins and furans which occurred at the Swan Hills Treatment Centre on October 16, 1996.

"When dealing with issues that may even remotely affect public health it is best to err on the side of caution, said Dr. Waters. "I am therefore advising that precautionary measures be taken to minimize potential health risks that may be associated with eating wild game from the area.

Alberta Health is currently conducting a comprehensive health risk assessment. The public will be provided with any information which may alter the Public Health

Advisory. An initial report will be issued in approximately two months containing findings of the health risk assessment which will be ongoing for several months.

Until these results are released and the advisory revoked, the following precautionary measures are recommended:

- Avoid eating wild game taken from a 30 km radius of the Swan Hills Treatment Centre. This 30 km radius includes a safety factor of approximately 10 times that of the potential range of game in the area.
- If wild game from the area has already been eaten, simply avoid eating any more of the meat. Again no health risk has been identified and the consumption of potentially contaminated meat would have to occur over a number of years before it could lead to any adverse health effects.
- There is no need to dispose of any wild meat until further information is available. Meat should be stored in the freezer with clearly marked labels until Alberta Health is able to assess and advise on any possible health risks.

"We have no information to date to indicate that there is any public health risk or a risk to individuals who may have previously eaten meat from the area. However, the role of Alberta Health and the Provincial Health Officer is to be extremely cautious and ensure that, above all, public health is protected," concluded Dr. Waters.

If the public would like more information on this health advisory they may dial 1-800-883-5551 between the hours of 8:15 a.m. and 4:30 p.m. Monday to Friday.

For more information, contact:

Dr. John Waters
Provincial Health Officer
(403) 422-4711

Garth Norris
Alberta Health Communications
(403) 427-7164

Background

Edmonton, December 13, 1996

Who is affected by the advisory?

The advisory only applies to people who eat wild game taken from within a 30 km radius of the Swan Hills Centre. Only animals near the Swan Hills Treatment Centre would potentially be affected by the emission.

How far reaching are the effects of the release?

Toxicology experts indicate that the emission reached the ground within a three kilometre radius of the plant site and that there is no direct threat to the surrounding population, including the town of Swan Hills. To ensure all precautions are taken to minimize potential public health risks, the game advisory has been extended to include the areas within a 30 kilometre radius of the plant site.

What are the health effects?

There is no reason to expect negative health effects from consuming the wild game even if significant levels of toxins are found in the meat. Health effects such as chloracne (an acne like skin condition), skin discolouration, headaches, swelling around the eyes, weakness, numbness, weight loss, or abnormal liver functioning may sometimes occur. These are seen only if a high level of exposure occurs over a number of years.

If I have already eaten wild meat from the area what should I do? Should I see a doctor?

The only thing you need to do is to stop consuming the meat. You do not need to see a doctor. Again, health is affected only following long-term exposure to high levels of PCBs, dioxins and furans.

If there are no negative health effects, why can't I eat the meat?

There are unlikely to be health effects, however, until we conduct further tests it is best to avoid eating the meat. Alberta Health wants to minimize exposure to any level of PCBs, dioxins and furans.

What will a health risk assessment determine?

The health risk assessment will determine, where possible, the amount of contaminants to which the people and the environment were exposed. This will likely involve further testing of animals, soil, water, fish and possibly human volunteers who have consumed wild game.

What do preliminary tests indicate?

Although no specific guidelines exist for wild game, the test results indicated that PCB levels for most of the samples were within the guidelines developed by Health Canada for similar domestic animals (beef).

What about cattle or other livestock in the area? Will they be affected?

Preliminary information indicates that there are no cattle or livestock in the potentially affected area. Animals in other areas are not at risk.

Can I eat fish caught from the area?

Fish should be treated the same as wild game and should not be consumed until the health risk assessment results are released.

Why wasn't the advisory issued sooner?

The advisory was issued by Alberta Health as soon as evidence was presented by Alberta Environmental Protection to suggest wildlife in the surrounding area may have been exposed to contaminants.

Edmonton, December 23, 1996

HEALTH ASSESSMENT UPDATE SWAN HILLS AREA

BACKGROUND

- On December 13, 1996 Alberta Health issued a public health notice advising against eating wild game and fish taken within a 30 kilometre radius of the Swan Hills Treatment Centre.
- The advisory was based on preliminary test results received from Alberta Environmental Protection as a result of an October 16, 1996 air emissions release containing Poly Chlorinated Biphenyls (PCBs), dioxins and furans at the Treatment Centre.
- The advisory was a precautionary measure as there was **no evidence of immediate risk to human health**.
- Some area residents continue to have concerns about the potential health risk involved.

DETAILS OF THE HEALTH ADVISORY

- Preliminary results of testing on animal samples indicate **no immediate threat to human health**.
- As a precautionary measure to minimize any potential health risks, individuals should avoid eating any wild game or fish taken from a 30 kilometre radius of the Swan Hills Treatment Centre. This radius has a large built in safety factor to take into account the movement of wild game.
- At this time there is no need to throw away the meat of the game taken within the 30 kilometre radius. This meat should be stored in the freezer with clearly marked labels until further testing is completed.
- **No immediate health risk has been identified at this time.** Therefore there is no need to be concerned if some of the meat has already been eaten. Just do not eat any more of the meat until further testing has been completed. Health effects are unlikely to occur as a result of eating of contaminated meat unless consumption is on a regular basis over a number of years.
- At this time there is no evidence that the meat from the 30 kilometre radius is significantly contaminated. **However, to be absolutely safe, eating the meat should be avoided until further testing is complete.**

- Alberta Health, in cooperation with the local Regional Health Authorities, Health Canada and Alberta Environmental Protection, is moving quickly to conduct a full health assessment in the area and will provide further advice by about the end of January, 1997.

