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**BASELINE STUDY OF WATER QUALITY, SEDIMENTS
AND BENTHIC FAUNA OF SELECTED STREAMS
IN THE BREWERY CREEK AREA,
YUKON, LOKI GOLD CORPORATION**

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BASELINE STUDY OF WATER QUALITY, SEDIMENTS
AND BENTHIC FAUNA OF SELECTED STREAMS
IN THE BREWERY CREEK AREA,
YUKON, LOKI GOLD CORPORATION

REGIONAL PROGRAM REPORT NO. 95-02

by

D. Davidge

March, 1995

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
WATER RESOURCES DIVISION
MONTANA
TETON
WATER RESOURCES

CAN Davidge, D.A. (Douglas A.)
11.93 Baseline study of water
95-02 quality, sediments, and
c.2 benthic fauna of selected
streams in the Brewery
Creek area, Yukon, Loki

ABSTRACT

During July of 1991, a baseline study was conducted by the Environmental Protection Branch - Yukon Division to document environmental conditions in the vicinity of the Brewery Creek mine property east of Dawson City, Yukon. The study was carried out in response to the proposed development of a hard rock mine at the Brewery Creek Property in the near future.

Most water quality parameters met the Canadian Water Quality Guidelines. The exceptions were total aluminum at Station 7 (Brewery Creek), total copper at Station 9 (Klondike River) and total zinc at Station 3 (Laura Creek). Stream sediment chemistry was comparable to sediment compositions found in other mineralized areas in the Yukon. Benthic invertebrate populations were significant in numbers and diversity.

RÉSUMÉ

En Juillet 1991, la division de la Protection de l'Environnement (Yukon) a conduit une étude de base pour documenter les conditions environnementales près de la propriété de Brewery Creek à l'est de la ville de Dawson, Yukon. L'étude fut produite en réponse au futur projet de développement minier.

La plupart des paramètres de qualité de l'eau rencontrent les Normes Canadiennes de Qualité de l'Eau. Certaines exceptions furent par contre identifiées: l'aluminium total à la station 7 (Brewery Creek), le cuivre total à la station 9 (Klondike River) et le zinc total à la station 3 (Laura Creek). La chimie des sédiments était comparable aux sédiments analysés dans d'autres régions minéralisés du Yukon. Les populations d'invertébrés benthiques furent significatives tant en nombres qu'en diversité.

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1.0 INTRODUCTION

In July of 1991, Environmental Protection Branch - Yukon Division conducted a baseline inventory of several Klondike River tributaries. The study area encompasses the Brewery Creek Mining Property situated east of Dawson City (see Figure 1). The study was designed to assess the baseline water quality, stream sediment characteristics and the stream benthic invertebrate populations. Sample site selection was based on mining exploration activity and proposed mine development plans that existed as of July, 1991.

Since the completion of the field work, the level of exploration activity in the area has expanded and mine development plans have progressed significantly (Jilson, 1993). Therefore, readers should note that the information in this report may not adequately address all sites and drainages that may potentially be impacted by the development of a gold mine and mill facility that is currently being proposed.

2.0 STUDY AREA

The study area's location is approximately 57km east of Dawson City. This area is north of the Klondike River and bordered on the West by Lee Creek and on the east by Brewery Creek. (See Figure 2). Access to the mine exploration area is via the Dempster Highway and an existing roadway historically known as the Yukon Ditch Road.

Subsistence hunting, fishing, trapping and small scale timber harvesting take place in the area. Placer mining activity occurs on several Klondike River tributaries and on the Klondike River downstream of the study site, however, there are no active placer operations in the area of proposed mine development. The only notable industrial development that has taken place historically in the area is the now abandoned hydroelectric facility associated with the Klondike River and North Klondike River. The facility dates back to the early part of this century and was initially designed to provide power to large gold mining dredges in the Hunker and Grandville Creek area. In subsequent years the power grid was extended to supply power to Dawson City. The facility was abandoned in 1966 (Green, 1977).

Noranda Exploration Co. Ltd. originally staked the Brewery Creek property in 1987. Considerable interest has been generated since this baseline work was conducted. Loki Gold Corporation, the present owner/developer, estimates reserves of eight million tons and averaging 0.2 grams/tonne gold. Exploration activity on the property continued throughout 1992, 1993 (Jilson, 1993). An advanced exploration program was carried out in 1994 to further delineate reserves.

The geology is described as "a large, low grade oxide gold deposit hosted by Cretaceous quartz monzonite and underlying greywacke of the Devono-

Mississippian Earm Group. The property is located in unglaciated terrain on the west edge of the Selwyn Basin, adjacent to the Tintina Fault." (Yukon Minfile 116B 160, Brewery Creek, 1991).

Nine sample sites were established in the study area (see Figure 2). Water quality, stream sediments and benthic invertebrates were characterized at Stations 1 through 8. At Station 9, only water quality was characterized. Flow estimates for each of the tributary streams sites were determined. A description of each of the stations is provided in Table 1.

