Effect of a Rainfall Event on Contaminant Levels in the Brunette River Watershed
(Data Report)

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Abstract

In the spring of 1997 two sites in the Brunette River system (an urban stream flowing through the metropolitan Vancouver area) were sampled to measure contaminant concentrations in suspended sediment and water collected during a rainfall event. Dioxins, furans, polychlorinated biphenyls (PCBs), pesticides, chlorophenolics, 4-nonylphenol and polycyclic aromatic hydrocarbons (PAHs), trace metals, nutrients and microbial parameters were measured. The concentration of trace metals, nutrients, major ions and bacteria measured in the Brunette River system increased as a result of an influx of surface runoff. Loading calculations suggest that urban watersheds, like the Brunette River watershed, are a significant source of contaminants to the Fraser River receiving environment although Burnaby Lake (a shallow lake located in the middle of the Brunette River system) appears to act as a contaminant sink. Water collected from the Brunette River system exceeded the following provincial water quality criteria, and/or federal guidelines and/or provincial objectives for the protection of aquatic life: dioxins/furans, benzo(a)pyrene, DDT, PCBs, trace metals and pH. Water collected from the Brunette River system exceeded the following provincial water quality criteria, and/or federal guidelines and/or provincial objectives for recreational use: total coliforms, *E. coli* , Al, Cu, Zn and pH.

Résumé

Au printemps de 1997, on a prélevé des échantillons à deux sites du système de la rivière Brunette (cours d'eau urbain traversant l'agglomération de Vancouver) pour y mesurer les concentrations de contaminants dans l'eau et les sédiments en suspension recueillis au cours d'un épisode de pluie. On a mesuré les dioxines, les furanes, les biphényles polychlorés (PCB), les pesticides, les chlorophénolés, le 4-nonylphénol et les hydrocarbures aromatiques polycycliques (HAP), les métaux traces, les nutriants, les ions principaux et les paramètres microbiens. Les concentrations de métaux traces, de nutriants, d'ions principaux et de bactéries mesurées dans le système de la Brunette augmentaient en raison d'un apport de ruissellement de surface. Les calculs des charges suggèrent que les bassins versants urbains, comme celui de la Brunette, sont une source significative de contaminants vers le milieu récepteur du Fraser, bien que le lac Burnaby (lac peu profond situé au milieu du système de la Brunette) semble constituer un puits de contaminants. L'eau puisée dans le système de la Brunette dépassait certains critères provinciaux de qualité de l'eau, et/ou lignes directrices fédérales, et/ou objectifs provinciaux de protection des organismes aquatiques, visant en particulier les dioxines/furanes, le benzo(a)pyrène, le DDT, les PCB, les métaux traces et le pH. Elle dépassait aussi certains critères provinciaux de qualité de l'eau, et/ou lignes directrices fédérales, et/ou objectifs provinciaux pour les utilisations récréatives : coliformes totaux, *E. coli*, Al, Cu, Zn et pH.

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Introduction

The Brunette watershed, which drains into the Fraser River, is located in an urban setting in the metropolitan Vancouver area. The watershed drains approximately 70 square kilometers of land of predominately residential, commercial and industrial use. Three major highways are located in the watershed (Figure 1). The impact of urbanization on the watershed has been documented by Hall and Anderson (1988), McCallum (1995) and Macdonald *et al*. (1997). In their study, Macdonald *et al*. (1997) measured elevated levels of contaminants in water samples collected from the river system. Their results indicate that the contaminant load in the Brunette River system increases as a result of a significant rainfall event.

Currently, limited information exists on the concentration of contaminants in suspended solids in the Brunette River watershed. Therefore, as part of the Fraser River Action Plan, the present study was conducted as a cooperative effort between Environment Canada and the Institute for Resources and Environment, University of British Columbia. The objective of this study was to measure contaminant concentrations in suspended solids and water at two sampling sites located in the Brunette River watershed over the course of a rainfall event. Suspended solids may be introduced to the river through surface run-off and bank erosion, and many contaminants such as trace metals and hydrophobic organic chemicals are associated with these suspended solids. Sampling was conducted to measured the concentration of contaminants in the total and dissolved phase of the river water. Rainfall was collected concurrently and analysed for contaminants as reported in Belzer (1997).

Methods

Suspended solids and water samples were collected concurrently at the following two locations in the Brunette River watershed: i) Still Creek (STL), a major tributary of the Brunette River, approximately 1.5 km upstream of Burnaby Lake and ii) Brunette River (BRN) downstream of Burnaby Lake, approximately 1 km upstream of the confluence with the Fraser River (Figure 1). Sampling commenced approximately one hour prior to the onset of precipitation on February 28, 1997 and continued for approximately 12 hours into the storm event.

Suspended solids and water samples were collected according to methods presented in Sekela *et al*. (1995). Suspended solids were collected using a Westfalia Separator model KA-2-06-175 continuous flow centrifuge. Water was supplied to the centrifuge by a submersible pump suspended at 1 m depth approximately 3 m from shore. Sampling periods ranged from 8 hours at the Brunette River site to 12 hours at the Still Creek site.

Trace organic contaminants were sampled from water by passing 50 L of river water that had been clarified by the continuous flow centrifuge through an Infiltrex II (AXYS Analytical) solid phase extraction column. Suspended solids and water samples were analysed by AXYS Analytical Services Ltd., Sidney, B.C, for dioxins, furans, polychlorinated biphenyls (PCBs), pesticides, chlorophenolics, 4-nonylphenol and polycyclic aromatic hydrocarbons (PAHs).

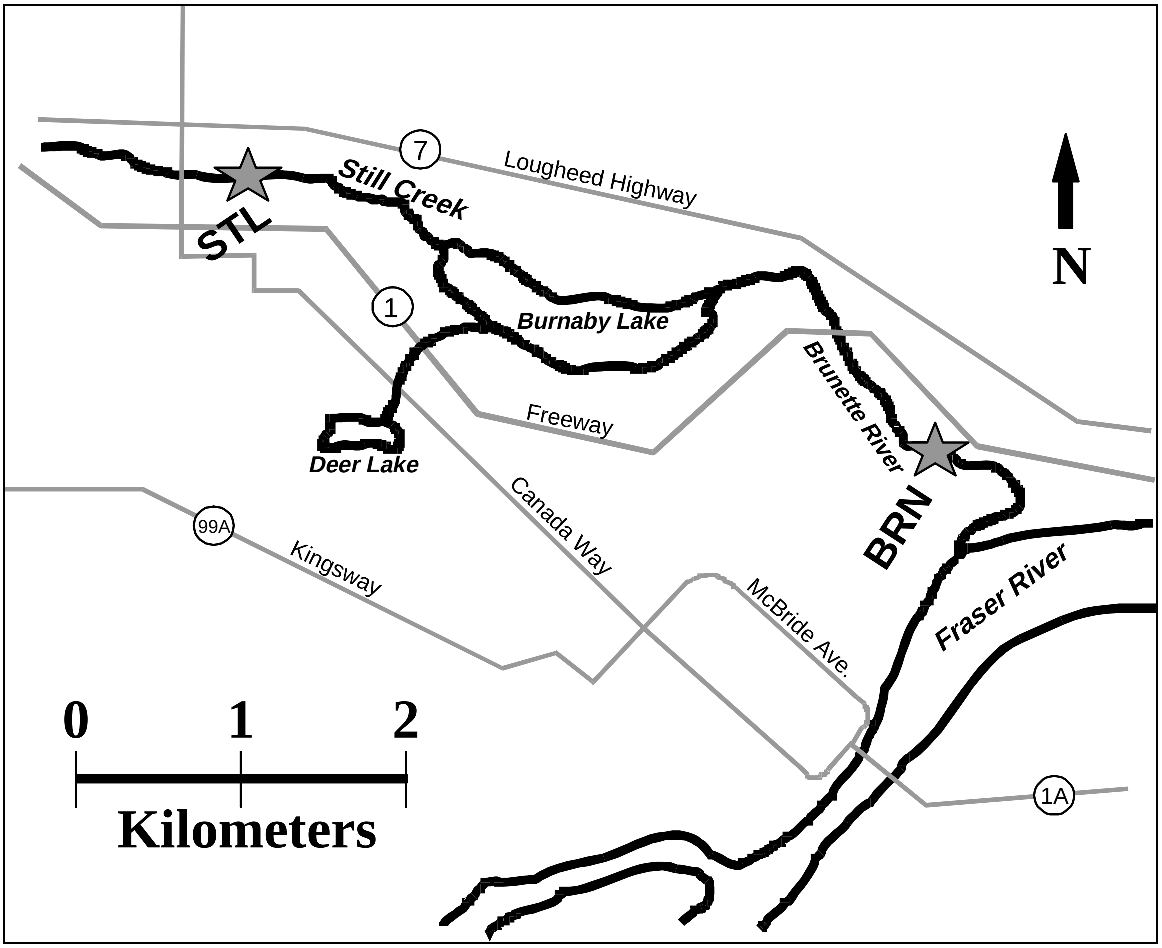

Figure 1 Sampling sites in the Brunette River watershed.

Single water samples were taken approximately every two hours for each of the following analyses: trace metals, nitrogen, phosphorus, major ions and bacteriological parameters. Three field blanks were taken for trace metals and nutrients during the rain event. Whole water was collected for trace metals and major ion analyses from an in-line T-valve located in the tubing from the submersible pump to the centrifuge. Clarified water from the centrifuge was sampled for nutrients and total dissolved organic carbon (DOC) analyses. Clarified water samples for total dissolved phosphorus were filtered in the field through a 0.45μm pore diameter Acrodisc® 32 filter. Whole water grab samples were taken approximately 1 m from shore for bacteriological analyses. Trace metal analyses were conducted by Environment Canada, National Laboratory for Environmental Testing, Burlington, Ontario. Nutrients and major ion analyses were performed by Environment Canada, Pacific Environmental Science Centre, North Vancouver, British Columbia. Cantest Ltd. performed the bacteriological, total organic carbon (TOC) and DOC analyses.

Water temperature, pH and conductivity were measured *in situ* with a Hydrolab DataSonde 3 transmitter (HYDROLAB Corporation, Texas). The transmitter was suspended 1 m below the water surface at approximately the same distance from shore as the submersible pump intake for the centrifuge. Readings of pH, temperature and conductivity were recorded every 15 minutes during the sampling period. Flow data were measured by the Greater Vancouver Regional District every 15 minutes in Still Creek and Brunette River.

Results and Discussion

Based on the site specific flow data, the first effects of surface runoff on the flow in the Brunette River system occurred approximately 1.5 hrs after the first precipitation was observed. Although flow in the Brunette River is regulated at the mouth of Burnaby Lake, precipitation from the storm event increased the flow at both sampling sites by more than six times (Figure 2). Temperature and conductivity decreased as the flow increased at both sites (Figure 2). The STL site showed a greater change in these parameters than the BRN site. This was likely because the BRN site is located downstream of Burnaby Lake, which may be acting as a “buffer”, reducing temperature and conductivity fluctuations caused by storm water runoff entering the river.

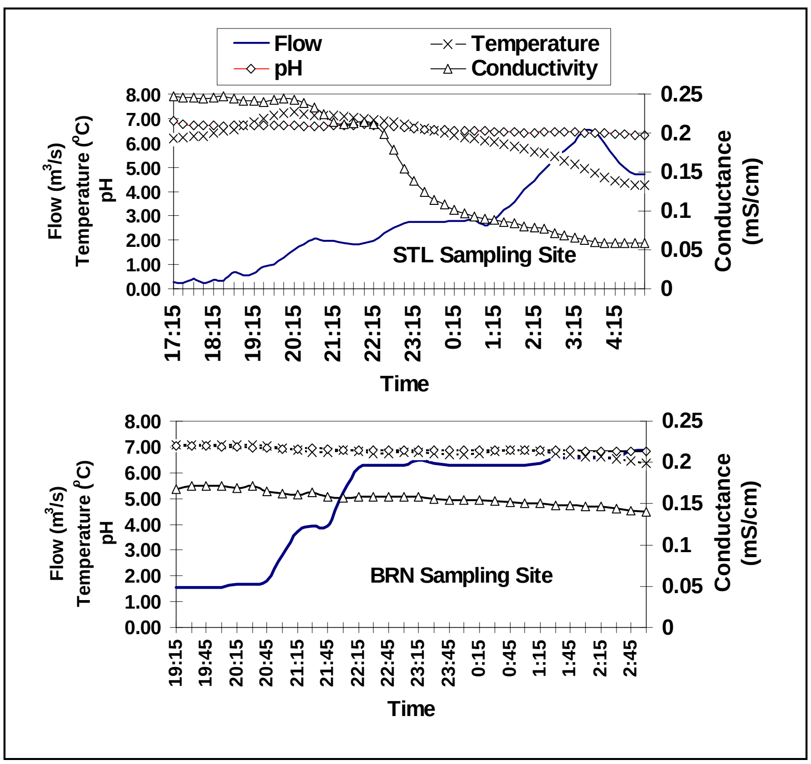

Figure 2 Changes in flow rate, temperature, pH and conductance at the STL and BRN sampling sites.