DETAILS OF THE HEALTH ASSESSMENT

- The health assessment being done will determine the amount of contaminants to which people and wildlife were exposed and what, if any, longer term health precautions may need to be taken, especially related to eating wild game and fish from the area.
- The health assessment will include further testing of meat samples already taken from the area, as well as testing of new samples to be taken in the next few weeks.
- The health assessment will also include the testing of a random sample of people from the area, to assess human exposure to the contaminants. It will include both people who regularly eat wild game and those that do not. This will take place in early January, 1997.
- Alberta Health will be assisted in the health assessment by an expert Science Advisory Committee of independent scientists who will bring expertise on the possible health effects of the contaminants involved; oversee the overall assessment; and provide an independent review of the results.
- The first results of the full health assessment will be available by late January, 1997 or early February. At that time Alberta Health will issue further advice on eating wild game from the area.

FOR MORE INFORMATION

- Alberta Health, in cooperation with the local Regional Health Authorities, will release information on the results of the health assessment once the additional testing is completed in January 1997.
- Individuals with further questions regarding eating wild game taken in the general Swan Hills area should contact their local Regional Health Authority: **Aspen at (403)349-8705**, and **Keeweenok Lakes at (403) 523-4434**
- Individuals with questions or concerns about specific personal health concerns should consult their physician.
- Individuals with questions about Alberta Health's overall health assessment should contact the **Alberta Health Communications Branch at (403) 427-7164**.

Appendix Q Public News Release (May, 1997)

News Release

Edmonton, May 15, 1997

Wild Game Public Health Advisory Downgraded

The wild game public health advisory for the Swan Hills area originally issued on December 13, 1996, has been revised by Alberta's Provincial Health Officer, Dr. John Waters, based on the results of more extensive wild game testing.

While recent test results confirm that eating wild game from the Swan Hills area poses no immediate threat to human health, it is recommended that individuals limit the amount of wild game eaten. The original public health advisory recommended that wild game taken from within a 30 km radius of the Swan Hills Treatment Centre not be eaten.

"Again, we have chosen to err on the side of caution with this matter. As the Provincial Health Officer, it is my responsibility to recommend the precautions necessary to ensure public health is protected", stated Waters.

The original advisory was based on two animal tests received from Alberta Environmental Protection and came following an air emissions release containing polychlorinated biphenyls (PCBs) dioxins and furans at the Swan Hills Treatment Centre on October 16, 1996.

Recent wild game meat samples taken from near the Swan Hills Treatment Centre were also found to have elevated levels of PCBs, dioxins and furans. "None of the levels detected in the wild meat samples are high enough to cause any immediate health problems, nor to cause undue concern for people who may have consumed the meat before the advisory was issued", said Waters.

"However, because we have detected elevated levels of contaminants and because these toxic chemicals accumulate with time, over the long-term it is prudent to limit consumption of game taken from within a 30 km radius of the Swan Hills Treatment Centre", said Waters. As a result, Waters is adjusting the advisory and is recommending the following precautionary measures:

- limit consumption of wild game taken from within a 30 km radius of Swan Hills Treatment Centre to 13 ounces per month (370 grams)
- avoid eating organ meat (liver, kidney) or using fat from game harvested within a 30 km radius of the treatment centre
- pregnant or breast feeding women should avoid eating wild game taken from within a 30 km radius of the treatment centre
- young children should avoid eating meat taken from within a 30 km radius of the treatment centre
- continue to avoid eating fish from within a 30 km radius of the treatment centre until fish sample testing is complete

The advisory applies to animals taken last fall, as well as to those that will be taken in the coming year. The advisory is in effect until further notice. As the health assessment continues and ongoing monitoring is conducted, the public health advisory will be updated as required.

The primary risk of contamination comes from eating animals that contain elevated levels of these contaminants. Contaminants in air and water are not of direct concern to human health.

Since December 1996, Alberta Health has been conducting a human health assessment. The assessment includes testing wild meat samples, human blood samples and fish samples from the Swan Hills area. Today's revised public health notice is based on the results of the wild meat samples. Blood test and fish test results are expected within the next two months.

Individuals who have questions may contact the Medical Officer of Health, Keeweenok Lakes Regional Health Authority at 458-7715, or the Medical Officer of Health, Aspen Regional Health Authority at 962-9687.

Media inquiries should be directed to:

Dr. John Waters
Provincial Health Officer
Alberta Health
(403) 427-5263

Garth Norris
Director, Communications
Alberta Health
(403) 427-7164

Edmonton, May 15, 1997

Questions and Answers

1) Who assisted the Provincial Health Officer with the assessment and advisory?

Two committees were formed to help direct the assessment and assist the Provincial Health Officer with the advisory.

The Scientific Advisory Committee provided objective professional advice on scientific matters related to the human health assessment. Membership included scientists with collective expertise in the fields of medicine, human health effects, environmental epidemiology, wildlife biology, animal and human pathology, transport of environmental contaminants, and environmental health.

The Public Health Advisory Committee was established to assist the Provincial Health Officer in assessing potential public health risk. The team included representatives from Alberta Health, Keeweenaw Lakes Regional Health Authority, Aspen Regional Health Authority, Health Canada, and Alberta Environmental Protection.

2) How many Swan Hills and area residents eat wild game?

62% of the population in the area does not eat wild game. Approximately 2% of the area residents eat wild game daily, 11% eat wild game weekly, 13% eat it monthly and 11% of the population eats wild game once yearly.