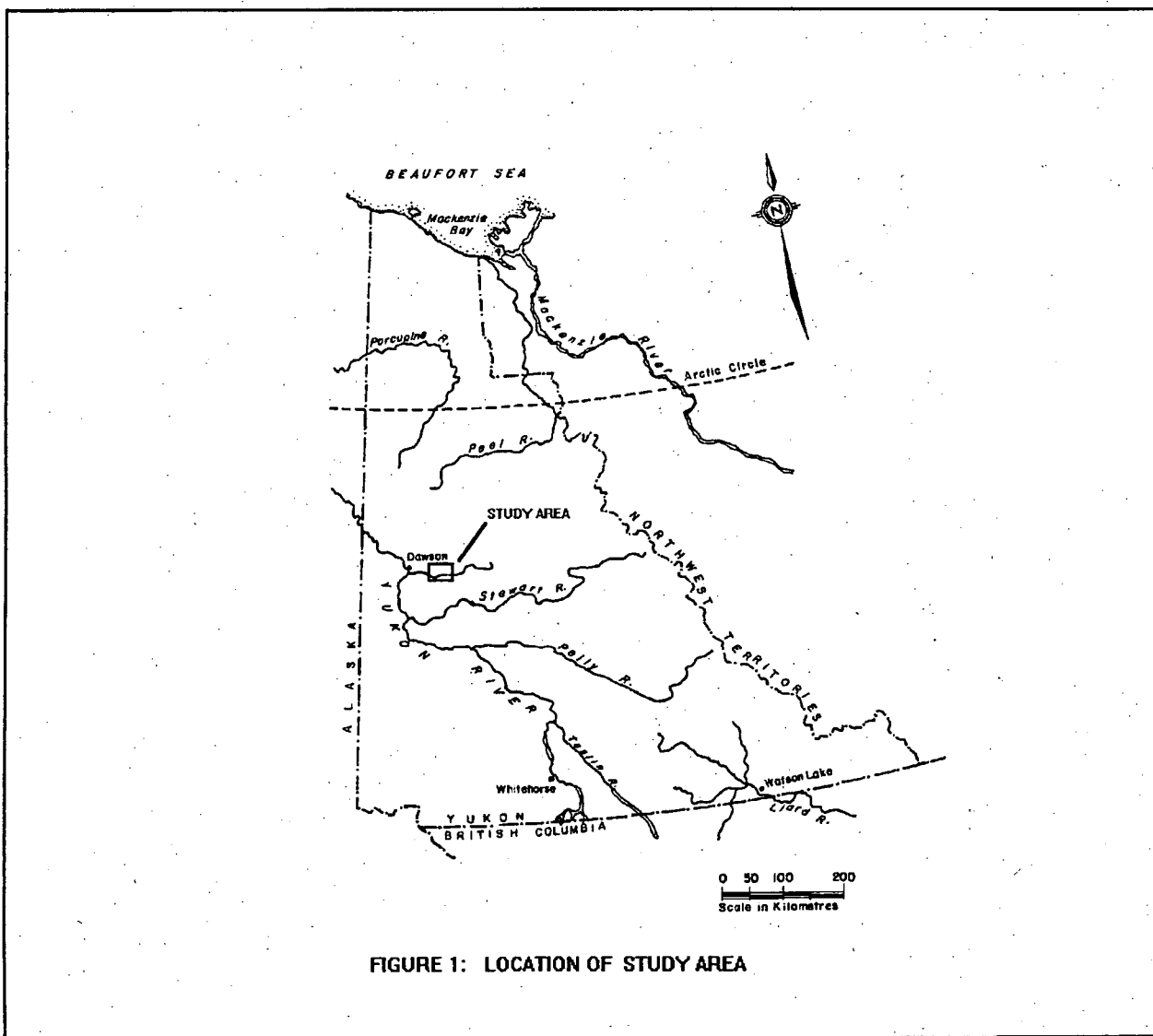


FIGURE 1: LOCATION OF STUDY AREA

TABLE 1 SAMPLE STATION DESCRIPTIONS

Station	Location	Description
1	63° 58.80'N 138° 23.58'W, Klondike River ~1km downstream of Lee Creek along the right bank.	Water, sediment and benthic samples were collected close to shore in 0.3m water depth. The site is characterized by broad active braided stream channels interdispersed with old river channels, log jams, gravel bars and small islands; shoreline vegetation consists mainly of grasses and willow.
2	64° 01.49'N 138° 03.27'W, Klondike River downstream of Brewery Creek along the right bank.	Water, sediment and benthic samples were collected close to shore in 0.3m water depth. The site is characterized by broad active braided stream channels interdispersed with old river channels, log jams, gravel bars and small islands; shoreline vegetation consists mainly of grasses and willow.
3	64° 00.33'N 138° 29.95'W, Lee Creek upstream of Pacific Creek.	The site is characterized by confined meandering creek channel heavily burdened with wood debris and log jams; Stream banks up to 3m in height and unstable where there is standing timber; vegetation consists of some grasses, willow and stands of heavy spruce and poplar timber; substrate composed primarily of a cobble/boulder mixture intermixed with fine sands.
4	64° 00.32'N 138° 28.71'W, Lee Creek upstream of the Yukon Ditch Road crossing.	The site is characterized by a low gradient and gentle meandering stream channel free of wood debris; uninterrupted stream flow; vegetation consists of aspen, willow with some grasses along stable stream banks; substrate composed largely of gravel, sands and fines; some small cobble present.

TABLE 1 (Cont'd)

Station	Locations	Descriptions
5	63° 59.76'N 138° 22.60'W, Lee Creek upstream of the Klondike River.	The site is characterized by a sharp meandering stream channel interrupted frequently by wood debris and log jams; deep water common along overhanging banks; stream banks stable; shoreline vegetation consists mainly of willow, large poplar with some grasses; substrate composed of fine gravels, sand and fines; some cobbles present.
6	64° 01.31'N 138° 06.71'W, Golden Creek upstream of the Klondike River; site located at "WQ2" stream level gauge.	The site is characterized by a confined stream channel with little meander; uniform flow with few riffles; depth uniform; vegetation consist mainly of thick overhanging willow and alder growth; poplar present; substrate somewhat cemented; primarily cobble intermixed with sand and fines.
7	64° 01.52'N 138° 00.99'W, Brewery Creek upstream of the Klondike River.	The site is characterized by a wide stream channel with little meander; frequent gravel bars, pools, and riffles; occasional interruption of flow by wood debris and log jams; over hanging unstable stream banks (1 - 2m high) where there is standing timber; vegetation consists mainly of willow and spruce/poplar stands; substrate composed of boulder and cobble intermixed with sand and fines .
8	63° 59.76'N 138° 14.81'W, Laura Creek upstream of the Klondike River at Yukon Ditch Road Crossing.	The site is characterized by a narrow poorly defined stream channel, low gradient; sampling done at clearing where channel cuts through the Yukon Ditch Road; surrounding vegetation primarily grasses with some willow; substrate consists of fine gravels, sands and fines.
9	63° 56.65'N 138° 38.12'W, Klondike River, left bank, approximately 20km downstream of Lee Creek near Klondike Hwy.	The site is characterized by wide braided river channels with numerous gravel bars and islands; accumulations of wood debris and log jams frequent; substrate boulder and cobble intermixed with sand and fines.