Burnaby Lake also appears to be acting as a “sediment trap”, since there were 28% less suspended solids measured at BRN than at STL (Appendix B, Table 1). Substantial deposition into Burnaby Lake of contaminants associated with sediment may contribute to the lower concentrations of almost all contaminants in suspended solids and water at BRN compared to STL.

A second contributing factor to the higher level of contaminants measured at the STL site is the more intense commercial and industrial activity in this part of the watershed. Macdonald *et al*. (1997) have shown that significant levels of contaminants are present in street and storm water runoff and mobilization of particles from land during a storm event can increase the concentration of both suspended solids and total trace metals in the water. The effect of this mobilization on concentrations of Cu in whole water at both sampling sites can be seen in Figure 3. Initially, concentrations of trace metals (except Sr) increased with the increase in flow; however as the flow continued to increase the trace metal concentrations decreased to concentrations similar to those measured before the storm event (Appendix A, Table 5).

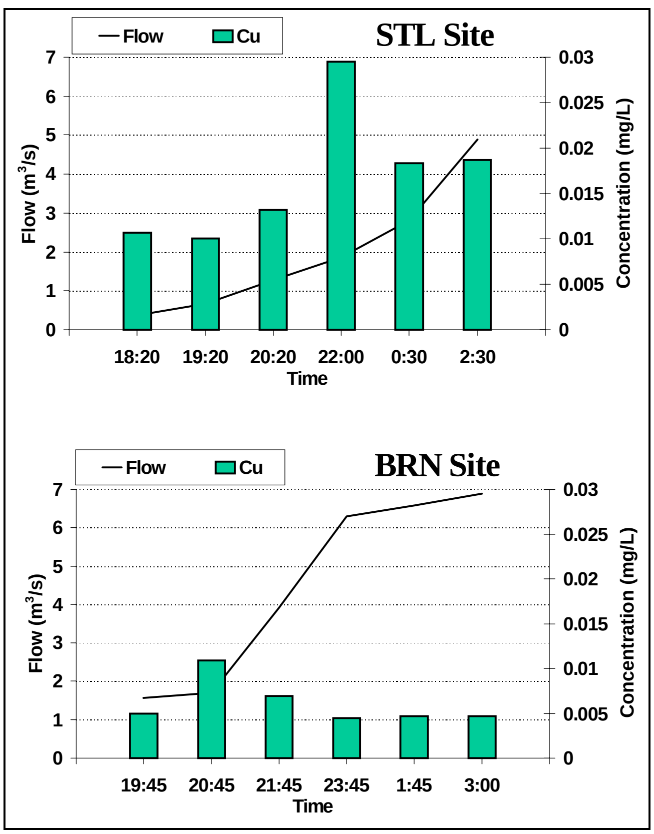

Figure 3 Flow versus copper concentrations in whole water samples from the STL and BRN sites.

At both the STL and BRN sites the following eight trace metals exceeded at least one guideline, criterion or objective for the protection of aquatic life or for recreational use: Al, Cd, Cr, Cu, Fe, Mn, Pb and Zn. Refer to Table 1 for a summary of contaminants which exceed existing guidelines, criteria or objectives. Of the 20 trace metals measured, Fe, Al and Mn respectively, contributed the highest loadings (Table 2). The highest loading for most metals was calculated for Still Creek. Based on the difference in loading at the STL and BRN sites, the percent of the load retained in Burnaby Lake was calculated (Table 2). Based on this calculation, Burnaby Lake retained from 17% (Co) to 50% (Cu) of the trace metals load from Still Creek. Since Still Creek represents approximately 50% of the total flow into Burnaby Lake, the percent of trace metals retained in Burnaby Lake is likely under-estimated. The contribution of trace metals from an urban watershed (like the Brunette River system) to the lower Fraser River can be significant since these loading estimates represent only a small fraction (8 hrs) of a single storm event.

Table 1 Summary of contaminants which exceeded water quality guidelines, criteria and objectives

Inorganic Parameter	*STL Site*	*BRN Site*	*Organic/Bacteriological Parameter*	*STL Site*	*BRN Site*
Al	A,B,D	A,B,D	2,3,7,8-dioxin	A	
Cd	A,B	A,B			
Co	B		2,3,7,8-dioxin TEQ	A	A
Cr	A,B	A,B			
Cu	A,B,E	A,B,E	Benzo(a)pyrene	B	B
Fe	A,B	A,B	Total DDT	A	
Mn	B	B	Total PCBs	A,B	A,B
Pb	A	A	PCB#126	B	B
Zn	A,B,E	E			
			Total Coliforms	D	D
pH	E	E	*E. Coli*	C,D	C,D

A - Canadian Federal water quality guidelines for the protection of aquatic life (CCREM, 1987 and CCME, draft 1995).
B - British Columbia Provincial water quality criteria for the protection of aquatic life (BCMELP, 1995).
C - Canadian Federal water quality guidelines for recreational use (CCREM, 1987).
D - British Columbia Provincial water quality criteria for recreational use (BCMELP, 1995).
E - British Columbia Provincial water quality objective, for the protection of aquatic life- Brunette River (BCMELP, 1989).

Table 2 Storm event loading of trace metals

Parameter	*STL Site g/hr*	*BRN Site g/hr*	*% Retained in Burnaby Lake**
Al	7837.48	5469.33	30
Cd	4.09	2.88	30
Co	8.09	6.73	17
Cr	26.98	906.78	**
Cu	165.35	82.43	50
Fe	24089.66	17951.77	25
Mn	1066.31	1378.90	**
Pb	89.24	53.37	40
Zn	487.79	271.61	44

*** assuming Still creek to be the only source of inputs to Burnaby Lake**
**** denotes an increase in contaminant concentration was measured downstream of Burnaby Lake**

Similar to the change in trace metal concentrations in whole water, *E. coli* and fecal coliform levels peaked with the increase in flow at both sampling sites (Table 4, Appendix A). The higher levels at the STL site most likely reflect the greater urbanization of the area and may also indicate possible contamination from the sanitary sewer system. Nutrient levels at both sites increased with flow, whereas major ion concentrations showed a small decrease with the increasing flow. Levels of these variables in our study were similar to those measured by Macdonald *et al*. (1997).

Samples collected at both the STL and BRN sites exceeded federal water quality guidelines, provincial criteria and objectives for bacteriological contamination (Table 1). Concentrations of dioxins and furans measured in solid phase extracted water did not exceed water quality guidelines, criteria or objectives. When expressed as pg/L, only the STL site had concentrations of 2,3,7,8-tetrachlorodibenzo-para-dioxin (TCDD) in suspended solids which exceeded the 0.06 pg/L Canadian Council of Environment Ministers (CCME) interim water quality guideline for the protection of aquatic life (CCME, draft 1995). However, at both sampling sites the 2,3,7,8-TCDD toxicity equivalent factors exceeded the CCME guideline (Table 1). The total loading of 2,3,7,8-TCDD and 2,3,7,8-tetrachlorodibenzofuran to the Fraser River from the Brunette River system during the first 8 hours of the storm event was estimated at 5.48 µg and 104.55 µg, respectively. Refer to Table 3 for a summary of trace organic contaminant loading at the STL and BRN sites as well as the calculated retention of contaminants in Burnaby Lake. Since Still Creek represents approximately 50% of the total flow into Burnaby Lake, the percent of organic contaminants retained in Burnaby Lake is likely under estimated.

Table 3 Storm event loading of trace organics

Parameter	***STL Site µg/8 hr***	***BRN Site µg/8 hr***	***% Retained in Burnaby Lake****
2,3,7,8-Dioxin	8.35	5.48	34
2,3,7,8-Furan	112.48	104.55	7
Benzo(a)pyrene	5.45×10^6	4.31×10^6	21
Total DDT	209.48	46.45	78
4-Nonylphenol	8.93×10^6	18.02×10^6	**
Total 4-Nonylphenol Ethoxylates	219×10^6	251×10^6	**
Total PCBs	1.01×10^6	0.55×10^6	46
PCB#126	356	249	30

*** assuming the BRN value represents only inputs from Still Creek**
**** denotes an increase in contaminant concentration was measured downstream of Burnaby Lake**

Although the concentration of all PAHs measured in solid phase extracted water from the Brunette River system was higher than levels measured by Sekela *et al*. (1995) and Sylvestre *et al*. (1998) elsewhere in the Fraser River system, the levels in the Brunette

River system did not exceed provincial water quality criteria. The levels of PAHs measured in suspended solids at both sites were consistently two to three orders of magnitude higher than the levels measured elsewhere in the Fraser River system by Sekela *et al*. (1995) and Sylvestre *et al*. (1998).

When expressed as pg/L, both the STL and the BRN sites had concentrations of benzo(a)pyrene in suspended solids which exceeded the 0.01 μg/L BCMELP water quality criterion for the protection of aquatic life (Table 1). During the first 8 hours of the storm event, the Brunette River was estimated to contribute 4.31×10^6 μg of benzo(a)pyrene to the lower Fraser River.

The Brunette River system also had higher levels of PCBs than those measured by Sylvestre *et al*. (1998) in the Fraser River system. Solid phase extracted water collected from the STL site had approximately two times the concentration of total PCBs and Aroclors than concentrations measured at the BRN site. The level of both total PCBs and Aroclor 1242 measured in the Brunette River system exceeded water quality criteria and guidelines for the protection of aquatic life (Table 1).

The concentration of Aroclors, coplanar PCBs and total PCBs measured in suspended solids at the STL site was approximately twice the concentration measured at the BRN site. When expressed as ng/L, these contaminants, as well as PCB#126, exceeded water quality criteria and guidelines (Table 1). The estimated loading of total PCBs and PCB#126 to the lower Fraser River during the first 8 hours of the storm event is 0.55×10^6 μg and 249.36 μg, respectively.

Suspended solids collected from the STL sampling site had approximately twice the concentration of total chlorophenolics of the BRN site. The concentration of total chlorophenolics measured in solid phase extracted water at the STL site was approximately three times the concentration measured at the BRN site, although no water quality criteria were exceeded. The STL and the BRN sampling sites had similar concentrations of 4-nonylphenol in both suspended solids and solid phase extracted water. However, the parent compounds, total 4-nonylphenol polyethoxylates, measured in both suspended solids and solid phase extracted water were approximately 30% higher at the STL site.

The nearly four times higher concentration of semi-volatiles in solid phase extracted water at the STL site as compared to the BRN site is likely the result of the greater industrialization of the Still Creek area. Semi-volatile compounds such as the chlorinated benzenes have been associated with industrial effluents. The levels of these contaminants were more than 10 times higher in the Brunette River system compared to the lower Fraser River (Sylvestre *et al*. 1998). No water quality criteria were exceeded for semi-volatiles measured in solid phase extracted water from the Brunette River system.

DDT and its breakdown products were the predominant pesticides detected in solid phase extracted water from the Brunette River system. No water quality criteria were exceeded for pesticides measured in solid phase extracted water samples collected from the Brunette River system. However, the concentration of total organochlorine pesticides measured in suspended solids was more than 10 times higher than levels measured in the Fraser River system (Sylvestre *et al*., 1998). When expressed as μg/L, only the STL site had a total DDT concentration which exceeded the 0.001 μg/L federal guideline (CCREM, 1987) for the protection of aquatic life (Table 1). During the first 8 hours of the storm event, the Brunette River is estimated to contribute 46.45 μg of total DDT to the lower Fraser River.