3) What is the 13 ounce limit based on?

The 13 ounce limit is based on lifetime exposure to the most contaminated meat. Although not all animals in the Swan Hills area were found to be contaminated, utmost caution is being exercised to ensure public safety.

4) Why is the advisory being altered at all if only 13 ounces of the wild game can be eaten per month?

The initial advisory was a precautionary measure until further scientific data was available. We have now conducted thorough sampling and have revised the public health notice based on scientific data.

5) Why wasn't the updated health advisory issued after the results of the upcoming human blood sampling and fish samples were received?

Alberta Health made a commitment to release results and any revisions to the public health advisory as soon as results were available.

6) Why is it recommended that organ meat not be eaten?

Higher levels of PCBs, dioxins and furans tend to concentrate in greater quantities in organ and fat tissue. The highest levels of these chemicals in the Alberta study were found in liver samples.

7) How should the organs be disposed of?

No special precautions need to be taken to dispose of the organs.

8) Why shouldn't women who are pregnant or breast feeding eat this meat?

In the case of pregnant women, fetal development may be impaired by PCB, dioxin and furan contamination. The chemicals tend to accumulate in the brain of the fetus. Breast feeding women should avoid eating the meat as breast milk contains high levels of fat and these contaminants concentrate in fat.

9) When will the blood test and fish sample results be available?

The human blood and fish sample results are expected by the end of June. Blood samples from 100 Swan Hills area residents will be tested and compared with samples from other blood donors in the province.

10) Why can't young children consume wild game taken from the area?

For the sake of taking all precautions possible, the Provincial Health Officer is recommending that young children do not eat wild game taken from the Swan Hills area to avoid possible impairments to healthy development.

11) How many samples were taken?

Four fresh deer and 60 deer and moose freezer meat samples were taken from the Swan Hills area. The samples include muscle, liver, fat, kidney and heart tissue.

12) What is the average level of PCBs found in the deer and moose samples?

Fresh deer muscle: 22 parts per billion (all samples on whole weight basis)

Fresh liver: 74 parts per billion

Fresh deer fat: 253 parts per billion

Freezer meat muscle (deer and moose within 20 km of plant) : 18 parts per billion

The standard acceptable level of PCBs proposed by Health Canada is 200 parts per billion in beef adjusted for fat content. Standards do not exist for wild game muscle or organs.

13) What is the average level of toxic dioxins and furans found in the fresh deer and moose samples?

Fresh deer muscle: 1 parts per trillion (all samples on whole weight basis)

Fresh deer liver: 500 parts per trillion

Fresh deer fat: 45 parts per trillion

Freezer meat muscle (deer and moose within 20 km of plant): 10 parts per trillion

The standard acceptable level of dioxins and furans, proposed by Health Canada is 20 parts per trillion in fish. Standards do not exist for wild game muscle, organs or for mammals.

14) What is indicated by the freezer meat samples?

By studying the freezer meat samples we are able to confirm that levels of contamination decrease as you move further from the plant.

15) What health effects of PCBs, dioxins and furans?

There is no reason to expect negative health effects even if you have been consuming the wild game. Health effects are seen only if a high level of exposure occurs over a number of years. In the rare instance where health effects have been experienced in cases around the world, health effects have sometimes included chloracne (an acne-like skin condition), skin discolouration,

headaches, swelling around the eyes, weakness, numbness, weight loss, abnormal liver functioning, reproductive difficulties, endocrine disorders, cognitive impairment and cancer.

16) Can people with meat taken from the Swan Hills area have it sent in for testing?

Freezer meat samples are no longer required for testing. Those who wish to have meat tested will have to pay a private laboratory to do so.

17) Can residents or people who have consumed large quantities of the meat participate in the blood sampling that is underway?

Participants in the current scientific blood sampling study have already been identified. No further blood testing is planned after the current sampling is complete. A physician, however, can order patient testing if the physician feels it is medically required.

18) Does the 30 km radius consider the migration of game?

A safety margin has been built into the 30 km radius to take into account normal migration patterns of deer. However, if you are still concerned, follow the consumption guidelines.

19) Were wild game samples from other parts of the province tested?

Twelve deer from across the province were tested. Overall, levels of contamination were higher for samples from the Swan Hills area than for samples from the rest of the province.

Appendix R Public News Release (September, 1997)

News Release

Edmonton, September 4, 1997

Swan Hills Blood Test Results Not Elevated

Blood tests taken from a random sample of Swan Hills and area residents are comparable to levels of PCBs, dioxins and furans in the Edmonton and area control sample and lower than other parts of the world, announced Alberta's Provincial Health Officer, Dr. John Waters.

"We are pleased that the blood tests do not indicate elevated levels of contaminants," stated Waters. "Most people living in developed countries have some levels of PCBs, dioxins and furans in their blood. The levels found in the Swan Hills area residents are actually below levels reported in industrialized countries around the world. As well, the Swan Hills and area blood samples are consistent with the control sample."

"However," added Waters, "Albertans are cautioned to continue to limit the amount of wild game they eat from the area since continued consumption of contaminated meat may lead to elevated levels of toxins in the blood. In some cases, such as pregnant or breast feeding women and young children, eating wild game from a 30 km radius of the Swan Hills area should be avoided altogether." The public health advisory, issued May 1997, continues and is attached.

The blood sampling is a single component of the Swan Hills health assessment and was conducted as a result of an air emissions release at the Swan Hills Waste Treatment Centre on October 16, 1996. The blood tests determine the amount of contaminants (PCBs, dioxins and furans) to which people

may have been exposed. Approximately 100 randomly selected individuals from the Swan Hills area were asked to provide blood samples as part of Alberta Health's human health assessment. Sixty-five samples were received.