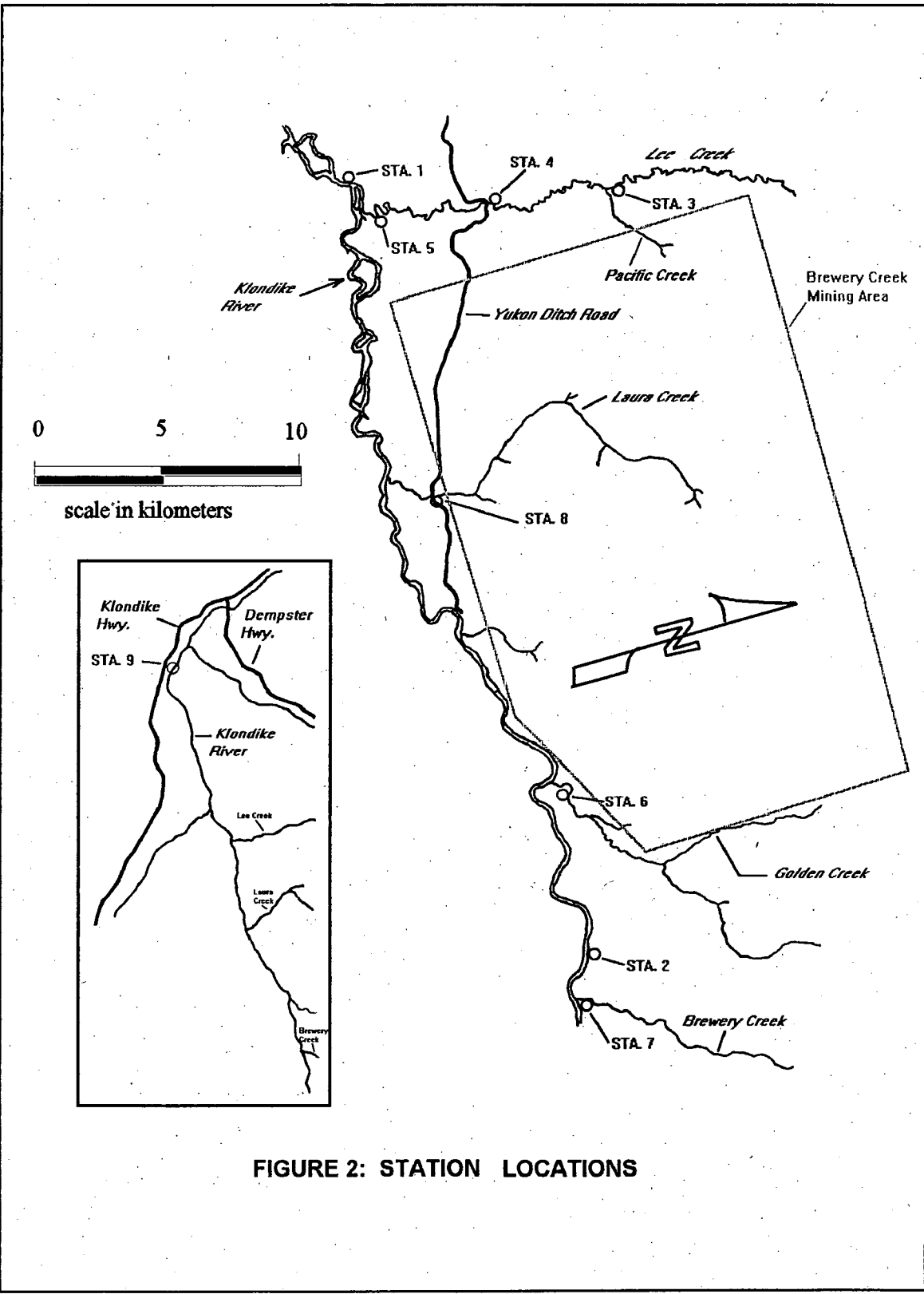


FIGURE 2: STATION LOCATIONS

3.0 METHODS

In situ measurements and sample collection occurred between July 30 and August 1, 1991. Sample sites were selected based on the progress of exploration work and the potential for mine development at the time of the survey. Access to the sites was by vehicle, all terrain vehicle (ATV) or helicopter.

3.1 Water Quality and Quantity

Collection and preservation of water samples was carried out as outlined in the "Sampling for Water Quality" handbook published by Environment Canada. All sites visited during the study were sampled for dissolved and total metals:

Aluminium (Al)	Copper (Cu)	Silicon (Si)
Antimony (Sb)	Mercury (Hg, total only)	Silver (A)
Arsenic (As)	Iron (Fe)	Sodium (Na)
Barium (Ba)	Lead (Pb)	Strontium (Sr)
Beryllium (Be)	Magnesium (Mg)	Tin (Sn)
Boron (B)	Manganese (Mn)	Titanium (Ti)
Cadmium (Cd)	Molybdenum (Mo)	Vanadium (V)
Calcium (Ca)	Nickel (Ni)	Zinc (Zn)
Chromium (Cr)	Phosphorous (P)	
Cobalt (Co)	Selenium (Se)	

conductivity, pH, filterable residue, non-filterable residue, ammonia, nitrite, nitrite+nitrate, ortho phosphate, sulfate, color, turbidity, hardness, chloride and total phosphorus were also analysed. In situ measurements obtained include water flow estimates (as total discharge), temperature, pH, conductivity and dissolved oxygen. Stream depth and velocity were measured using a wading rod and a Marsh McBirney Model 201D Portable Water Current Meter. Water velocity was determined using the "Six-tenths-depth Method (United States Department of the Interior, 1975). Total discharge was calculated based on the interval width,

depth and velocity using the "Midsection Method" formula (United States Department of the Interior, 1975).