Conclusions

In conclusion, the present study was conducted to measure the concentration of contaminants in suspended sediments and water at two sampling sites located in the Brunette River watershed during a rainfall event. The results indicate the following:

- the concentration of trace metals, nutrients, major ions and bacteria measured in the Brunette River system increased as a result of an influx of surface runoff;
- loading calculations suggest that urban watersheds, like the Brunette River watershed, are a significant source of contaminants to the Fraser River receiving environment;
- Burnaby Lake appears to act as a contaminant sink in the Brunette River system;
- water collected from the Brunette River system exceeded the following provincial water quality criteria, and/or federal guidelines and/or provincial objectives for the protection of aquatic life: dioxins/furans, benzo(a)pyrene, DDT, PCBs, trace metals and pH
- water collected from the Brunette River system exceeded the following provincial water quality criteria, and/or federal guidelines and/or provincial objectives for recreational use: total coliforms, *E. coli* , Al, Cu, Zn and pH.

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Appendix A

List of Water Data Tables

Table 1 Flow measured at the Still Creek and Brunette River sampling sites.

97BRN1 Site* Time	Flow m^3/s	97STL1 Site Time	Flow m^3/s
28/02/97 16:00	1.46	28/02/97 16:00	0.82
28/02/97 16:15	1.46	28/02/97 16:15	0.69
28/02/97 16:30	1.46	28/02/97 16:30	0.87
28/02/97 16:45	1.46	28/02/97 16:45	0.66
28/02/97 17:00	1.46	28/02/97 17:00	0.59
28/02/97 17:15	1.46	28/02/97 17:15	0.28
28/02/97 17:30	1.46	28/02/97 17:30	0.22
28/02/97 17:45	1.46	28/02/97 17:45	0.43
28/02/97 18:00	1.46	28/02/97 18:00	0.23
28/02/97 18:15	1.46	28/02/97 18:15	0.38
28/02/97 18:30	1.46	28/02/97 18:30	0.33
28/02/97 18:45	1.46	28/02/97 18:45	0.67
28/02/97 19:00	1.46	28/02/97 19:00	0.53
28/02/97 19:15	1.57	28/02/97 19:15	0.66
28/02/97 19:30	1.57	28/02/97 19:30	0.91
28/02/97 19:45	1.57	28/02/97 19:45	0.99
28/02/97 20:00	1.57	28/02/97 20:00	1.27
28/02/97 20:15	1.69	28/02/97 20:15	1.59
28/02/97 20:30	1.69	28/02/97 20:30	1.82
28/02/97 20:45	1.80	28/02/97 20:45	2.07
28/02/97 21:00	2.82	28/02/97 21:00	1.95
28/02/97 21:15	3.74	28/02/97 21:15	1.95
28/02/97 21:30	3.92	28/02/97 21:30	1.86
28/02/97 21:45	3.92	28/02/97 21:45	1.84
28/02/97 22:00	5.25	28/02/97 22:00	1.86
28/02/97 22:15	6.21	28/02/97 22:15	1.97
28/02/97 22:30	6.30	28/02/97 22:30	2.28
28/02/97 22:45	6.30	28/02/97 22:45	2.50
28/02/97 23:00	6.30	28/02/97 23:00	2.68
28/02/97 23:15	6.50	28/02/97 23:15	2.72
28/02/97 23:30	6.35	28/02/97 23:30	2.72
28/02/97 23:45	6.30	28/02/97 23:45	2.72
01/03/97 0:00	6.30	01/03/97 0:00	2.72
01/03/97 0:15	6.30	01/03/97 0:15	2.79
01/03/97 0:30	6.30	01/03/97 0:30	2.81
01/03/97 0:45	6.30	01/03/97 0:45	2.82
01/03/97 1:00	6.30	01/03/97 1:00	2.59
01/03/97 1:15	6.35	01/03/97 1:15	2.85
01/03/97 1:30	6.58	01/03/97 1:30	3.23
01/03/97 1:45	6.58	01/03/97 1:45	3.58
01/03/97 2:00	6.58	01/03/97 2:00	4.05
01/03/97 2:15	6.58	01/03/97 2:15	4.44
01/03/97 2:30	6.58	01/03/97 2:30	4.90
01/03/97 2:45	6.82	01/03/97 2:45	5.36
01/03/97 3:00	6.88	01/03/97 3:00	5.67
		01/03/97 3:15	6.05
		01/03/97 3:30	6.49
		01/03/97 3:45	6.43
		01/03/97 4:00	6.01
		01/03/97 4:15	5.39
		01/03/97 4:30	4.97
		01/03/97 4:45	4.69
		01/03/97 5:00	4.72

* Measured at the outlet of Burnaby Lake (700 m upstream of the BRN sampling site).

Table 2 Temperature, pH and Conductivity in water collected from the Brunette River System.

97STL1					**97BRN1**				
Date D/M/Y	**Time HHMMSS**	**Temp deg C**	**pH units**	**Cond. mS/cm**	**Date D/M/Y**	**Time HHMMSS**	**Temp deg C**	**pH units**	**Cond. mS/cm**
28/02/97	171500	6.15	6.89	0.247	28/02/97	191500	7.06	7.03	0.168
28/02/97	173000	6.20	6.75	0.246	28/02/97	193000	7.06	7.03	0.172
28/02/97	174500	6.27	6.73	0.246	28/02/97	194500	7.06	7.02	0.172
28/02/97	180000	6.27	6.72	0.245	28/02/97	200000	7.09	7.00	0.171
28/02/97	181500	6.40	6.70	0.246	28/02/97	201500	7.08	6.98	0.169
28/02/97	183000	6.48	6.69	0.247	28/02/97	203000	7.08	6.96	0.171
28/02/97	184500	6.55	6.70	0.245	28/02/97	204500	7.03	6.94	0.165
28/02/97	190000	6.70	6.70	0.242	28/02/97	210000	6.95	6.92	0.162
28/02/97	191500	6.85	6.70	0.241	28/02/97	211500	6.88	6.92	0.161
28/02/97	193000	7.01	6.71	0.24	28/02/97	213000	6.78	6.95	0.163
28/02/97	194500	7.13	6.70	0.243	28/02/97	214500	6.78	6.92	0.158
28/02/97	200000	7.24	6.71	0.244	28/02/97	220000	6.86	6.89	0.157
28/02/97	201500	7.26	6.70	0.243	28/02/97	221500	6.83	6.86	0.158
28/02/97	203000	7.16	6.69	0.238	28/02/97	223000	6.73	6.85	0.158
28/02/97	204500	7.12	6.69	0.233	28/02/97	224500	6.75	6.85	0.158
28/02/97	210000	7.14	6.69	0.225	28/02/97	230000	6.80	6.86	0.158
28/02/97	211500	7.11	6.70	0.215	28/02/97	231500	6.80	6.86	0.158
28/02/97	213000	7.07	6.72	0.211	28/02/97	233000	6.75	6.86	0.156
28/02/97	214500	7.02	6.74	0.213	28/02/97	234500	6.70	6.85	0.155
28/02/97	220000	6.98	6.75	0.215	01/03/97	000000	6.70	6.85	0.154
28/02/97	221500	6.93	6.74	0.212	01/03/97	1500	6.75	6.85	0.154
28/02/97	223000	6.89	6.71	0.199	01/03/97	3000	6.83	6.86	0.153
28/02/97	224500	6.84	6.68	0.179	01/03/97	4500	6.88	6.87	0.152
28/02/97	230000	6.78	6.63	0.155	01/03/97	10000	6.86	6.86	0.151
28/02/97	231500	6.68	6.58	0.138	01/03/97	11500	6.81	6.86	0.151
28/02/97	233000	6.57	6.56	0.124	01/03/97	13000	6.75	6.85	0.148
28/02/97	234500	6.47	6.53	0.115	01/03/97	14500	6.70	6.85	0.148
01/03/97	000000	6.39	6.52	0.108	01/03/97	20000	6.63	6.84	0.147
01/03/97	1500	6.30	6.50	0.102	01/03/97	21500	6.60	6.84	0.146
01/03/97	3000	6.22	6.49	0.097	01/03/97	23000	6.53	6.83	0.144
01/03/97	4500	6.17	6.47	0.093	01/03/97	24500	6.44	6.83	0.142
01/03/97	10000	6.09	6.47	0.09	01/03/97	30000	6.36	6.82	0.14
01/03/97	11500	6.02	6.45	0.088	01/03/97	31500	6.25	6.81	0.137
01/03/97	13000	5.94	6.44	0.085	01/03/97	33000	5.89	5.61	0.055
01/03/97	14500	5.86	6.43	0.084	01/03/97	34500	5.71	6.94	0.055
01/03/97	20000	5.74	6.42	0.08	01/03/97	40000	5.58	6.84	0.053
01/03/97	21500	5.64	6.42	0.078	01/03/97	41500	5.49	6.86	0.057
01/03/97	23000	5.56	6.43	0.077	01/03/97	43000	5.53	7.05	0.058
01/03/97	24500	5.43	6.43	0.072	01/03/97	44500	5.59	7.07	0.058
01/03/97	30000	5.28	6.43	0.069	01/03/97	50000	5.63	7.12	0.058
01/03/97	31500	5.13	6.43	0.066	01/03/97	51500	5.66	6.92	0.058
01/03/97	33000	4.95	6.41	0.063	01/03/97	53000	5.66	7.07	0.06
01/03/97	34500	4.75	6.39	0.06	01/03/97	54500	5.66	7.15	0.06
01/03/97	40000	4.58	6.39	0.059	01/03/97	60000	5.59	7.16	0.06
01/03/97	41500	4.43	6.37	0.058	01/03/97	61500	5.53	6.91	0.056
01/03/97	43000	4.33	6.35	0.058	01/03/97	63000	5.71	6.92	0.027
01/03/97	44500	4.25	6.32	0.059	01/03/97	64500	6.02	6.90	0.027
01/03/97	50000	no data	6.31	0.019	01/03/97	70000	6.20	6.86	0.019
01/03/97	51500	5.44	6.31	0.018					
01/03/97	53000	5.83	6.38	0.018					
01/03/97	54500	6.07	6.43	0.018					
01/03/97	60000	6.37	6.47	0.018					
01/03/97	61500	6.55	6.50	0.017					
01/03/97	63000	6.60	6.53	0.017					
01/03/97	64500	6.60	6.56	0.017					
01/03/97	70000	6.58	6.58	0.017					

Table 3 Nutrients, Major Ions and Carbon Content (mg/L) in water collected from the Brunette River System.

Sampling Time	97BRN 1 19:45	97BRN 2 20:45	97BRN 3 21:45	97BRN 4 23:45	97BRN 5 01:45	97BRN 6 03:00	97BRN-B1 19:45	97BRN-B2 20:45	97BRN-B3 21:45
Ammonia	0.113	0.164	0.069	0.085	0.098	0.099	0.003	0	0.004
Nitrite	0.013	0.022	0.013	0.012	0.011	0.011	0	0	0
Nitrite/Nitrate	0.802	0.865	0.735	0.626	0.599	0.582	0.009	0.013	0.074
Total	0.99	1.40	0.71	0.98	0.94	0.92	0	0	0.08
Total Dissolved Phosphorus	0.018	0.017	0.019	0.038	0.016	0.018	0	No Data	No Data
Ca	14.8	14	13.8	13.4	13	12.3			
K	1.4	1.4	1.3	1.3	1.3	1.2			
Mg	3.0	2.7	2.7	2.5	2.4	2.3			
Na	13.8	13.4	13.3	12.8	12.2	11.5			
Si	4.96	4.65	4.57	4.21	3.88	3.68			
Hardness Ca+Mg - HC	49.1	46.2	45.5	43.7	42.4	40.0			
Dissolved Organic Carbon	7.9		11.6	6.8					
Total Orgainc Carbon	7.9		11.6	6.8					

Table 3 Continued

Sampling Time	97STL 1 18:20	97STL 2 19:20	97STL 3 20:20	97STL 4 22:00	97STL 5 00:36	97STL 6 02:30	97STL-B1 no data	97STL-B2 no data	97STL-B3 no data
Ammonia	0.265	0.275	0.298	0.629	0.309	0.203	0.008	0.006	0.005
Nitrite	0.013	0.012	0.018	0.051	0.03	0.016	0	0	0
Nitrite/Nitrate	0.87	0.862	0.911	1.17	0.78	0.564	0	0.004	0.003
Total	1.3	1.3	1.6	2.3	1.3	0.94	0	0	0
Total Dissolved Phosphorus	0.022	0.023	0.031	0.036	0.023	0.017	0	0	0
Ca	25.6	25	24.8	18.8	8.2	6.6			
K	2.0	1.9	2.0	1.9	0.9	0.7			
Mg	4.9	4.8	4.7	3.1	1.1	0.9			
Na	17.2	16.8	16.7	19.7	6.6	4.5			
Si	6.44	6.35	6.22	4.26	1.85	1.6			
Hardness Ca+Mg - HC	84.0	82.5	81.5	59.8	25.1	20.3			
Dissolved Organic Carbon	9.3		7.3			6.7			
Total Orgainc Carbon	9.4		7.3			6.7			

Table 4 Total Coliform, Fecal Coliform and E. Coli levels measured in water collected from the Brunette River System.