Since December 1996, Alberta Health has been conducting a human health assessment. To date, the assessment has included testing wild meat samples and human blood sampling. The results of wild game testing, released in May 1997, indicated elevated levels of PCBs, dioxins and furans in game surrounding the treatment centre. While levels of contaminants were not found to be high enough to cause any immediate health concerns, a public health advisory was issued as PCBs, dioxins and furans may accumulate over time.

Albertans are reminded that the public health advisory includes the 1997 hunting season.

For more information, please contact:

Dr. John Waters

Provincial Health Officer

Communications

(403) 427-5263

Garth Norris

Alberta

Health

(403) 427-7164

Backgrounder

Edmonton, September 4, 1997

Wild Game Public Health Advisory

- limit eating wild game taken from within a 30 km radius of the Swan Hills Treatment Centre to 13 ounces (370 grams) per month;
- avoid eating organ meat (liver, kidney) or using fat from wild game harvested within a 30 km radius of the treatment centre;
- pregnant or breast feeding women should avoid eating wild game taken from within a 30 km radius of the treatment centre;
- young children should avoid eating wild game taken from within a 30 km radius of the treatment centre;
- continue to avoid eating fish from within a 30 km radius of the treatment centre until fish sample testing is complete.

The advisory is in effect until further notice.

Questions and Answers

1. What do the blood test results indicate?

The blood tests taken from a random sample of Swan Hills and area residents (those within a 100 km radius of the treatment centre) are comparable to the Edmonton and area control sample and are lower than the levels found in other countries and regions including such jurisdictions as Eastern Canada, the United States, Germany, Sweden and Norway.

2. If the levels of these contaminants found in the blood samples are within normal ranges, does that mean the public health advisory is no longer in effect?

The public health advisory, issued in May 1997, is still in effect. While blood samples are not elevated, eating significant amounts of wild game taken from the Swan Hills Treatment Centre area, over a long period of time, could potentially be harmful. Elevated levels of PCBs, dioxins and furans have been detected in game surrounding the treatment centre. Because these toxic chemicals accumulate with time, it is recommended that consumption of game taken from within a 30 km radius be limited.

3. What were the average levels of contamination found in the blood samples?

The average level of PCBs found in the samples taken from the Swan Hills area was 0.14 parts per billion while the control sample, or average, is 0.16 parts per billion. The average level of dioxins and furans (TEQ) found in the samples taken from the Swan Hills area was 18.30 parts per trillion while the control sample, or average (TEQ), is 14.36 parts per trillion.

These levels can be compared to average ranges based on numerous studies conducted around the world which indicate that average levels of PCBs range from 3.0 to 6.8 parts per billion and average levels of dioxins and furans range from 12 to 54 parts per trillion.

4. Will Alberta Health conduct any further testing?

Alberta Health will complete the current study by analyzing fish samples from the Swan Hills area. The department will also review any results provided to them by Alberta Environmental Protection as part of the ongoing monitoring plan developed by Bovar at

Environmental Protection's instructions. Alberta Health will provide recommendations from a human health perspective for inclusion in the long-term monitoring plan after the current health assessment is complete. The public health advisory will be reassessed on a yearly basis.

5. How were people chosen to participate in the human blood sampling?

500 people from the Swan Hills and surrounding area were randomly selected for participation in a telephone interview. Following the interview process, 100 individuals were asked to volunteer to participate in the blood sampling process. 65 Albertans participated.

6. Do results indicate higher levels of contamination for those who regularly consume wild game than those that do not?

No. There is no statistically significant difference between the blood samples from those who consume wild game and those that do not.

7. Were aboriginals included in the human blood sampling?

First Nations and Metis Albertans were included in the health assessment as part of the general population. The study was not targeted specifically at aboriginals. The number of aboriginals that participated in the study represents the proportion of the population that they make up. 72 aboriginals were telephoned in the survey and 10 aboriginals were asked to provide blood samples. Blood samples were received from 5 Metis and 1 First Nations participants.

There is no evidence to suggest that blood results of aboriginals differed from the results of all participants. Health Canada is conducting a separate study which will look at PCBs, dioxins and furans, eating patterns, and other health related factors in First Nations people.

Alberta Health Communications (403) 427-7164

Appendix S Public News Release (October, 1997)

News Release

October 1997

Public News Release

October 1997

The following information was provided to the public on October 19, 1997. The information was provided to the public in a public news release. The information was provided to the public in a public news release. The information was provided to the public in a public news release.

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News Release

Edmonton, October 30, 1997

Fish Consumption Limit Established for Lakes Near Swan Hills Waste Treatment Centre

Following fish testing, Albertans are advised that although they may resume eating fish from lakes in the Swan Hills Waste Treatment Centre area, they are cautioned to limit their consumption according to provincially recommended guidelines, announced Dr. John Waters, Provincial Health Officer.

Test results indicate that levels of PCBs, dioxins and furans in brook trout taken from Chrystina Lake, located close to the Swan Hills Waste Treatment Centre, are somewhat higher than levels in fish from Roche and Chip lakes which are located further from the plant.

As a result, Albertans may resume eating unlimited amounts of fish from Roche Lake and lakes and streams at least 20 kilometres from the Swan Hills Waste Treatment Centre, but are advised to limit the amount of fish they eat from lakes and streams located inside a 20 km radius of the Swan Hills Waste Treatment Centre. Beginning December 1996, Albertans were cautioned not to eat any fish taken from a 30 km radius of the Swan Hills Waste Treatment Centre until fish testing was completed.