For the purpose of quality control, Station 4 was sampled in triplicate and field blanks of distilled water were prepared and submitted as hidden blanks with the sample set that was shipped to the lab. Water samples were submitted to the Environmental Canada Chemistry Lab in Vancouver for analysis.

The procedures used in the analysis of water and sediments samples were in accordance with the Environment Canada - Conservation and Protection Laboratories Standard Operating Procedures Manual.

3.2 Sediments

Sediment samples were collected in triplicate at Stations 1 through 8 using a Teflon scoop. Each individual sediment grab sample was placed in a paper geochemical bag and overpacked in a plastic bag. Samples were later frozen for preservation and maintained in this state until the time of analysis. Sediment samples were analyzed for metals composition:

Aluminium (Al)	Cobalt (Co)	Selenium (Se)
Antimony (Sb)	Copper (Cu)	Silicon (Si)
Arsenic (As)	Iron (Fe)	Silver (A)
Barium (Ba)	Lead (Pb)	Sodium (Na)
Beryllium (Be)	Magnesium (Mg)	Strontium (Sr)
Boron (B)	Manganese (Mn)	Tin (Sn)
Cadmium (Cd)	Molybdenum (Mo)	Titanium (Ti)
Calcium (Ca)	Nickel (Ni)	Vanadium (V)
Chromium (Cr)	Phosphorous (P)	Zinc (Zn)

Sediment samples were also analysed for particle size distribution. Sediment samples were submitted to the Environmental Protection Chemistry Lab in Vancouver for analysis.

The procedures used in the analysis of sediments samples were in accordance with the Environment Canada - Laboratories Standard Operating Procedures Manual.

3.3 Benthic Fauna

Benthic invertebrate samples were collected using a Hess type sampler. The sampler was 34.5cm in diameter and was equipped with a 250 μ m nylon mesh net. Three replicate samples were randomly collected at Stations 1 through 8. Sampling was carried out in mid channel at each of the tributary sites and along the right bank at the Klondike River sites.

Benthic samples were preserved in the field using a 10% formalin solution. Samples were later submitted to Dr. Charles Low, a contract invertebrate taxonomist, in Victoria, B.C. for sorting, enumeration and identification. All invertebrate samples have been retained by the department at the Whitehorse Office.

Indices of benthic community diversity and evenness were calculated using the following formula (Pielou 1975):

$$\text{Species Diversity (H')} = - \sum_{i=1}^n (P_i \log_{10} P_i)$$

where, $P_i = n_i / N$

n_i = number of individuals in the i th most specific taxonomic group (ie. genus) at one sample location.

N = total number of individuals identified to specific taxonomic group (ie. genus) at one sample location.

n = total number of taxonomic groups (ie. genus) identified at one sample location.

$$\text{Evenness (J')} = H' / \log_{10} n$$

Percent Similarity Index: The benthic invertebrate communities collected during the two surveys were compared using a percent similarity index (Psc) formula described by Brock (1977):

$$\text{Psc} = 100 - 0.5 \sum_{i=1}^k |a-b|$$

where a and b are, for a given genus, percentage of the total samples A and B which that genus represents. The absolute value of their difference is summed over all genera, k . The Psc compares the percentage of genera present at two different locations but is not a comparison of total invertebrate abundance. The information produced by the percent similarity index was plotted into a cluster using the nearest neighbour clustering method (Legendre, L., 1984).

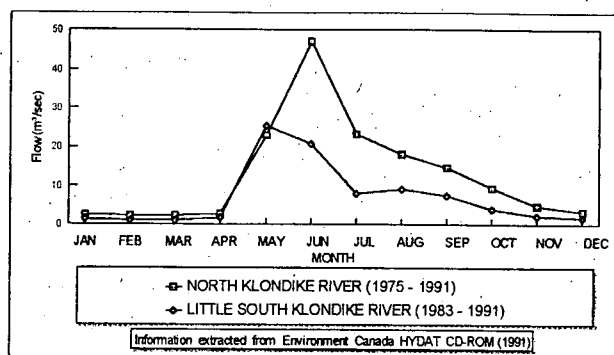
4.0 RESULTS

4.1 Water Quality and Quantity

The water quality data is provided in Appendix I. Stream flows were measured at each of the Klondike River tributary sites sampled. There is no long term flow monitoring data available for any of the tributary streams sampled, however, some comparisons can be made with the flow data from two hydrometric monitoring stations located nearby on major tributaries of the Klondike River.

Tributary flows at the time of sampling ranged from 0.03 m³/sec at Station 8, Laura Creek, to 5.64 m³/sec at Station 7, Brewery Creek (see Appendix I, Table 1). Figure 3 shows monthly mean flow values for two hydrometric stations located in the general vicinity of the study area (the North Klondike River and the Little South Klondike River). The water, sediment and benthic invertebrate sampling completed in the present study took place at or near the end of the peak flow period for this area as depicted by the average monthly flow patterns shown in Figure 3. The flow estimate for Brewery Creek (5.64 m³/sec), when compared with the Little South Klondike River average for the month of July (8.09 m³/sec), shows that Brewery Creek is of significant size (approximately 70%). The other streams sampled in the study area are considerably smaller in size and volume, accounting for less than 20% of the Brewery Creek volume.

FIGURE 3: MONTHLY MEAN FLOWS FOR NORTH KLONDIKE AND LITTLE SOUTH KLONDIKE RIVER HYDROMETRIC STATIONS



In situ measurements indicate that Station 6 (Golden Creek) is possibly influenced more so by ground water sources than the other creeks that were sampled. This is reflected by the lowest temperature and highest conductivity measured in the study area compared to the other sample stations.