BRN Site	Time	Total Coliform MPN/100 mL	Fecal Coliform MPN/100 mL	E. Coli MPN/100 mL
97BRNFC1	19:25	9200	140	130
97BRNFC2	20:25	35000	220	220
97BRNFC3	21:15	13000	920	540
97BRNFC4	21:45	9200	2400	2400
97BRNFC5	22:15	17000	2400	2400
97BRNFC6	23:00	3300	350	350
97BRNFC7	23:45	2400	350	170
97BRNFC8	00:15	2400	110	46
97BRNFC9	00:45	1600	170	170
97BRNFC10	01:45	5400	170	170
STL Site				
97STLFC1	18:20	12000	540	330
97STLFC2	19:20	16000	920	540
97STLFC3	19:55	16000	1600	350
97STLFC4	22:00	92000	9200	5400
97STLFC5	22:45	35000	2400	2400
97STLFC6	23:45	54000	2400	2400
97STLFC7	00:45	92000	2400	2400
97STLFC8	01:35	5400	2400	790
97STLFC9	02:30	35000	5400	3500
97STLFC10	03:30	9200	3500	1700

MPN denotes most probable number

Table 5 Trace metals in whole water collected from the Brunette River System.

Sampling Site Sampling Time	97BRN1 19:45 mg/L	97BRN2 20:45 mg/L	97BRN3 21:45 mg/L	97BRN4 23:45 mg/L	97BRN5 1:45 mg/L	97BRN6 3:00 mg/L	97BRN-MB1 Field Blank 1 mg/L	97BRN-MB2 Field Blank 2 mg/L	97BRN-MB3 Field Blank 3 mg/L
Al	0.264	0.514	0.593	0.278	0.284	0.361	0.002	<0.002	<0.002
Ba	0.0208	0.023	0.023	0.0195	0.0186	0.0185	<0.0002	<0.0002	<0.0002
Cd	0.0001	0.0002	0.0003	0.0002	0.0002	0.0001	<0.0001	<0.0001	<0.0001
Co	0.0004	0.0005	0.0006	0.0004	0.0004	0.0004	<0.0001	<0.0001	0.0001
Cr	0.0008	0.0018	0.0013	0.0593	0.0592	0.0992	0.0804	0.0002	0.0005
Cu	0.005	0.0109	0.0069	0.0045	0.0047	0.0047	<0.0002	<0.0002	<0.0002
Fe	0.882	1.60	1.83	0.983	0.986	1.12	0.0009	0.0014	0.0004
Li	0.0009	0.0012	0.0008	0.0006	0.0007	0.0006	<0.0001	<0.0001	<0.0001
Mn	0.0748	0.0869	0.117	0.0847	0.0826	0.0861	0.0012	0.0001	0.0001
Mo	0.0016	0.0022	0.001	0.0009	0.0007	0.0007	<0.0001	<0.0001	0.0001
Ni	0.0009	0.0012	0.0011	0.001	0.0009	0.0009	<0.0002	<0.0002	<0.0002
Pb	0.0027	0.0066	0.0046	0.0028	0.003	0.0033	<0.0002	0.0002	<0.0002
Sr	0.0963	0.0925	0.0883	0.0844	0.079	0.0762	<0.0001	<0.0001	<0.0001
As	0.0005	0.0008	0.0009	0.0009	0.0009	0.001	0.0002	0.0001	0.0001
Se	0.0002	0.0003	0.0003	0.0003	0.0002	0.0003	0.0002	0.0002	0.0002
V	0.0011	0.002	0.0021	0.0009	0.0009	0.0008	<0.0001	<0.0001	<0.0001
Zn	0.0163	0.0342	0.0221	0.0146	0.0157	0.016	0.0044	<0.0002	0.0002
Ag	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.0001
Hg	0.000022	0.000011	0.000018	0.000019	0.000022	0.000021	0.000017	0.000010	0.000010
Be	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005

< denotes less than specified detection limit

Table 5 Continued

Sampling Site **Sampling Time**	**97STL1** **18:20** **mg/L**	**97STL2** **19:20** **mg/L**	**97STL3** **20:20** **mg/L**	**97STL4** **22:00** **mg/L**	**97STL5** **0:30** **mg/L**	**97STL6** **2:30** **mg/L**	**97STL-MB1** **Field Blank 1** **mg/L**	**97STL-MB2** **Field Blank 2** **mg/L**	**97STL-MB3** **Field Blank 3** **mg/L**
Al	0.099	0.134	0.306	1.04	0.764	1.17	0.011	<0.002	<0.002
Ba	0.0347	0.0315	0.0336	0.0393	0.0199	0.0209	0.0017	<0.0002	<0.0002
Cd	0.0003	0.0002	0.0004	0.0007	0.0004	0.0005	<0.0001	<0.0001	<0.0001
Co	0.0006	0.0005	0.0008	0.0013	0.0008	0.001	<0.0001	<0.0001	0.0001
Cr	0.0045	0.0014	0.0013	0.0034	0.003	0.0035	0.0025	<0.0002	<0.0002
Cu	0.0107	0.0101	0.0132	0.0295	0.0183	0.0187	0.0005	<0.0002	<0.0002
Fe	1.79	1.74	2.54	4.28	2.08	3.02	0.0051	0.0004	<0.0004
Li	0.0011	0.001	0.0013	0.0021	0.001	0.0008	<0.0001	<0.0001	<0.0001
Mn	0.24	0.234	0.255	0.179	0.0884	0.0976	0.0001	<0.0001	<0.0001
Mo	0.0008	0.0008	0.0011	0.0024	0.0013	0.001	<0.0001	<0.0001	<0.0001
Ni	0.0056	0.0043	0.0021	0.0054	0.0028	0.0036	0.0031	0.0002	0.0002
Pb	0.0014	0.0016	0.0034	0.0118	0.0086	0.0134	<0.0002	<0.0002	0.0003
Sr	0.156	0.152	0.154	0.107	0.0451	0.0362	0.0001	<0.0001	<0.0001
As	0.0005	0.0005	0.0007	0.0007	0.0014	0.0018	0.0002	0.0001	0.0001
Se	0.0003	0.0003	0.0003	0.0003	0.0004	0.0003	0.0002	0.0002	0.0002
V	0.0005	0.0006	0.001	0.0033	0.0023	0.0035	<0.0001	<0.0001	<0.0001
Zn	0.0155	0.0173	0.0257	0.0769	0.0569	0.0601	0.0045	0.0003	0.0002
Ag	0.0001	<0.0001	0.0001	0.0002	<0.0001	0.0001	<0.0001	<0.0001	<0.0001
Hg	0.000027	0.000023	0.000026	0.000039	0.000025	0.000028	0.000018	0.000012	0.000010
Be	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005

< denotes less than specified detection limit

Table 6 Dioxins and Furans in solid phase extracted water collected from the Brunette River System.

Sampling Site: **Sample Volume:** **Sampling Date:** **Dioxins/Furans**	**97STL1** **57.3 L** **28/02/97** **pg/L**	**SDL**	**97BRN1** **50.0 L** **28/02/97** **pg/L**	**SDL**	**Procedural Blank** **(pg/L)**	**SDL**	**Spiked Matrix % recovery**
T4CDD-Total	ND	0.01	ND	0.01	ND	0.01	
2,3,7,8	ND	0.01	ND	0.01	ND	0.01	100
P5CDDD-Total	ND	0.01	ND	0.01	ND	0.01	
1,2,3,7,8	ND	0.01	ND	0.01	ND	0.01	102
H6CDD-Total	0.07	0.04	0.20	0.04	ND	0.04	
1,2,3,4,7,8	ND	0.04	ND	0.04	ND	0.04	93
1,2,3,6,7,8	ND	0.04	0.04	0.04	ND	0.04	98
1,2,3,7,8,9	ND	0.04	0.05	0.04	ND	0.04	92
H7CDD-Total	0.3	0.06	0.67	0.06	ND	0.06	
1,2,3,4,6,7,8	0.14	0.06	0.38	0.06	ND	0.06	86
O8CDD-Total	0.5	0.1	2.0	0.1	ND	0.1	92
T4CDF-Total	ND	0.01	ND	0.01	ND	0.01	
2,3,7,8	ND	0.01	ND	0.01	ND	0.01	95
P5CDF-Total	ND	0.01	0.06	0.01	ND	0.01	
1,2,3,7,8	ND	0.01	ND	0.01	ND	0.01	98
2,3,4,7,8	ND	0.01	ND	0.01	ND	0.01	98
H6CDF-Total	0.06	0.03	0.15	0.03	ND	0.03	
1,2,3,4,7,8	ND	0.03	ND	0.03	ND	0.03	100
1,2,3,6,7,8	ND	0.03	ND	0.03	ND	0.03	100
2,3,4,6,7,8	ND	0.03	ND	0.03	ND	0.03	91
1,2,3,7,8,9	ND	0.03	ND	0.03	ND	0.03	87
H7CDF-Total	0.08	0.06	0.05	0.06	ND	0.06	
1,2,3,4,6,7,8	0.06	0.06	0.11	0.06	ND	0.06	98
1,2,3,4,7,8,9	ND	0.06	ND	0.06	ND	0.06	109
O8CDF-Total	ND	0.06	0.15	0.1	ND	0.1	97
TEQ (ND = 0)	0.0025		0.016				
Surrogate Standards	% recovery		% recovery		% recovery		% recovery
13C-2,3,7,8 T4CDF	74		79		58		83
13C-2,3,7,8 T4CDD	83		87		63		91
13C-1,2,3,7,8 P5CDF	67		74		54		80
13C-1,2,3,7,8 P5CDD	82		86		60		91
13C-1,2,3,4,7,8 H6CDF	77		88		70		97
13C-1,2,3,4,7,8 H6CDD	78		86		66		89
13C-1,2,3,4,6,7,8 H7CDF	64		87		60		79
13C-1,2,3,4,6,7,8 H7CDD	72		89		61		77
13C-O8CDD	71		87		53		77

SDL = sample detection limit
ND = not detected

Table 7 PAH concentrations in solid phase extracted water sampled from the Brunette River System.