“While no immediate health risk exists to those who consume fish from lakes within a 20 kilometre radius, test results indicate the fish have elevated levels of contaminants which may be harmful if regularly consumed over an extended period of time,” said Waters.

“Again, we are being cautious by asking Albertans to follow this advisory. While the test results are not alarmingly high, they do indicate that limited consumption is prudent at this time,” added Waters.

The Provincial Health Officer recommends the following precautions:

- limit eating fish taken from within a 20 kilometre radius of the Swan Hills Waste Treatment Centre to 6 oz (170 grams) per week or less
- avoid eating fish organs or eggs taken from lakes within the 20 kilometre radius
- avoid eating fish from within the 20 kilometre radius if pregnant or breast feeding
- young children should avoid eating fish taken from within the 20 km radius

Waters added, “If people choose to consume the recommended amount of 6 ounces of fish or less per week from the area, they can reduce the levels of contaminants in the fish even further by cooking it according to recommended guidelines”.

The following fish preparation guidelines are recommended:

- remove the skin before cooking the fish
- trim the fat from the fish (belly flap, sides, back and under the skin)
- broil or bake the fish on a rack so the fats drips away
- do not use the drippings to prepare any other recipes

Three lakes were used for the fish sampling. Chrystina Lake is approximately 1.5 km from the Swan Hills Waste Treatment Plant, and Roche Lake is approximately 20 km from the plant. Chip Lake, located between Edmonton and Edson, was used as the control lake.

Currently mercury advisories are posted on some lakes within the 20 km radius, including Chrystina Lake. The mercury advisories recommend that fish from the posted lakes not be eaten. The 6 ounce consumption limit will apply to these lakes only in the event that the mercury advisories are lifted. The mercury advisories are currently under review.

The fish sampling was the final component of the Swan Hills health assessment initiated as a result of an air emissions release at the Swan Hills Waste Treatment Centre on October 16, 1996. To date, the assessment has included testing wild meat, human blood and fish.

A final report, reviewed by the Scientific Advisory Committee and the Public Health Advisory Committee, summarizes the results of the entire assessment. Blood test results from Swan Hills and area residents are comparable to levels of PCBs, dioxins and furans in Edmonton and lower than other parts of the world. However a public health advisory continues to be in effect limiting the consumption of wild game taken from the area as continued consumption may lead to increased blood contamination levels over time.

The final report also includes initial details of a long-term monitoring plan. The levels of contaminants in wild game and fish will continue to be monitored annually, human blood sampling will occur if warranted by the wild game and fish results, and the public health advisory will be updated as required.

Albertans are reminded that the wild game public health advisory remains in effect in addition to the fish advisory.

For more information, please contact:

Dr. John Waters
Provincial Health Officer
(403) 427-5263

Garth Norris
Alberta Health Communications
(403) 427-7164

Backgrounder

Edmonton, October 30, 1997

Wild Game and Fish Public Health Advisory

Wild Game

- limit eating wild game taken from within a 30 km radius of Swan Hills Treatment Centre to 13 ounces per month (370 grams);
- avoid eating organ meat (liver, kidney) or using fat from wild game harvested within a 30 km radius of the treatment centre
- pregnant or breast feeding women should avoid eating wild game taken from within a 30 km radius of the treatment centre
- young children should avoid eating wild game taken from within a 30 km radius of the treatment centre

Fish

- limit eating fish taken from within a 20 kilometre radius of the Swan Hills Waste Treatment Centre to 6 oz (170 grams) per week or less
- avoid eating fish organs or eggs taken from lakes within the 20 kilometre radius
- avoid eating fish from lakes within the 20 kilometre radius if pregnant or breast feeding

- young children should avoid eating fish taken from within the 20 kilometre radius

Fish Preparation Instructions

- remove the skin before cooking the fish
- trim the fat from the fish (belly flap, sides, back and under the skin)
- broil or bake the fish on a rack so the fats drips away
- do not use the drippings to prepare any other recipes

The advisory applies to animals and fish taken in the fall of 1996, as well as to those taken in the current year.

Alberta Health
Communications
(403) 427-7164

Appendix T Letters to Freezer Meat Donors

Letter I

Dear _____:

Thank you for submitting a meat sample for the health risk assessment study being conducted by Alberta Health. We have received the wild game test results and have now issued a revised public health notice for the consumption of wild game taken from near the Swan Hills Treatment Centre.

The test results of the wild game sample you submitted show no detectable levels of PCBs, dioxins, and furans. However, it is recommended that you follow the public health advisory outlined below and limit your intake.

Please be advised that should you have another animal taken from within a 30 kilometre radius of the Swan Hills Treatment Centre, or intend to take one from that area in the future, you should follow the recommendations of the revised public health notice (fact sheet enclosed) and limit your intake.

The following precautions are recommended if you intend to consume wild game from within the 30 km radius in addition to the animal(s) submitted for testing:

- 1) Limit eating wild game taken from within a 30 km radius of the Swan Hills Treatment Centre to 13 ounces (370 grams) per month.
- 2) Avoid eating organ meat (liver, kidney) or using fat from game harvested within a 30 km radius.
- 3) Avoid eating wild game taken from within a 30 km radius if pregnant or breast feeding.
- 4) Young children should avoid eating wild game taken from within a 30 km radius.
- 5) Continue to avoid eating fish from within a 30 km radius until fish sample testing is complete.