All in situ measurements (i.e. temperature, conductivity, pH and dissolved oxygen) and the physical parameters analysed in the water samples (i.e. filterable and non-filterable residues) show that each of the streams are typical of small to medium size drainages found in other parts of the Yukon (Mathers, et al, 1981).

In addition, nutrients and total metals concentrations were also typical of Yukon streams and were generally well below the recommended levels for the protection of aquatic life (Canadian Water Quality Guidelines, 1987). However, there were some exceptions: total aluminum concentrations at Station 7 (Brewery Creek) equalled the upper limit of the recommended maximum of 0.1 mg/L; total copper at Station 9 Klondike River (0.0028 mg/L), Station 8 Laura Creek (0.0029 mg/L,) and Station 6 Golden Creek (0.0029 mg/L) exceeded the recommended limit of 0.002 mg/L (where total hardness is 60 - 120 mg/L as CaCO₃); and total zinc concentrations at Station 3, Lee Creek (0.048 mg/L) exceeded the recommended limit of 0.03 mg/L.

Dissolved metals data for the samples collected were declared invalid due to contamination of samples. The source of the contamination was not determined, however, the field filtering apparatus is suspected.

Contamination of field blanks for extractable and total copper was also noted. The source of this contamination is attributed to the EP - Yukon Lab water distilling apparatus and has been noted in the past as the source of copper in distilled water blanks.

4.2 Sediments

Sediment metals and particle size analysis data is provided in Appendix II, Tables 1 and 2. Metals analysis of sediments collected at Stations 1 through 8 reveal some minor differences in sediment metals composition between creeks. Calcium, cadmium, copper, magnesium, molybdenum, nickel, phosphorus, strontium, vanadium and zinc levels were all slightly higher in concentration at all Lee Creek Stations compared to the other sites sampled. In addition, arsenic was found to be lower in concentration at the Lee Creek Stations than levels at the other sites sampled in the study area. The highest arsenic levels were found at Station 6, Golden Creek. The only other anomaly noted in the sediment data was the slightly higher concentrations of lead at Station 6 (Golden Creek), Station 7 (Brewery Creek) and Station 8 (Laura Creek) as compared with the other sites sampled.

Stream sediment particle size distribution was classified using the Wentworth Size classification system. Overall, stream sediments in the study area consist primarily of sand and coarse granular material. The percentage distribution ratio at most of the sites were heavily influenced by the material in the >2.0mm size range. However, sediments at Station 3 (Lee Creek upstream of Pacific Creek), Station 4 (Lee Creek upstream of the Yukon Ditch Road) and

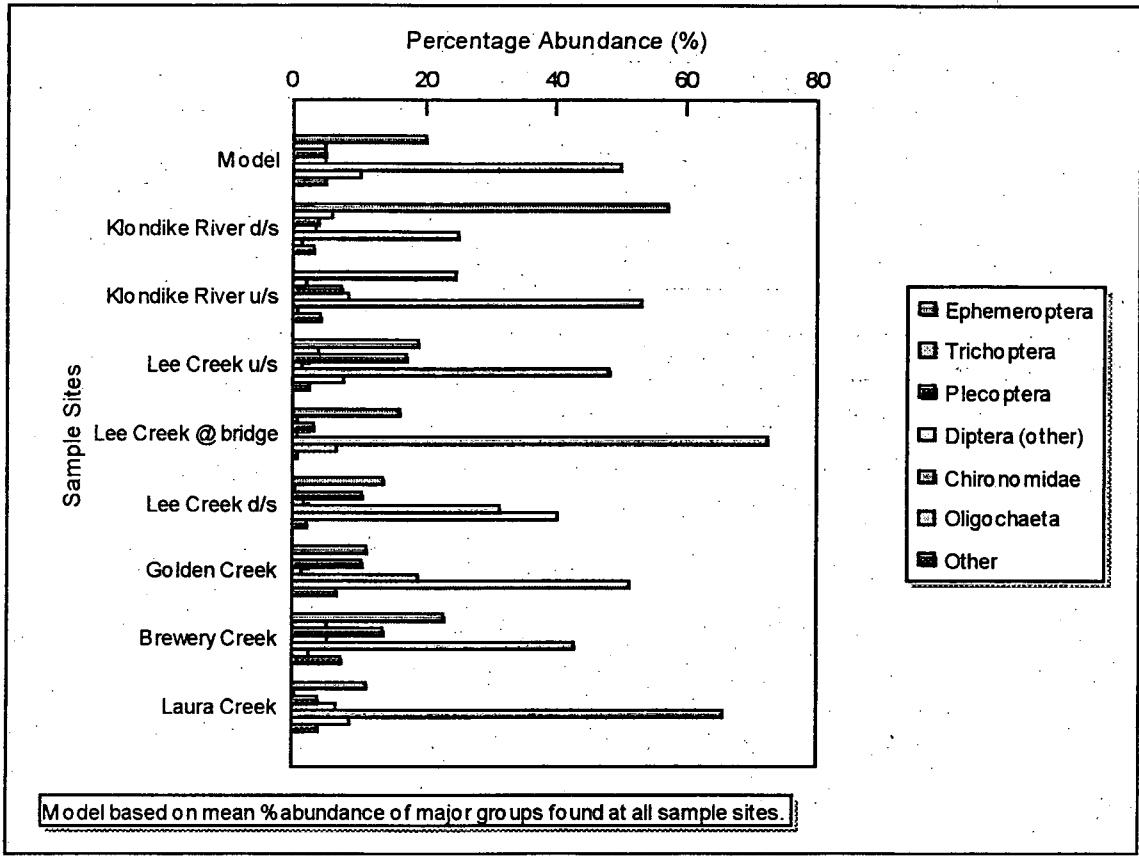
Station 7 (Brewery Creek) tended to have a significant percentage of material in the medium to very coarse sand size classes (0.25 - 0.5mm, 0.5 - 1.0mm and 1.0 - 2.0mm).

4.3 Bottom Fauna

A benthic invertebrate taxonomic list and the sample results are provided in Appendix III, Tables 1 and 2. Figures 4 and 5 and Tables 2 and 3 summarize the benthic invertebrate data collected.