Sampling Site:	**97STL1**		**97BRN1**	
Sample Volume:	**57.3 L**		**50.0 L**	
PAHs	**ng/L**	**SDL**	**ng/L**	**SDL**
Acenaphthylene	7.5	0.05	3.5	0.05
Acenaphthene	130	0.07	3.8	0.07
Fluorene	78	0.04	5.6	0.05
Phenanthrene	54	0.02	15.0	0.02
Anthracene	6.1	0.02	1.0	0.02
Fluoranthene	17	0.04	11.0	0.04
Pyrene	19	0.03	14.0	0.04
Benz(a)anthracene	0.46	0.09	0.5	0.11
Chrysene	2.00	0.09	3.0	0.11
Benzofluoranthenes	0.69	0.06	1.3	0.07
Benzo(e)pyrene	0.31	0.07	0.6	0.1
Benzo(a)pyrene	0.09	0.08	0.2	0.09
Perylene	ND	0.1	ND	0.09
Dibenz(ah)anthracene	ND	0.46	ND	0.3
Indeno(1,2,3cd)pyrene	ND	0.13	ND	0.38
Beno(ghi)perylene	ND	0.13	0.4	0.18
C2 naphthalenes	140	0.48	40.0	0.5
C3 naphthalenes	140	0.05	32.0	0.05
C4 naphthalenes	72	0.19	14.0	0.22
C1 phen,anth	50	0.03	21.0	0.04
C2 phen,anth	61	0.22	26.0	0.25
C3 phen,anth	42	0.07	19.0	0.08
C4 phen,anth	7.3	0.14	1.1	0.17
Retene	7.3	0.14	1.1	0.17
Dibenzothiophene	9.3	0.08	1.3	0.09
C1 dibenzothiophene	9.8	0.03	3.2	0.03
C2 dibenzothiophene	12	0.05	5.1	0.05
Total LPAHs	275.6		28.9	
Total HPAHs	39.6		31.0	
Total parent PAHs	315.2		59.9	
Total alkylated PAHs	512.3		153.1	
Field Surrogate	% recovery		% recovery	
Anthracene d-10	150		160	
Surrogate Standards	% recovery		% recovery	
Acenaphthene d-10	57		59	
Phenanthrene d-10	69		70	
Pyrene d-10	74		75	
Chrysene d-12	81		80	
Benzo(a)pyrene d-12	85		84	
Perylene d-12	78		76	
Dibenz(ah)anthracene d-14	83		76	
Benzo(ghi)perylene d-12	78		70	

SDL = sample detection limit
ND = not detected

Table 8 PCB Congeners, Coplanars and Aroclors in solid phase extracted water collected from the Brunette River System.

Sampling Location:	97STL1		97BRN1		Procedural Blank		Spiked Matrix
Sampling Date:	28/02/97		28/02/97				
Sample Volume:	57.3 L		50.0 L				
Compounds	(ng/L)	SDL	(ng/L)	SDL	(ng/L)	SDL	% recovery
8/5	0.03	0.002	0.006	0.003	ND	0.004	
15	NDR 0.06	0.002	NDR 0.02	0.003	ND	0.008	
19	0.01	0.002	ND	0.003	ND	0.003	
18	0.02	0.002	0.01	0.002	ND	0.003	82
17	0.02	0.002	0.004	0.002	ND	0.003	
24/27	0.006	0.002	ND	0.003	ND	0.003	
16/32	0.02	0.002	0.01	0.003	ND	0.003	
26	0.004	0.001	ND	0.002	ND	0.003	
25	ND	0.003	ND	0.002	ND	0.003	
31/28	0.04	0.002	0.02	0.002	ND	0.003	92
33	0.006	0.001	0.005	0.002	ND	0.003	
22	0.006	0.001	ND	0.004	ND	0.003	
45	ND	0.003	ND	0.005	ND	0.003	
46	ND	0.003	ND	0.005	ND	0.003	
52	0.02	0.004	0.01	0.004	ND	0.003	81
49	0.006	0.003	0.004	0.004	ND	0.002	
47/48	0.003	0.003	ND	0.004	ND	0.002	
44	0.01	0.004	0.008	0.005	ND	0.003	
42	0.004	0.004	ND	0.005	ND	0.003	
41/71/64	0.01	0.004	0.006	0.005	ND	0.003	
40	ND	0.004	ND	0.005	ND	0.004	
74	ND	0.005	ND	0.005	ND	0.004	
70/76	0.01	0.004	0.009	0.005	ND	0.004	
66	0.005	0.002	0.004	0.004	ND	0.002	
56/60	0.004	0.003	ND	0.003	ND	0.002	
95	0.01	0.003	0.01	0.004	ND	0.003	87
91	ND	0.004	ND	0.005	ND	0.003	
84/89	ND	0.004	ND	0.005	ND	0.003	
90/101	0.01	0.004	0.01	0.005	ND	0.003	
99	ND	0.004	ND	0.005	ND	0.003	
83	ND	0.004	ND	0.005	ND	0.003	
97	ND	0.004	ND	0.005	ND	0.003	
87	ND	0.004	ND	0.005	ND	0.003	
85	ND	0.004	ND	0.005	ND	0.003	
110	0.02	0.005	0.01	0.004	ND	0.003	
107	ND	0.004	ND	0.005	ND	0.003	
118	0.006	0.004	0.006	0.005	ND	0.003	103
114	ND	0.004	ND	0.005	ND	0.003	
105	ND	0.003	ND	0.004	ND	0.002	
136	ND	0.006	ND	0.01	ND	0.004	
151	ND	0.006	ND	0.01	ND	0.004	
144/135	ND	0.006	ND	0.01	ND	0.004	
149	0.009	0.006	ND	0.01	ND	0.004	
134	ND	0.006	ND	0.01	ND	0.004	
131	ND	0.006	ND	0.01	ND	0.004	
146	ND	0.002	ND	0.003	ND	0.001	
153	0.007	0.004	ND	0.008	ND	0.003	
141	ND	0.006	ND	0.01	ND	0.004	
130	ND	0.006	ND	0.01	ND	0.004	
137	ND	0.006	ND	0.01	ND	0.004	
138/163/164	0.009	0.006	ND	0.01	ND	0.004	94
158	ND	0.006	ND	0.01	ND	0.004	
129	ND	0.006	ND	0.01	ND	0.004	
128	ND	0.005	ND	0.01	ND	0.004	
156	ND	0.005	ND	0.01	ND	0.004	
157	ND	0.005	ND	0.01	ND	0.004	
179	ND	0.007	ND	0.01	ND	0.005	
176	ND	0.007	ND	0.01	ND	0.005	

SDL = sample detection limit
ND = not detected
NDR = peak detected but did not meet quantification criteria

Table 8 Continued

Sampling Location: **Sampling Date:** **Sample Volume:** **Compounds**	**97STL1** **28/02/97** **57.3 L** **(ng/L)**	**SDL**	**97BRN1** **28/02/97** **50.0 L** **(ng/L)**	**SDL**	**Procedural** **Blank** **(ng/L)**	**SDL**	**Spiked** **Matrix** **% recovery**
178	ND	0.007	ND	0.01	ND	0.005	
175	ND	0.007	ND	0.01	ND	0.005	
187/182	ND	0.007	ND	0.01	ND	0.005	
183	ND	0.008	ND	0.02	ND	0.006	
185	ND	0.008	ND	0.02	ND	0.006	
174	ND	0.008	ND	0.02	ND	0.006	
177	ND	0.008	ND	0.02	ND	0.006	
171	ND	0.008	ND	0.02	ND	0.006	
172	ND	0.008	ND	0.02	ND	0.006	
180	ND	0.008	ND	0.02	ND	0.006	99
183	ND	0.008	ND	0.02	ND	0.006	
191	ND	0.008	ND	0.02	ND	0.006	
170/190	ND	0.009	ND	0.02	ND	0.008	
189	ND	0.009	ND	0.02	ND	0.008	
201	ND	0.005	ND	0.02	ND	0.005	
197	ND	0.01	ND	0.03	ND	0.01	
198	ND	0.01	ND	0.03	ND	0.01	
199	ND	0.01	ND	0.03	ND	0.01	
196/203	ND	0.008	ND	0.02	ND	0.01	92
195	ND	0.008	ND	0.02	ND	0.01	
194	ND	0.009	ND	0.03	ND	0.01	
205	ND	0.009	ND	0.03	ND	0.01	
208	ND	0.02	ND	0.04	ND	0.01	
207	ND	0.02	ND	0.04	ND	0.01	
206	ND	0.02	ND	0.04	ND	0.01	
209	ND	0.01	ND	0.02	ND	0.008	
Total PCBs	0.365		0.152		0		
PCB #77 (3,3',4,4' TCB)	0.00063	0.00006	0.00062	0.00023	ND	0.00038	109
PCB #126 (3,3',4,4',5 PCB)	ND	0.00009	ND	0.00017	ND	0.00029	113
PCB #169 (3,3',4,4',5,5' HCB)	ND	0.00007	ND	0.00022	ND	0.00051	117
Aroclor 1242	0.34	0.04	0.16	0.65	ND	0.06	89
Aroclor 1254	ND	0.07	ND	0.96	ND	0.09	93
Aroclor 1260	ND	0.08	ND	1.3	ND	0.11	96
Field surrogates:	% recovery		% recovery				
PCB 30	36		42				
PCB 204	13		6				
Surrogate Standards	% recovery		% recovery		% recovery		% recovery
13C-PCB #77	84		54		35		21
13C-PCB #126	83		54		43		22
13C-PCB #169	74		52		47		20
13C-PCB 101	93		110		62		120
13C-PCB 180	92		87		69		110
13C-PCB 209	62		66		64		71

SDL = sample detection limit
ND = not detected

Table 9 Pesticides and Semi-Volatiles in solid phase extracted water collected from the Brunette River System.

Sampling Site: Sample Volume: Sampling Date: Pesticed/Semi-Volatile	97STL1 57.3 L 28/02/97 (ng/L)	SDL	97BRN1 50.0 L 28/02/97 (ng/L)	SDL	Procedural Blank (ng/L)	SDL	Spiked Matrix % recovery
Hexachlorobutadiene	ND	0.007	ND	0.005	ND	0.006	84
1,3-Dichlorobenzene	1.6	0.01	ND	0.02	ND	0.009	92
1,4-Dichlorobenzene	4.6	0.006	1.6	0.01	NDR 0.05	0.004	50
1,2-Dichlorobenzene	0.84	0.007	0.14	0.01	0.006	0.005	78
1,3,5-Trichlorobenzene	0.60	0.01	ND	0.02	ND	0.01	106
1,2,4-Trichlorobenzene	8.4	0.009	2.0	0.01	0.2	0.008	80
1,2,3-Trichlorobenzene	0.34	0.009	0.31	0.01	ND	0.008	69
1,2,3,5/1,2,4,5-Tetrachlorobezene	0.12	0.003	0.08	0.004	ND	0.003	95
1,2,3,4-Tetrachlorobenzene	0.03	0.002	0.02	0.003	ND	0.003	90
Pentachlorobenzene	0.12	0.003	0.16	0.004	0.01	0.003	99
Hexachlorobenzene	0.03	0.005	0.03	0.006	0.01	0.005	100
alpha HCH	0.16	0.01	0.29	0.02	ND	0.02	92
beta HCH	ND	0.02	0.06	0.03	ND	0.03	100
gamma HCH	0.13	0.02	0.22	0.02	ND	0.03	92
delta HCH	ND	0.02	ND	0.02	ND	0.03	73
Heptachlor (a)	ND	0.04	ND	0.05	ND	0.04	-
Aldrin (i)	ND	0.007	ND	0.01	ND	0.01	79
Oxychlordane	ND	0.03	ND	0.04	ND	0.07	100
trans-Chlordane	ND	0.01	ND	0.02	ND	0.006	86
cis-Chlordane	0.02	0.02	ND	0.02	ND	0.006	79
trans-Nonachlor	ND	0.01	ND	0.009	ND	0.006	77
cis-Nonachlor	ND	0.01	ND	0.01	ND	0.007	86
o,p'-DDE	NDR 0.01	0.004	ND	0.005	ND	0.003	92
p,p'-DDE	0.06	0.006	0.08	0.004	NDR 0.009	0.004	92
o,p'-DDD	NDR 0.02	0.004	NDR 0.02	0.004	ND	0.005	91
p,p'-DDD	0.04	0.006	0.04	0.005	ND	0.007	93
o,p'-DDT	NDR 0.05	0.009	ND	0.02	ND	0.006	100
p,p'-DDT	NDR 0.01	0.008	0.02	0.01	ND	0.007	92
Mirex	ND	0.03	ND	0.03	ND	0.03	92
Heptachlor Epoxide (b)	0.1	0.01	0.06	0.009	ND	0.004	73
alpha-Endosulphan (I)	NDR 0.06	0.009	0.06	0.009	ND	0.004	88
Dieldrin (ii)	0.39	0.01	0.23	0.01	ND	0.005	76
Endrin	ND	0.04	ND	0.03	ND	0.01	92
beta-Endosulphan (II)	ND	0.009	ND	0.008	ND	0.004	-
Endosulphan Sulphate (III)	ND	0.01	ND	0.01	ND	0.004	-
Methoxychlor	0.2	0.07	0.3	0.05	ND	0.02	115
Total Semi-Volatiles	16.68		4.34		0.296		
Total Pesticides	1.25		1.38		0.009		
Surrogate Standards	% recovery		% recovery		% recovery		% recovery
13C-1,4-Dichlorobenzene	35		45		55		70
13C-1,2,3-Trichlorobenzene	37		47		44		74
13C-1,2,3,4-Tetrachlorobenzene	42		54		44		70
13C-Pentachlorobenzene	43		52		39		77
13C-Hexachlorobenzene	62		77		48		98
13C-gamma HCH	68		73		60		88
13C-p,p'-DDE	98		110		60		110
13C-p,p'-DDT	76		98		74		97
13C-Mirex	54		65		55		86
d4-alpha-Endosulphan	130		110		120		96

SDL = sample detection limit
ND = not detected
NDR = peak detected but did not meet quantification criteria
- denotes not analysed

Table 10 Chlorophenolics in solid phase extracted water collected from the Brunette River System.