Again, thank you for taking the time to submit a meat sample for the health assessment. If you have any questions, please call the Medical Officer of Health, Keeweenaw Lakes Regional Health Authority at 458-7715, or the Medical Officer of Health, Aspen Regional Health Authority at 962-9687.

Sincerely,

Dr. John Waters,
Provincial Health Officer
Enclosure: Public Health Advisory Fact Sheet

Letter II

Dear _____:

Thank you for submitting a meat sample for the health risk assessment study being conducted by Alberta Health. We have received the wild game test results and have now issued a revised public health notice for the consumption of wild game taken from near the Swan Hills Treatment Centre.

The test results of the wild game sample you submitted are within the current standards. You may eat the meat from that animal, but it is recommended that you follow the public health advisory outlined below and limit your intake (fact sheet enclosed).

The following precautions are recommended:

- 1) Limit eating wild game taken from within a 30 km radius of the Swan Hills Treatment Centre to 13 ounces (370 grams) per month.
- 2) Avoid eating organ meat (liver, kidney) or using fat from game harvested within a 30 km radius.
- 3) Avoid eating wild game taken from within a 30 km radius if pregnant or breast feeding.
- 4) Young children should avoid eating wild game taken from within a 30 km radius.
- 5) Continue to avoid eating fish from within a 30 km radius until fish sample testing is complete.

Again, thank you for taking the time to submit a meat sample for the health assessment. If you have any questions, please call the Medical Officer of Health, Keeweenaw Lakes Regional Health Authority at 458-7715, or the Medical Officer of Health, Aspen Regional Health Authority at 962-9687.

Sincerely,

Dr. John Waters,

Provincial Health Officer

Enclosure: Public Health Advisory Fact Sheet

Letter III

Dear _____ :

Thank you for submitting the meat samples for the health risk assessment study being conducted by Alberta Health. We have received the wild game test results and have now issued a revised public health notice for the consumption of wild game taken from near the Swan Hills Treatment Centre.

The test results of the moose liver and the moose muscle sample you submitted exceed current standards for PCBs, dioxins and furans. It is recommended that you do not eat the liver or muscle from the moose you submitted for testing. Contact Ken Schmidt of Alberta Environmental Protection if you have any questions regarding meat disposal (403) 333-2229.

However, be assured that none of the levels detected in the wild meat samples are high enough to cause any immediate health problems, nor to cause undue concern if you consumed the meat before the December 13, 1996 advisory was issued.

Please be advised that should you have another animal taken from within a 30 kilometre radius of the Swan Hills Treatment Centre, or intend to take one from that area in the future, you should follow the recommendations of the revised public health notice (fact sheet enclosed) and limit your intake.

The following precautions are recommended if you intend to consume wild game from within the 30 km radius other than the animal(s) you submitted for testing:

- 1) Limit eating wild game taken from within a 30 km radius of the Swan Hills Treatment Centre to 13 ounces (370 grams) per month.
- 2) Avoid eating organ meat (liver, kidney) or using fat from game harvested within a 30 km radius.
- 3) Avoid eating wild game taken from within a 30 km radius if pregnant or breast feeding.
- 4) Young children should avoid eating wild game taken from within a 30 km radius.
- 5) Continue to avoid eating fish from within a 30 km radius until fish sample testing is complete.

Again, thank you for taking the time to submit a meat sample for the health assessment. If you have any questions about your results, please call the Medical Officer of Health, Keeweenok Lakes Regional Health Authority at 458-7715, or the Medical Officer of Health, Aspen Regional Health Authority at 962-9687.

Sincerely,

Dr. John Waters

Provincial Health Officer

Enclosure: Public Health Advisory Fact Sheet

Appendix U Letters to Blood Donors

Letter to blood sample participants

Dear :

Thank you for participating in the Swan Hills and area health assessment. The blood sample you provided has been analyzed and is comparable to the Edmonton and area control sample. It does **not** indicate elevated levels of PCBs, dioxins and furans.

Most people living in Alberta and in North America have some levels of PCBs, dioxins and furans in their blood. The levels found in the blood samples of the Swan Hills and area residents are actually below levels reported in industrialized countries around the world. The Swan Hills and area blood samples are also consistent with blood samples taken from Edmonton and area.

While levels of PCBs, dioxins and furans found in the blood samples are not elevated, eating significant amounts of the wild game taken from Swan Hills Treatment Centre area, over a long period of time, could potentially be harmful. All people who consume wild game, are cautioned to continue to adhere to the public health advisory (enclosed) and limit eating the amount of wild game taken from within a 30 km radius of the Swan Hills Treatment Centre. Pregnant or breast feeding women and young children are advised to avoid eating the meat altogether.

More information on your blood test results is attached. If you have any questions please contact the Medical Officer of Health, Keeweenaw Lakes Regional Health Authority at (403) 458-7715, or the Medical Officer of Health, Aspen Regional Health Authority at (403) 962-9687.

Again, thank you for taking the time to participate in the health assessment.

Sincerely,

Dr. Karen Grimsrud

Deputy Provincial Health Officer

enclosure

Letter to meat sample providers following blood test results

Dear :

I would again like to thank you for submitting meat samples as part of Alberta Health's assessment of the Swan Hills area as a result of an air emissions release at the Swan Hills Waste Treatment Centre.

Following meat sample testing, a separate study involving blood testing of a random sample of Swan Hills and area residents was conducted. We are providing you with the results for your information. The blood samples are within normal ranges for PCBs, dioxins and furans, and comparable to the Edmonton and area control sample.