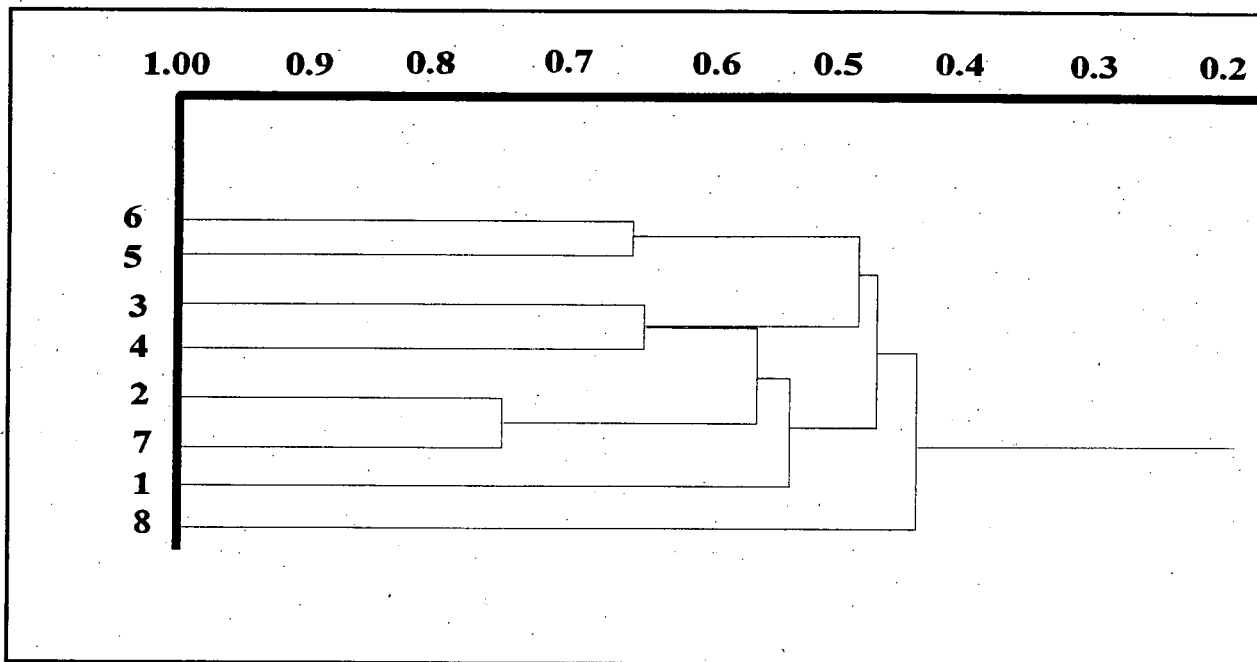
The dominant benthic invertebrate group throughout the study area was of the order Diptera (see Figure 4). Among this group, the greatest percentage of abundance was represented by the Family Chironomidae. A shift in dominance from this group was found at Station 5 (Lee Creek downstream) and Station 6 (Golden Creek) where the Family Lumbriculidae of the Order Oligochaeta was found to be significantly more abundant. As well, the Order Ephemeroptera, represented over half of the population in terms of abundance at Station 1 (Klondike River downstream).

Figure 4: Percentage Abundance of Major Benthic Invertebrate Taxonomic Groups



A benthic invertebrate analysis summary can be found in Table 2. Population densities ranged from 2,834 individuals/m² at Station 6 (Golden Creek) to 16,117 individuals/m² at Station 4 (Lee Creek at the Yukon Ditch Road crossing). Population densities at other stations were relatively low in comparison except Station 8 (Laura Creek), where density was in excess of 10,000 individuals/m². Diversity (H') and Evenness (J') were high at most sites. The exceptions were the stations with the highest density, Stations 4 and Station 8.

Figure 5 Cluster Analysis of Benthic Community Based on Percentage Similarity



Similarity above 60% was noted only in 3 pairs of stations: Station 7 and 2 (76%), Stations 5 and 6 (65%) and Stations 3 and 4 (64%). Among the sites sampled, similarity greater than 40% was most frequently associated with Station 7, Station 2 and Station 5.

5.0 CONCLUSIONS

1. Canadian Water Quality Guidelines for Freshwater Aquatic Life were exceeded for total aluminum, total copper and total zinc separately at three sites. The guidelines were met on all other instances.
2. Stream sediment chemistry was variable between sites. Lee Creek sediments were higher in cadmium, copper and zinc concentrations and lower in arsenic concentrations when compared to the other sites sampled. Overall, metals concentrations and sediment characteristics were comparable to other mineralized sites in the Yukon.
3. Benthic populations appear to be significant in abundance and diversity at the stations sampled. Benthic populations in Laura Creek and Golden Creek, both originating from the mine exploration area, were significantly different than the other tributary sites in terms of the dominant taxa present.

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ACKNOWLEDGEMENTS

The Environmental Protection Branch - Yukon Division would like to acknowledge the following people for their contributions towards the completion of this report: Joan Eamer and Doug Davidge for data collection and field work, Doug Davidge, Benoit Godin and Scott Herron for draft preparations, and Al Colodey for technical review.