Sampling Site: **Sample Volume:** **Sampling Date:** **Chlorophenolic**	**97STL1** **57.3 L** **28/02/97** **(ng/L)**	**SDL**	**97BRN1** **50.0 L** **28/02/97** **(ng/L)**	**SDL**	**Procedural** **Blank** **(ng/L)**	**SDL**	**Spiked** **Matrix** **% recovery**
4-chlorophenol	NQ	NQ	NDR 0.47	0.19	NDR 4.0	2.5	115
2,6-dichlorophenol	NDR 0.46	0.10	NDR 0.27	0.17	ND	2.2	100
2,4/2,5-dichlorophenol	NDR 2.2	0.08	NDR 0.67	0.15	NDR 3.7	1.9	100
3,5-dichlorophenol	NDR 1.32	0.12	NDR 0.47	0.21	ND	2.7	115
2,3-dichlorophenol	ND	0.12	ND	0.20	ND	2.6	110
3,4-dichlorophenol	NDR 0.36	0.11	ND	0.18	ND	2.4	129
6-chloroguaiacol	NQ	NQ	ND	0.03	ND	1.8	95
4-chloroguaiacol	NQ	NQ	NDR 0.19	0.04	ND	2.2	110
5-chloroguaiacol	NQ	NQ	ND	0.04	ND	2.3	110
2,4,6-trichlorophenol	2.8	0.06	1.3	0.10	ND	1.9	100
2,3,6-trichlorophenol	ND	0.08	ND	0.12	ND	2.4	114
2,3,5-trichlorophenol	NQ	NQ	0.43	0.13	ND	2.8	124
2,4,5-trichlorophenol	ND	0.05	ND	0.09	ND	1.8	100
2,3,4-trichlorophenol	NQ	NQ	ND	0.10	ND	2.1	119
3,4,5-trichlorophenol	NQ	NQ	ND	0.10	ND	2.2	119
3-chlorocatecol	NQ	NQ	NQ	NQ	ND	2.4	45
4-chlorocatecol	NQ	NQ	NQ	NQ	ND	2.6	85
4,6-dichloroguaiacol	ND	0.04	ND	0.06	ND	1.4	95
3,4-dichloroguaiacol	ND	0.05	ND	0.08	ND	1.7	90
4,5-dichloroguaiacol	ND	0.05	ND	0.08	NDR 2.2	1.7	114
3-chlorosyringol	NQ	NQ	ND	0.05	ND	1.1	143
3,6-dichlorocatecol	NQ	NQ	NDR 0.26	0.18	ND	8.7	86
3,5-dichlorocatecol	NQ	NQ	ND	0.17	ND	8	71
3,4-dichlorocatecol	NQ	NQ	NDR 0.40	0.17	ND	8.1	90
4,5-dichlorocatecol	NQ	NQ	ND	0.17	ND	8.2	95
2,3,5,6-tetrachlorophenol	NDR 0.68	0.04	0.83	0.05	ND	2.9	81
2,3,4,6-tetrachlorophenol	NDR 9.4	0.03	2.07	0.04	ND	2.1	81
2,3,4,5-tetrachlorophenol	NDR 3.0	0.03	0.32	0.05	ND	2.6	105
5-chlorovanillin	NQ	NQ	ND	0.80	ND	11	95
6-chlorovanilin	NQ	NQ	ND	0.80	ND	11	71

SDL = sample detection limit
ND = not detected
NQ = not quantified
NDR = peak detected but did not meet quantification criteria

Table 10 Continued

Sampling Site: **Sample Volume:** **Sampling Date:** **Chlorophenolic**	**97STL1** **57.3 L** **28/02/97** **(ng/L)**	**SDL**	**97BRN1** **50.0 L** **28/02/97** **(ng/L)**	**SDL**	**Procedural** **Blank** **(ng/L)**	**SDL**	**Spiked** **Matrix** **% recovery**
3,5-dichlorosyringol	ND	0.09	ND	0.09	ND	2.3	100
3,4,6-trichloroguaiacol	ND	0.09	ND	0.09	ND	4	76
3,4,5-trichloroguaiacol	NDR 0.20	0.09	ND	0.09	ND	4	76
4,5,6-trichloroguaiacol	ND	0.06	ND	0.06	ND	2.8	81
3,4,6-trichlorocatecol	NQ	NQ	ND	0.18	ND	12	124
3,4,5-trichlorocatecol	NQ	NQ	0.26	0.17	ND	11	129
5,6-dichlorovanillin	ND	0.07	ND	0.11	ND	2.7	52
pentachlorophenol	46	0.05	13.33	0.08	ND	3.9	95
2-chlorosyringaldehyde	ND	0.08	ND	0.12	ND	1.3	52
tetrachloroguaiacol	0.1	0.06	0.18	0.07	ND	2.7	100
trichlorosyringol	ND	0.05	ND	0.08	ND	4.4	114
tetrachlorocatecol	0.1	0.09	ND	0.14	ND	8.6	90
dichlorosyringaldehyde	ND	0.24	ND	0.09	ND	1.9	44
Total dichlorophenols	4.34		1.41		3.7		
Total trichlorophenols	2.8		1.73		0		
Total tetrachlorophenols	13.08		3.22		0		
Total chlorophenols	66.22		20.16		7.7		
Total chlorocatechols	0.1		0.92		0		
Total chloroguaiacols	0.3		0.37		2.2		
Total Chlorophenolics	66.62		21.45		9.9		
Surrogate Standards	% recovery		% recovery		% recovery		% recovery
4-chlorophenol-13C	NQ		59		68		34
2,4-dichlorophenol-13C	89		77		68		45
4-chloroguaiacol-13C	NQ		100		42		59
2,4,6-trichlorophenol-13C	94		84		85		48
2,4,5-trichlorophenol-13C	110		94		89		56
5-chlorovanillin-13C	76		65		41		55
2,3,4,5-tetrachlorophenol-13C	83		74		84		54
4,5-dichlorocatecol-13C	NQ		71		26		48
4,5,6-trichloroguaiacol-13C	78		75		52		67
pentachlorophenol-13C	85		75		69		66
tatrachloroguaiacol-13C	83		71		58		64
tetrachlorocatecol-13C	73		65		16		72

SDL = sample detection limit
ND = not detected
NQ = not quantified
NDR = peak detected but did not meet quantification criteria

Table 11 Nonylphenol in solid phase extracted water collected from the Brunette River System.

Sampling Site: **Sample Volume:** **Sampling Date:**	**97STL1** **50.0 L** **28/02/97** **(ng/L)**	**MDL**	**97BRN1** **30.0 L** **28/02/97** **(ng/L)**	**MDL**	**Procedural Blank** **(ng/L)**	**SDL**	**Spiked Matrix** **% recovery**
4-Nonylphenol	*70	2.0	97	3.3	*6.7	0.83	75
NP1EO	*58	2.0	33	3.3	ND	2.4	75
NP2EO	*160	2.0	37	3.3	ND	5.7	104
Total NP3EO-NP14EO equivalents	2400	40	1500	67	ND	100	42
NP3EO equivalents	22		10		ND		
NP4EO equivalents	140		93		ND		
NP5EO equivalents	200		160		ND		
NP6EO equivalents	340		210		ND		
NP7EO equivalents	420		220		ND		
NP8EO equivalents	420		200		ND		
NP9EO equivalents	360		180		ND		
NP10EO equivalents	280		150		ND		
NP11EO equivalents	180		150		ND		
NP12EO equivalents	74		93		ND		
NP13EO equivalents	17		1.9		ND		
NP14EO equivalents	ND		2.3		ND		
NP1EC	74	0.4	83	0.67	NDR 1.8	0.29	79
NP2EC	64	0.4	50	0.67	ND	0.13	145
Total NP1EC-NP2EC	138		133				
Surrogate Standards	% recovery		% recovery		% recovery		% recovery
D6-Bisphenol-A	49		77		92		99
d27-Myristic Acid	100		76		30		86
d-39-Arachidic Acid	110		85		32		83

SDL = Sample Detection Limit
MDL = Method Detection Limit
ND = not detected
NDR = peak detected but did not meet quantification criteria
Note: concentrations are not recovery corrected
Note: Concentrations of NP3EO-NP14EO are reported in equivalents based on a commercially available mixture of 4-nonylphenol polyethoxylates. They are presented for comparison purposes only and should not be interpreted as absolute concentrations.
* Some candidate peaks failed the ion criteria and may be enhanced by interferences, therefore, this value should be regarded as the maximum concentration.

Appendix B

List of Suspended Solids Data Tables

Table 1 Physical parameters of suspended solids collected from the Brunette River System.

Sampling Location: Sampling Date:	97STL1C 28/02/97	97BRN1C 28/02/97
Moisture content (%)	70	70
Total organic carbon (%)	12.1	13.2
Particle Size		
gravel (%)	0	0
sand (%)	0	0
silt (%)	86.33	88.24
clay (%)	13.67	11.76
* Suspended solids (mg/L)	47.6	34.3

* suspended solids concentrations based on average flow rate of 4L/min

Table 2 Total metal concentrations in suspended solids collected from the Brunette River System.

Sampling Location: Sampling Date: Total Metals	97STL1C 28/02/97 Concentration (mg/kg)	97BRN1C 28/02/97 Concentration (mg/kg)
Hg	0.146	0.615
Al	65400	61100
Cd	3	1
Co	17.8	17.1
Cu	320	164
Fe	80800	54800
Mn	1260	2900
Ni	43	32
Pb	254	175
Zn	772	557
Cr	85	68
As	25	20.4
Se	0.9	0.7

Table 3 Dioxins and Furans in suspended solids collected from the Brunette River System.