Most people living in Alberta and in North America have some levels of PCBs, dioxins and furans in their blood. The levels found in the blood samples of the Swan Hills and area residents are actually below levels reported in industrialized countries around the world. The Swan Hills and area blood samples are also consistent with blood samples taken from Edmonton and area.

While levels of PCBs, dioxins and furans found in the blood samples are not elevated, eating significant amounts of the wild game taken from Swan Hills Treatment Centre area, over a long period of time, could potentially be harmful. All people who consume wild game that was not tested and approved as part of the health assessment, are cautioned to continue to adhere to the public health advisory (enclosed) and limit eating the amount of wild game taken from within a 30 km radius of the Swan Hills Treatment Centre. Pregnant or breast feeding women and young children are advised to avoid eating the meat altogether.

If you have any questions please contact the Medical Officer of Health, Keeweenaw Lakes Regional Health Authority at (403) 458-7715, or the Medical Officer of Health, Aspen Regional Health Authority at (403) 962-9687.

Again, thank you for taking the time to submit meat samples for the health assessment.

Sincerely,

Dr. Karen Grimsrud

Deputy Provincial Health Officer

enclosure

Letter to person with high result

Dear :

Thank you for participating in the Swan Hills and area health assessment. The blood sample you provided has been analyzed and is within accepted international measures of background levels for PCBs, dioxins and furans.

Most people living in Alberta and in North America have some levels of PCBs, dioxins and furans in their blood. The levels found in the blood samples of the Swan Hills and area residents are actually below levels reported in industrialized countries around the world. The Swan Hills and area blood samples are also consistent with blood samples taken from Edmonton and area.

While levels of PCBs, dioxins and furans found in the blood samples are not elevated, eating significant amounts of the wild game taken from Swan Hills Treatment Centre area, over a long period of time, could potentially be harmful. All people who consume wild game, are cautioned to continue to adhere to the public health advisory (enclosed) and limit eating the amount of wild game taken from within a 30 km radius of the Swan Hills Treatment Centre. Pregnant or breast feeding women and young children are advised to avoid eating the meat altogether.

More information on your blood test results is attached. If you have any questions please contact me at (403) 427-5263.

Again, thank you for taking the time to participate in the health assessment.

Sincerely,

Dr. Karen Grimsrud

Deputy Provincial Health Officer

enclosure

Letter to workers

Dear :

Thank you for participating in the Swan Hills and area health assessment. The blood sample you provided has been analyzed and is below the proposed 10 parts per billion Alberta Labour, Occupational Health and Safety guideline for occupational exposure to PCBs, dioxins and furans. It is however above the average levels found in the participants from in and around the Swan Hills area.

Most people living in Alberta and in North America have some levels of PCBs, dioxins and furans in their blood. The levels found in the blood samples of the Swan Hills and area residents are actually below levels reported in industrialized countries around the world. The Swan Hills and area blood samples are also consistent with blood samples taken from Edmonton and area.

While levels of PCBs, dioxins and furans found in the blood samples are not elevated, eating significant amounts of the wild game taken from Swan Hills Treatment Centre area, over a long period of time, could potentially be harmful. All people who consume wild game, are cautioned to continue to adhere to the public health advisory (enclosed) and limit eating the amount of wild game taken from within a 30 km radius of the Swan Hills Treatment Centre. Pregnant or breast feeding women and young children are advised to avoid eating the meat altogether.

More information on your blood test results is attached. I will be contacting you to discuss your results. If you have any other questions about your occupational exposure please contact Sharon Chadwick of Alberta Labour, Occupational Health and Safety at (403) 415-0602.

Again, thank you for taking the time to participate in the health assessment.

Sincerely,

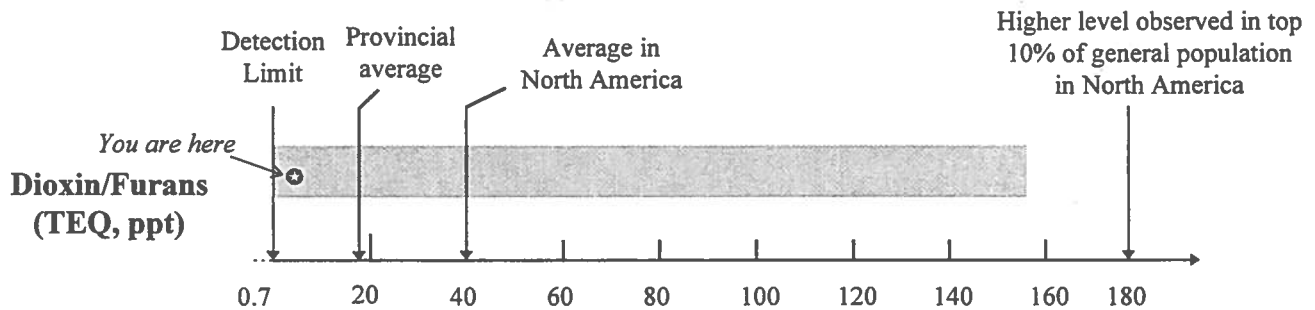
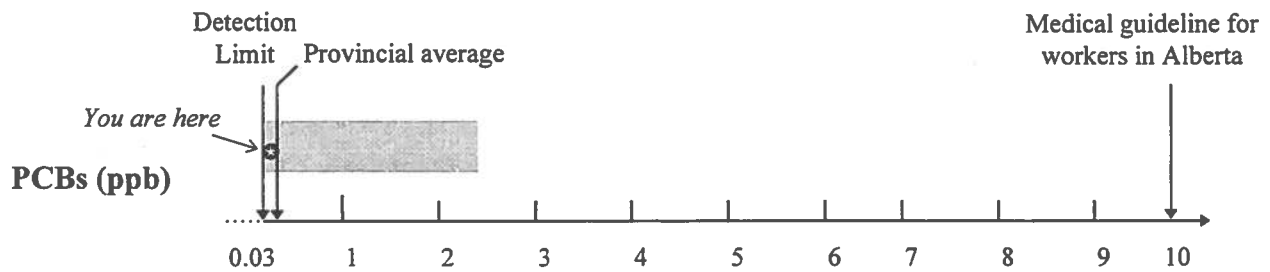
Dr. Karen Grimsrud