APPENDIX I

WATER QUALITY AND QUANTITY DATA

APPENDIX I TABLE 1 WATER QUALITY AND QUANTITY DATA

STATION NUMBER	Location	SAMPLE DATE	MEAN DEPTH (m)	STREAM WIDTH (m)	MEAN VELOCITY (m/sec)	DISCHARGE (m ³ /sec)	TEMP (C)	pH INSITU	pH LAB	LAB						
										IN SITU CONDUCTIVITY (umhos/cm)	CONDUCTIVITY (umhos/cm)	DISSOLVED OXYGEN (mg/L)	ER (mg/L)	NER (mg/L)	AMMONIA (mg/L)	NITRITE (mg/L)
1	Klondike River d/s of Lee Creek	31-Jul-91	n/a	n/a	n/a	n/a	11.2	7.36	7.9	210	240	9.02	160	< 5	< 0.002	< 0.002
2	Klondike River d/s of Brewery Creek	31-Jul-91	n/a	n/a	n/a	n/a	11.8	7.8	8	192	218	8.80	150	< 5	0.003	< 0.002
3	Lee Creek u/s of Pacific Creek	31-Jul-91	0.3	5.0	0.57	0.89	7.0	7.8	8.1	265	432	9.94	300	< 5	0.013	0.002
4.1	Lee Creek u/s of Ditch Road bridge	30-Jul-91	0.16	10.0	0.51	0.95	9.8	8.16	8.1	271	432	10.30	290	< 5	0.007	< 0.002
4.2	same as above	30-Jul-91							8.1	434	434	290	290	< 5	0.009	< 0.002
4.3	same as above	30-Jul-91							8.1	434	433	290	290	< 5	0.009	< 0.002
5	Lee Creek u/s of Klondike River	31-Jul-91	0.32	6.5	0.30	0.73	10.1	7.53	8.1	358	434	9.29	300	< 5	0.008	0.002
6	Golden Creek u/s of Klondike River	31-Jul-91	0.26	3.8	0.15	0.22	6.2	8.13	8.2	410	477	10.30	330	< 5	0.007	0.003
7	Brewery Creek u/s of Klondike River	31-Jul-91	0.39	16.3	0.78	5.64	8.8	8.07	8.0	205	234	9.94	160	< 5	0.003	0.002
8	Laura Creek at Ditch Road Crossing	30-Jul-91	0.06	1.6	0.30	0.03	7.1	7.7	8.2	320	432	11.00	300	< 5	0.014	< 0.002
9	Klondike River d/s near Klondike Hwy.	01-Aug-91	n/a	n/a	n/a	n/a	10.5	7.43	8.0	148	228	9.20	150	< 5	< 0.002	< 0.002
	Field Blank (nutrients and metals)								7.7			9.00	< 10	< 5	0.030	< 0.002
	Field blank (metals only)															

n/a - data not collected or analysis not done.

APPENDIX I TABLE I WATER QUALITY AND QUANTITY DATA

STATION NUMBER	Location	SAMPLE DATE	NITRITE+		SULFATE (mg/L)	COLOR (REL.U.)	TURB. (FTU)	TOTAL ALK. (asCaCO ₃) (mg/L)
			NITRATE (mg/L)	OP (mg/L)				
1	Klondike River d/s of Lee Creek	31-Jul-91	0.046	0.002	39	10	0.3	77
2	Klondike River d/s of Brewery Creek	31-Jul-91	0.047	< 0.002	31	5	0.15	71
3	Lee Creek u/s of Pacific Creek	31-Jul-91	0.038	< 0.002	79	10	0.3	127
4.1	Lee Creek u/s of Ditch Road bridge	30-Jul-91	0.006	< 0.002	86	10	0.65	128
4.2	same as above	30-Jul-91	0.007	< 0.002	91	10	0.3	129
4.3	same as above	30-Jul-91	0.007	< 0.002	88	10	0.3	129
5	Lee Creek u/s of Klondike River	31-Jul-91	0.012	< 0.002	75	10	0.15	129
6	Golden Creek u/s of Klondike River	31-Jul-91	0.096	< 0.002	87	20	0.5	146
7	Brewery Creek u/s of Klondike River	31-Jul-91	0.069	< 0.002	36	5	< 0.1	78
8	Laura Creek at Ditch Road Crossing	30-Jul-91	0.035	0.004	90	20	0.25	125
9	Klondike River d/s near Klondike Hwy. Field Blank (nutrients and metals)	01-Aug-91	0.04	0.004	34	10	0.7	73
	Field blank (metals only)		0.008	< 0.002	< 0.5	< 5	< 0.1	< 0.5

STATION NUMBER	Location	SAMPLE DATE	(Diss.) HARDNESS (asCaCO ₃) (mg/L)		(Extr.) HARDNESS (asCaCO ₃) (mg/L)		TOTAL HARDNESS (mg/L)	CHLORIDE (mg/L)	P (mg/L)	Ag ₂ (mg/L)
			TOTAL		TOTAL					
1	Klondike River d/s of Lee Creek	31-Jul-91	106	107	110	111	0.2	0.039	0.0005	
2	Klondike River d/s of Brewery Creek	31-Jul-91	96.1	96.4	98	98.4	0.2	< 0.002	< 0.0005	
3	Lee Creek u/s of Pacific Creek	31-Jul-91	213	213	214	214	0.4	0.003	< 0.0005	
4.1	Lee Creek u/s of Ditch Road bridge	30-Jul-91	206	207	214	214	0.4	0.004	< 0.0005	
4.2	same as above	30-Jul-91	217	217	222	223	0.4	0.004	< 0.0005	
4.3	same as above	30-Jul-91	216	217	223	223	0.4	0.004	< 0.0005	
5	Lee Creek u/s of Klondike River	31-Jul-91	202	202	212	212	0.4	0.006	< 0.0005	
6	Golden Creek u/s of Klondike River	31-Jul-91	232	232	241	241	0.5	0.003	< 0.0005	
7	Brewery Creek u/s of Klondike River	31-Jul-91	107	107	109	110	0.2	< 0.002	0.0005	
8	Laura Creek at Ditch Road Crossing	30-Jul-91	198	198	213	214	0.6	0.009	< 0.0005	
9	Klondike River d/s near Klondike Hwy. Field Blank (nutrients and metals)	01-Aug-91	99.3	99.5	102	102	0.2	< 0.002	< 0.0005	
	Field blank (metals only)		0.5	0.7	< 0.4	< 0.4	< 0.2	0.005	< 0.0005	
			0.4	< 0.4	1.2	1.3				

n/a - data not collected or analysis not done.