Sampling Location: Sampling Date: Compounds	97STL1C 28/02/97 Concentration (pg/g)	SDL	97BRN1C 28/02/97 Concentration (pg/g)	SDL
T4CDD - Total	97	0.4	6	0.5
2,3,7,8 TCDD	2.3	0.4	1.1	0.5
P5CDD - Total	230	0.4	130	0.5
1,2,3,7,8 PCDD	24	0.4	13	0.5
H6CDD - Total	1000	0.4	610	0.5
1,2,3,4,7,8 H6CDD	48	0.4	23	0.5
1,2,3,6,7,8 H6CDD	120	0.4	75	0.5
1,2,3,7,8,9 H6CDD	120	0.4	66	0.5
H7CDD - Total	3400	2.2	1900	1.5
1,2,3,4,6,7,8 H7CDD	1900	2.2	1000	1.5
O8CDD - Total	11000	6.2	6600	3.5
T4CDF - Total	220	0.2	160	0.3
2,3,7,8 T4CDF	31	0.2	21	0.3
P5CDF - Total	380	0.5	240	0.4
1,2,3,7,8 P5CDF	9.5	0.5	6.2	0.4
2,3,4,7,8 P5CDF	20	0.5	12	0.4
H6CDF - Total	920	1.0	510	0.9
1,2,3,4,7,8 H6CDF	39	1.0	21	0.9
1,2,3,6,7,8 H6CDF	28	1.0	18	0.9
2,3,4,6,7,8 H6CDF	27	1.0	16	0.9
1,2,3,7,8,9 H6CDF	0	1.0	0	0.9
H7CDF - Total	1800	2.0	940	2.0
1,2,3,4,6,7,8 H7CDF	570	2.0	330	2.0
1,2,3,4,7,8,9 H7CDF	35	2.0	19	2.0
O8CDF - Total	1100	4.0	620	2.0
TEQ (ND = 0)	103.2		58.8	
TEQ at 1% organic carbon	8.6		4.5	
Surrogate Standards	% recovery		% recovery	
13C-2,3,7,8 T4CDF	78		70	
13C-2,3,7,8 T4CDD	70		70	
13C-1,2,3,7,8 P5CDF	84		76	
13C-1,2,3,7,8 P5CDD	94		93	
13C-1,2,3,4,7,8 H6CDF	81		79	
13C-1,2,3,4,7,8 H6CDD	82		77	
13C-1,2,3,4,6,7,8 H7CDF	74		64	
13C-1,2,3,4,6,7,8 H7CDD	80		67	
13C-O8CDD	86		58	

Table 4 PAH concentrations in suspended solids collected from the Brunette River System.

Sampling Location: **Sampling Date:** **Compounds**	**97STL1C** **28/02/97** **(ng/g)**	**SDL**	**97BRN1C** **28/02/97** **(ng/g)**	**SDL**
Naphthalene	180	2.8	220	9.2
Acenaphthylene	100	0.96	59	2.7
Acenaphthene	170	3.2	51	8.7
Fluorene	270	1.3	94	3.7
Phenanthrene	2300	0.82	1200	2.2
Anthracene	190	0.89	120	2.4
Fluoranthene	3900	0.89	2200	2.0
Pyrene	4500	0.69	2300	2.0
Benz(a)anthracene	1100	1.6	610	4.5
Chrysene	3100	1.7	1700	4.7
Benzofluoranthenes	4700	4.8	2400	9.2
Benzo(e)pyrene	1900	5.2	1100	9.9
Benzo(a)pyrene	1500	5.7	860	11
Perylene	410	6.0	270	11
Dibenz(ah)anthracene	260	3.5	140	6.4
Indeno(1,2,3-c,d)pyrene	1900	12	1100	21
Benzo(g,h,I)perylene	2100	11	1300	18
C1-Naphthalenes	360	1.7	160	5.1
C2-Naphthalenes	770	4.5	190	12
C3-Naphthalenes	2100	2.3	230	7.3
C4-Naphthalenes	2100	5.6	300	15
C1-Phenanthrene/Anthracene	3100	1.8	1100	4.6
C2-Phenanthrene/Anthracene	6000	2.2	2800	6.4
C3-Phenanthrene/Anthracene	6400	2.7	3200	7.9
C4-Phenanthrene/Anthracene	4000	2.4	2600	7
Retene	880	2.4	720	6.9
Dibenzothiophene	150	2.6	60	7.1
C1-Dibenzothiophene	370	0.67	110	7.4
C2-Dibenzothiophene	950	0.8	390	2.1
Total LPAHs	3210		1744	
Total HPAHs	25370		13980	
Total parent PAHs	28580		15724	
Total alkylated PAHs	24830		10580	
Surrogate Standards	% recovery		% recovery	
Naphthalene	23		21	
Acenaphthene	43		43	
Phenanthrene	68		70	
Pyrene	90		84	
Chrysene	91		86	
Benzo(a)pyrene	77		88	
Perylene	69		82	
Dibenz(ah)anthracene	64		77	
Benzo(ghi)perylene	56		75	
2-Methylnaphthalene	28		25	

Table 5 PCB Congeners, Coplanars and Aroclors in suspended solids collected from the Brunette River System.

Sampling Location:	**97STL1C**		**97BRN1C**		**97STL1C Lab. Duplicate**		**Procedural Blank**		**Spiked Matrix**
Sampling Date:	**28/02/97**		**28/02/97**		**28/02/97**				
Compounds	**(ng/g)**	**SDL**	**(ng/g)**	**SDL**	**(ng/g)**	**SDL**	**(ng/g)**	**SDL**	**% recovery**
8/5	NDR 0.62	0.24	ND	0.31	NDR 0.52	0.3	ND	0.06	
15	NDR 2.7	0.31	NDR 0.63	0.41	NDR 7.0	0.39	ND	0.1	
19	ND	0.48	ND	0.41	ND	0.74	ND	0.06	
18	1.2	0.46	0.6	0.42	1.2	0.77	ND	0.06	84
17	0.8	0.48	ND	0.41	ND	0.74	ND	0.06	
24/27	ND	0.48	ND	0.41	ND	0.74	ND	0.06	
16/32	1.1	0.48	0.6	0.41	1.2	0.74	ND	0.06	
26	ND	0.37	ND	0.32	ND	0.57	ND	0.05	
25	ND	0.37	ND	0.32	ND	0.57	ND	0.05	
31/28	4.0	0.37	2.5	0.32	4.2	0.57	ND	0.05	99
33	0.9	0.37	0.5	0.31	1.7	0.56	ND	0.05	
22	0.7	0.37	0.4	0.32	1.0	0.55	ND	0.05	
45	ND	0.46	ND	0.46	ND	0.49	ND	0.03	
46	ND	0.46	ND	0.46	ND	0.49	ND	0.03	
52	4.0	0.46	2.6	0.45	3.8	0.48	0.06	0.03	95
49	1.3	0.39	1.0	0.38	1.3	0.43	ND	0.03	
47/48	0.8	0.39	0.5	0.39	0.7	0.42	ND	0.03	
44	2.3	0.5	1.5	0.5	2.2	0.55	ND	0.04	
42	0.6	0.5	ND	0.5	0.6	0.54	ND	0.04	
41/71/64	2.6	0.51	2.0	0.51	2.2	0.54	ND	0.04	
40	ND	0.51	ND	0.51	ND	0.55	ND	0.04	
74	1.4	0.52	1.1	0.51	1.5	0.56	ND	0.04	
70/76	5.0	0.51	3.5	0.52	4.9	0.55	ND	0.04	
66	2.2	0.32	1.6	0.33	2.3	0.35	ND	0.03	
56/60	1.3	0.32	1.0	0.33	1.7	0.36	ND	0.03	
95	8.9	0.51	4.6	0.63	8.8	0.51	ND	0.03	98
91	1.1	0.52	ND	0.63	1.0	0.5	ND	0.03	
84/89	3.6	0.52	2.2	0.63	3.9	0.51	ND	0.03	
90/101	12.0	0.53	6.5	0.63	12.0	0.52	ND	0.03	
99	3.5	0.51	2.3	0.63	3.3	0.51	ND	0.03	
83	ND	0.54	ND	0.67	ND	0.54	ND	0.04	
97	2.8	0.54	1.7	0.66	2.6	0.53	ND	0.04	
87	4.6	0.55	2.9	0.67	4.5	0.54	ND	0.04	
85	1.5	0.55	0.9	0.67	1.4	0.55	ND	0.04	
110	16.0	0.56	9.1	0.67	15.0	0.53	ND	0.04	
107	0.6	0.46	ND	0.58	0.6	0.46	ND	0.03	
118	9.2	0.47	5.8	0.59	8.9	0.48	ND	0.03	106
114	ND	0.47	ND	0.58	ND	0.46	ND	0.03	
105	4.1	0.49	2.0	0.64	4.1	0.54	ND	0.03	
136	4.2	0.79	1.4	0.69	3.9	0.69	ND	0.04	
151	5.2	0.79	1.7	0.71	5.4	0.69	ND	0.04	
144/135	3.9	0.79	1.3	0.73	3.9	0.68	ND	0.04	
149	19.0	0.78	6.6	0.71	18.0	0.66	ND	0.04	
134	ND	0.79	ND	0.71	ND	0.68	ND	0.04	
131	ND	0.79	ND	0.71	ND	0.68	ND	0.04	
146	1.0	0.24	0.3	0.22	1.0	0.22	ND	0.01	
153	20.0	0.66	7.9	0.71	22.0	0.67	ND	0.03	
141	5.2	0.87	1.8	0.95	6.0	0.9	ND	0.04	
130	ND	0.86	ND	0.94	ND	0.88	ND	0.04	
137	ND	0.86	ND	0.94	ND	0.88	ND	0.04	
138/163/164	27.0	0.85	12.0	0.9	29.0	0.88	ND	0.04	99
158	2.8	0.86	1.6	0.95	3.3	0.9	ND	0.04	
129	ND	0.86	ND	0.94	ND	0.88	ND	0.04	
128	2.7	0.76	1.4	0.85	2.8	0.78	ND	0.04	
156	2.4	0.77	0.9	0.84	1.8	0.78	ND	0.05	
157	ND	0.76	ND	0.84	ND	0.79	ND	0.05	
179	4.1	1.2	ND	1.1	5.0	1.2	ND	0.05	
176	ND	1.2	ND	1.1	1.3	1.3	ND	0.05	
178	ND	1.2	ND	1.1	1.4	1.2	ND	0.05	

SDL = sample detection limit
ND = not detected
NDR = peak detected but did not meet quantification criteria

Table 5 Continued.

Sampling Location: / **Sampling Date:** / **Compounds**	**97STL1C** **28/02/97** **(ng/g)**	**SDL**	**97BRN1C** **28/02/97** **(ng/g)**	**SDL**	**97STL1C Lab. Duplicate** **28/02/97** **(ng/g)**	**SDL**	**Procedural Blank** **(ng/g)**	**SDL**	**Spiked Matrix** **% recovery**
175	ND	1.2	ND	1.1	ND	1.2	ND	0.05	
187/182	9.5	1.5	2.3	1.1	10	1.2	ND	0.05	
183	3.8	1.4	ND	1.4	5.4	1.5	ND	0.06	
185	ND	1.5	ND	1.4	ND	1.5	ND	0.06	
174	9.4	1.4	2.2	1.4	9.7	1.5	ND	0.06	
177	5.0	1.4	ND	1.4	5.4	1.6	ND	0.06	
171	2.1	0.1	ND	1.4	2	1.5	ND	0.07	
172	ND	1.3	ND	1.3	ND	1.4	ND	0.07	
180	19.0	1.4	4.8	1.3	19	1.4	ND	0.07	104
183	ND	1.3	ND	1.3	ND	1.4	ND	0.07	
191	ND	1.3	ND	1.3	ND	1.4	ND	0.07	
170/190	9.6	1.6	2.4	1.5	10	1.7	ND	0.09	
189	ND	1.6	ND	1.5	ND	1.7	ND	0.09	
201	ND	1.1	ND	1.4	ND	1.2	ND	0.05	
197	ND	2.1	ND	2.6	ND	2.2	ND	0.12	
198	ND	2.1	ND	2.6	ND	2.2	ND	0.12	
199	5.2	2.1	ND	2.6	5.3	2.2	ND	0.12	
196/203	5.4	1.8	ND	2.3	5.4	1.9	ND	0.1	100
195	ND	1.8	ND	2.3	ND	1.9	ND	0.1	
194	4.0	2.0	ND	2.5	4.8	2.1	ND	0.14	
205	ND	2.0	ND	2.5	ND	2.1	ND	0.14	
208	ND	2.2	ND	3.3	ND	2.4	ND	0.11	
207	ND	2.2	ND	3.3	ND	2.4	ND	0.11	
206	ND	2.2	ND	3.3	ND	2.4	ND	0.11	
209	ND	1.8	ND	2.8	ND	1.9	ND	0.09	
Total PCBs	272.15		106.54		285.92		0		
PCB #77 (3,3',4,4' TCB)	0.53	0.003	0.33	0.003	0.57	0.003	ND	0.00096	93
PCB #126 (3,3',4,4',5 PCB)	0.098	0.0037	0.05	0.0029	0.11	0.0039	ND	0.0027	100
PCB #169 (3,3',4,4',5,5' HCB)	0.014	0.0065	ND	0.0044	0.015	0.0069	ND	0.0029	100
Aroclor 1242	26	7.6	15	6.5	26	12	ND	0.98	94
Aroclor 1254	100	15	65	18	98	15	ND	1.1	106
Aroclor 1260	180	23	45	22	190	25	ND	1.2	100
TEQ	0.0218		0.0112		0.0232				
Surrogate Standards	% recovery		% recovery		% recovery		% recovery		% recovery
13C-PCB #77	34		61		35		87		92
13C-PCB #126	56		82		52		81		76
13C-PCB #169	130		130		110		78		82
13C-PCB 101	96		110		84		96		95
13C-PCB 180	100		88		95		110		94
13C-PCB 209	83		58		81		96		85

SDL = sample detection limit
ND = not detected

Table 6 Pesticides and Semi-volatiles in suspended solids collected from the Brunette River System.