Deputy Provincial Health Officer

enclosure

Alberta Health Swan Hills Health Study Blood Test Results

Your Results		
Study Number	Total PCB (ppb, whole weight)	Dioxins & Furans (TEQ, ppt, lipid weight)



= range of results for study participants
 = your results

Detection limit = the smallest amount of contaminants that can be measured by the laboratory
PCBs = the total amount of PCBs detected in the samples of blood provided measured in parts per billion (ppb) not adjusted for blood fat content (lipid weight)
Dioxins/Furans = the toxic equivalent (TEQ or toxic value) amount of these two groups of chemicals measured in parts per trillion (ppt) adjusted for blood fat content (lipid weight).

Appendix V Databases and Specimen Banks

Databases

For wildlife monitoring, four separate databases are available in electronic form (as Excel files): a wildlife sampling database, a wild game product database, a fish sampling database and chemical testing database.

In the wildlife sampling database, each record consists of sample identification code, lab identification code, types of species, date of collection, collection location including latitude and longitude, types of specimens, age of animal, sex of animal, weight of animal, name, address and telephone number of meat donor, condition of storage, and mass of each specimen. (1997 - Swansam4.dbf, 27 KB or Swansam4.xls, 44 KB).

In the fish database, each record consists of sample identification code, lab identification code, types of species, collection location, types of specimens, composite samples, and length and weight of fish (Sept, 1997 - fish-profile.xls, 21 KB).

In the chemical testing database (wild game and fish), each record consists of lab identification code, name of compound, unit, measured concentration, method detection limit, TEF, TEQ, half method detection limit, recovery rate and fat content. (May, 1997 - Gametest.dbf, 1169 KB or Gametest.xls, 1686 KB; Sept, 1997 - 9705873.dbf, 403 KB, fish-labdata.xls, 527 KB).

For human testing, three separate databases are available in electronic form (as Excel files): the initial questionnaire database, the second questionnaire database and the human blood chemical testing database.

In the initial questionnaire database, each record consists of the study identification code, chemical laboratory identification code, telephone contact status, agreement for participating phase I and II studies, activity status in the Swan Hills area, dietary information on wild game and/fish consumption (frequency and amount), and compliance with health advisory. (March-April, 1997 - pahse1qu.dbf, 73KB, coded. Need a hard copy of questionnaire for decoding).

In the second questionnaire database, each record consists of the study identification code, participant's name, address, telephone number, duration of residency, birthday, ethnic group, weight, height, employment status, job title, education, numbers of adults and children in a household, birth and breast-feeding information, time patterns of outdoor and indoor activities, specific outdoor activities near the facility, sources of drinking water and wild foods during outdoor activities, consumption rate of 20 fatty foods obtained from markets (frequency, duration and meal size), consumption rate of wild game meats obtained from the Swan Hills area in 1996, cooking techniques for wild fish, species of fish and wild game caught, collection location for fishing and wild game, use of alcohol, use of tobacco, health conditions, awareness of public health advisory, reasons for compliance with the advisory and recommendations for further risk management. (April 1997 - Quest1.dbf, 89KB, coded; Quest2.dbf, 28KB, coded.).

In the human blood chemical testing database, each record record consists of lab identification code, name of compound, unit, measured concentration, method detection limit, TEF, TEQ, half method detection limit, recovery rate and serum lipid content. (August, 1997 - bloodtest.xls, about 900KB).

Specimen Banks

A specimen bank for deer and moose samples has been established at the Food Laboratory, Food and Rural Development, Animal Health Laboratory Branch, 5th Floor, Alberta Agriculture, O. S. Longman Bldg., 6909-116 Street, Edmonton, Alberta, T6H 4P2. A database is maintained in both hard copy and electronic form and includes information about date of banking, identification code, species identification and relevant parameters, type of sample, and chemical test results.

A specimen bank for human blood serum for the Swan Hills Study has also been established for program evaluation (verification, interpretation of findings and follow-up), as an early warning system for new environmental health problems (biomarkers of effects), and for monitoring trends in human exposure. Informed consent for specimen banking was obtained under a guarantee of privacy and confidentiality, and a promise to inform specimen donors of study results. Legal ownership of the specimen bank resides with Alberta Health. Each serum specimen is labeled with a study identification code. Each sample is 5 ml. The total number of serum samples is 65. All serum specimens are stored at the Center for Toxicology, Heritage Research Building, University of Calgary, Faculty of Medicine, Calgary. All specimens are placed in an upright position in a square box labeled with Alberta Health/Swan Hills Health Study-1997, and stored at -25 °C. A database includes information about date of banking, identification code, age of participants, gender of participants, and chemical test results. The database is maintained in both a hard copy and a computer database.

The specimen bank access policy is (1) the specimen bank is only available for use of the Swan Hills health monitoring program and for research in the future, (2) Alberta Health has the first priority to access this bank for a long-term monitoring program, (3) scientific communities and other agencies must make formal requests for access to the banked specimens for research purposes and the requests must be reviewed by Alberta Health.