Sampling Location:	**97STL1C**		**97BRN1C**		**97STL1C Lab. Duplicate**		**Procedural Blank**	**Spiked Matrix**
Sampling Date:	**28/02/97**		**28/02/97**		**28/02/97**			
Compounds	**(ng/g)**	**SDL**	**(ng/g)**	**SDL**	**(ng/g)**	**SDL**	**(ng/g)**	**% recovery**
Hexachlorobutadiene	0	0.76	0	0.91	0	0.69	ND	82
1,3-Dichlorobenzene	0	2.1	0	2.1	0	1.6	ND	126
1,4-Dichlorobenzene	11	1.2	5.8	1.2	11	0.91	NDR 0.58	81
1,2-Dichlorobenzene	3	1.3	0	1.3	2.6	1.0	ND	120
1,3,5-Trichlorobenzene	0	1.0	0	1.2	0	0.89	ND	71
1,2,4-Trichlorobenzene	9.8	0.77	5	0.89	9.2	0.68	0.93	87
1,2,3-Trichlorobenzene	0.76	0.75	0	0.86	0.78	0.66	ND	81
1,2,3,5/1,2,4,5-Tetrachlorobezene	0.78	0.38	0.39	0.32	0.51	0.28	0.04	98
1,2,3,4-Tetrachlorobenzene	0.41	0.33	0	0.28	0.31	0.24	ND	91
Pentachlorobenzene	2.7	0.2	2.4	0.26	2.5	0.22	0.19	103
Hexachlorobenzene	2.5	0.03	1.2	0.02	2.4	0.04	0.17	103
alpha HCH	0.84	0.06	0.47	0.07	0.81	0.05	ND	90
beta HCH	0	0.14	0	0.1	0	0.15	ND	106
gamma HCH	0.9	0.09	0.47	0.1	0.75	0.07	ND	95
delta HCH	0	0.09	0	0.1	0	0.07	ND	83
Heptachlor (a)	0	0.15	0	0.13	0	0.32	ND	83
Aldrin (i)	0.15	0.02	0	0.14	0.15	0.02	ND	88
Oxychlordane	0	0.51	0	0.44	0	0.48	ND	121
trans-Chlordane	3	0.04	2	0.06	3.4	0.05	ND	109
cis-Chlordane	3.4	0.05	1.9	1.6	3.4	0.05	ND	92
trans-Nonachlor	2.5	0.05	2	0.07	2.5	0.06	ND	93
cis-Nonachlor	0.84	0.08	0.59	0.1	0.7	0.08	ND	102
o,p'-DDE	0.24	0.03	0.35	0.04	0.33	0.03	ND	105
p,p'-DDE	9.9	0.04	11	0.05	9.8	0.03	NDR 0.15	107
o,p'-DDD	3.8	0.04	2.6	0.05	4.5	0.03	ND	117
p,p'-DDD	12	0.04	11	0.06	16	0.04	ND	113
o,p'-DDT	4.8	0.05	2.6	0.09	5.5	0.04	ND	106
p,p'-DDT	23	0.04	9.6	0.07	28	0.03	ND	103
Mirex	0.6	0.008	0	0.18	0.51	0.009	ND	105
Heptachlor Epoxide (b)	1.8	0.67	1.6	0.79	1.5	0.6	ND	74
alpha-Endosulphan (I)	2.7	0.6	2	0.69	2.6	0.58	ND	95
Dieldrin (ii)	10	0.77	6.8	0.92	8.7	0.67	ND	79
Endrin	0	1.8	0	2.2	0	1.6	ND	117
beta-Endosulphan (II)	0	0.59	0	1.4	0	0.58	-	
Endosulphan Sulphate (III)	0	0.66	0	1.5	0	0.64	-	
Methoxychlor	27	3.3	35	3.9	26	2.9	ND	125
Total Semi-Volatiles	30.95		14.79		29.3		1.91	
Total Pesticides	107.47		89.98		115.15		0.15	
Surrogate Standards	% recovery		% recovery		% recovery		% recovery	% recovery
13C-1,4-Dichlorobenzene	60		52		70		44	42
13C-1,2,3-Trichlorobenzene	63		55		73		46	50
13C-1,2,3,4-Tetrachlorobenzene	82		68		93		51	57
13C-Pentachlorobenzene	97		79		96		56	69
13C-Hexachlorobenzene	70		84		62		68	80
13C-gamma HCH	76		84		74		90	87
13C-p,p'-DDE	110		110		99		58	97
13C-p,p'-DDT	110		100		120		84	85
13C-Mirex	73		74		70		69	73
d4-alpha-Endosulphan	110		120		100		110	95

SDL = sample detection limit
ND = not detected
NDR = peak detected but did not meet quantification criteria

Table 7 Chlorophenol concentrations in suspended solids collected from the Brunette River System.

Sampling Site: **Sampling Date:** **Chlorophenolic**	**97STL1** **28/02/97** **(ng/g)**	**SDL**	**97BRN1** **28/02/97** **(ng/g)**	**SDL**
4-chlorophenol	ND	1.8	ND	2.0
2,6-dichlorophenol	ND	1.8	ND	1.4
2,4/2,5-dichlorophenol	3.4	1.6	3.1	1.3
3,5-dichlorophenol	ND	2.2	ND	1.8
2,3-dichlorophenol	ND	2.2	ND	1.8
3,4-dichlorophenol	ND	2.1	ND	1.7
6-chloroguaiacol	ND	0.87	ND	0.88
4-chloroguaiacol	ND	1.0	ND	1.0
5-chloroguaiacol	ND	1.1	ND	1.1
2,4,6-trichlorophenol	ND	1.4	ND	1.3
2,3,6-trichlorophenol	ND	1.9	ND	1.8
2,3,5-trichlorophenol	ND	2.2	ND	2.0
2,4,5-trichlorophenol	ND	1.3	ND	1.3
2,3,4-trichlorophenol	ND	1.5	ND	1.5
3,4,5-trichlorophenol	ND	1.6	ND	1.6
3-chlorocatecol	ND	1.4	ND	1.2
4-chlorocatecol	ND	1.5	ND	1.3
4,6-dichloroguaiacol	ND	1.3	ND	1.4
3,4-dichloroguaiacol	ND	1.7	ND	1.8
4,5-dichloroguaiacol	ND	1.7	ND	1.8
3-chlorosyringol	ND	1.4	ND	1.1
3,6-dichlorocatecol	ND	4.6	ND	6.8
3,5-dichlorocatecol	ND	4.6	ND	6.7
3,4-dichlorocatecol	ND	4.8	ND	6.9
4,5-dichlorocatecol	ND	5.0	ND	7.2
2,3,5,6-tetrachlorophenol	ND	3.4	ND	3.4
2,3,4,6-tetrachlorophenol	4.3	2.6	ND	2.6
2,3,4,5-tetrachlorophenol	ND	2.5	ND	2.5
5-chlorovanillin	ND	7.9	ND	9.9
6-chlorovanilin	ND	8.1	ND	10

SDL = sample detection limit
ND = not detected
NQ = not quantified

Table 7 Continued

Sampling Site: **Sampling Date:** **Chlorophenolic**	**97STL1** **28/02/97** **(ng/g)**	**SDL**	**97BRN1** **28/02/97** **(ng/g)**	**SDL**
3,5-dichlorosyringol	ND	3.1	ND	3.5
3,4,6-trichloroguaiacol	ND	2.0	ND	2.0
3,4,5-trichloroguaiacol	ND	2.2	ND	2.2
4,5,6-trichloroguaiacol	ND	1.6	ND	1.6
3,4,6-trichlorocatecol	ND	8.6	ND	9.0
3,4,5-trichlorocatecol	ND	6.7	ND	9.2
5,6-dichlorovanillin	ND	3.6	ND	4.3
pentachlorophenol	82	3.5	48	4.8
2-chlorosyringaldehyde	ND	3.0	ND	3.2
tetrachloroguaiacol	ND	4.3	ND	4.7
trichlorosyringol	ND	3.8	ND	3.7
tetrachlorocatecol	ND	NQ	ND	NQ
dichlorosyringaldehyde	ND	3.0	ND	3.6
Total dichlorophenols	89.7		51.1	
Total trichlorophenols	ND		ND	
Total tetrachlorophenols	ND		ND	
Total chlorophenols	ND		ND	
Total chlorocatechols	ND		ND	
Total chloroguaiacols	ND		ND	
Total Chlorophenolics	89.7		51.1	
Surrogate Standards	% recovery		% recovery	
4-chlorophenol-13C	77		72	
2,4-dichlorophenol-13C	64		63	
4-chloroguaiacol-13C	85		62	
2,4,6-trichlorophenol-13C	65		87	
2,4,5-trichlorophenol-13C	81		76	
5-chlorovanillin-13C	61		43	
2,3,4,5-tetrachlorophenol-13C	80		51	
4,5-dichlorocatecol-13C	40		20	
4,5,6-trichloroguaiacol-13C	81		58	
pentachlorophenol-13C	69		36	
tatrachloroguaiacol-13C	71		44	
tetrachlorocatecol-13C	NQ		NQ	

SDL = sample detection limit
ND = not detected
NQ = not quantified

Table 8 Nonylphenol concentrations in suspended solids collected from the Brunette River System.

Sampling Location: **Sampling Date:** **Compounds**	**97STL1C** **28/02/97** **(ng/g)**	**MDL**	**97BRN1C** **28/02/97** **(ng/g)**	**MDL**	**Procedural Blank**	**SDL**	**Spiked Matrix** **% recovery**
4-Nonylphenol	990	10	790	20	*4.0	0.13	80
NP1EO	390	10	*160	20	*2.2	1.2	56
NP2EO	*690	10	*540	20	*7.7	1.4	59
Total NP3EO-NP14EO equivalents	9800	200	6600	200	10	5	92
NP3EO equivalents	820		570		1.6		
NP4EO equivalents	780		510		0.6		
NP5EO equivalents	950		630		0.4		
NP6EO equivalents	1200		890		1.2		
NP7EO equivalents	1400		1100		1.6		
NP8EO equivalents	1400		1000		2.6		
NP9EO equivalents	1500		880		2.2		
NP10EO equivalents	1200		640		ND		
NP11EO equivalents	610		290		ND		
NP12EO equivalents	ND		100		ND		
NP13EO equivalents	ND		33		ND		
NP14EO equivalents	ND		ND		ND		
NP1EC	*35	10	*47	20	*8.7	4.4	88
NP2EC	*170	10	*310	20	*1.5	0.24	100
Total NP1EC-NP2EC	*205		*357		*10.2		
Surrogate Standards	% recovery		% recovery		% recovery		% recovery
D6-Bisphenol-A	69		29		77		52
d27-Myristic Acid	75		76		110		85

SDL = Sample Detection Limit
MDL = Method Detection Limit
ND = not detected
NDR = peak detected but did not meet quantification criteria
Note: concentrations are not recovery corrected
Note: Concentrations of NP3EO-NP14EO are reported in equivalents based on a commercially available mixture of 4-nonylphenol polyethoxylates. They are presented for comparison purposes only and should not be interpreted as absolute concentrations.

* Some candidate peaks f ailed the ion criteria and may be enhanced by interferences, therefore, this value should be regarded as the maximum concentration.