2 Graphite Furnace Analysis

APPENDIX I TABLE 1 WATER QUALITY AND QUANTITY DATA

STATION NUMBER	Location	SAMPLE DATE	Extractable Metals									
			Mo ₁ (mg/L)	Na ₁ (mg/L)	Ni ₁ (mg/L)	E ₁ (mg/L)	Pb ₂ (mg/L)	Sb ₁ (mg/L)	Se ₁ (mg/L)			
1	Klondike River d/s of Lee Creek	31-Jul-91	< 0.01	1.7	< 0.02	< 0.1	< 0.0005	< 0.05	< 0.05	< 0.05	< 0.05	
2	Klondike River d/s of Brewery Creek	31-Jul-91	< 0.01	1.6	< 0.02	< 0.1	< 0.0005	< 0.05	< 0.05	< 0.05		
3	Lee Creek u/s of Pacific Creek	31-Jul-91	< 0.01	1.2	< 0.02	< 0.1	< 0.0005	< 0.05	< 0.05	< 0.05		
4.1	Lee Creek u/s of Ditch Road bridge	30-Jul-91	< 0.01	1.2	< 0.02	< 0.1	< 0.0005	< 0.05	< 0.05	< 0.05		
4.2	same as above	30-Jul-91	< 0.01	1.2	< 0.02	< 0.1	< 0.0005	< 0.05	< 0.05	< 0.05		
4.3	same as above	30-Jul-91	< 0.01	1.3	< 0.02	< 0.1	< 0.0005	< 0.05	< 0.05	< 0.05		
5	Lee Creek u/s of Klondike River	31-Jul-91	< 0.01	1.3	< 0.02	< 0.1	< 0.0005	< 0.05	< 0.05	< 0.05		
6	Golden Creek u/s of Klondike River	31-Jul-91	< 0.01	1.6	< 0.02	< 0.1	< 0.0005	< 0.05	< 0.05	< 0.05		
7	Brewery Creek u/s of Klondike River	31-Jul-91	< 0.01	1.4	< 0.02	< 0.1	< 0.0005	< 0.05	< 0.05	< 0.05		
8	Laura Creek at Ditch Road Crossing	30-Jul-91	< 0.01	2.9	< 0.02	< 0.1	< 0.0005	< 0.05	< 0.05	< 0.05		
9	Klondike River d/s near Klondike Hwy.	01-Aug-91	< 0.01	1.8	< 0.02	< 0.1	< 0.0005	< 0.05	< 0.05	< 0.05		
	Field Blank (nutrients and metals)		< 0.01	< 0.1	< 0.02	< 0.1	< 0.0007	< 0.05	< 0.05	< 0.05		
	Field Blank (metals only)		< 0.01	0.2	< 0.02	< 0.1	< 0.0005	< 0.05	< 0.05	< 0.05		

STATION NUMBER	Location	SAMPLE DATE	Extractable Metals										Total Metals	
			Si ₁ (mg/L)	Sr ₁ (mg/L)	Sr ₂ (mg/L)	Ti ₁ (mg/L)	V ₁ (mg/L)	Zn ₁ (mg/L)	Ag ₂ (mg/L)					
1	Klondike River d/s of Lee Creek	31-Jul-91	2.69	< 0.05	0.167	< 0.002	< 0.01	0.002	< 0.0006	< 0.0006	< 0.0006	< 0.0006		
2	Klondike River d/s of Brewery Creek	31-Jul-91	2.56	< 0.05	0.162	< 0.002	< 0.01	0.003	< 0.0006	< 0.0006	< 0.0006	< 0.0006		
3	Lee Creek u/s of Pacific Creek	31-Jul-91	3.12	< 0.05	0.206	< 0.002	< 0.01	0.006	< 0.0006	< 0.0006	< 0.0006	< 0.0006		
4.1	Lee Creek u/s of Ditch Road bridge	30-Jul-91	2.91	< 0.05	0.204	< 0.002	< 0.01	0.008	< 0.0006	< 0.0006	< 0.0006	< 0.0006		
4.2	same as above	30-Jul-91	3.22	< 0.05	0.208	< 0.002	< 0.01	0.005	< 0.0006	< 0.0006	< 0.0006	< 0.0006		
4.3	same as above	30-Jul-91	3.2	< 0.05	0.209	< 0.002	< 0.01	0.006	< 0.0006	< 0.0006	< 0.0006	< 0.0006		
5	Lee Creek u/s of Klondike River	31-Jul-91	2.81	< 0.05	0.203	< 0.002	< 0.01	0.004	< 0.0006	< 0.0006	< 0.0006	< 0.0006		
6	Golden Creek u/s of Klondike River	31-Jul-91	3.54	< 0.05	0.252	< 0.002	< 0.01	0.005	< 0.0006	< 0.0006	< 0.0006	< 0.0006		
7	Brewery Creek u/s of Klondike River	31-Jul-91	2.82	< 0.05	0.156	< 0.002	< 0.01	0.002	< 0.0006	< 0.0006	< 0.0006	< 0.0006		
8	Laura Creek at Ditch Road Crossing	30-Jul-91	4.59	< 0.05	0.243	< 0.002	< 0.01	<	< 0.0010	< 0.0010	< 0.0010	< 0.0010		
9	Klondike River d/s near Klondike Hwy.	01-Aug-91	2.64	< 0.05	0.164	< 0.002	< 0.01	0.002	< 0.0006	< 0.0006	< 0.0006	< 0.0006		
	Field Blank (nutrients and metals)		0.14	< 0.05	< 0.001	< 0.002	< 0.01	0.007	< 0.0006	< 0.0006	< 0.0006	< 0.0006		
	Field blank (metals only)		< 0.05	< 0.05	0.001	< 0.002	< 0.01	0.005	< 0.0006	< 0.0006	< 0.0006	< 0.0006		

n/a - data not collected or analysis not done.

¹ ICAP Analysis

² Graphite Furnace Analysis

APPENDIX I TABLE 1 WATER QUALITY AND QUANTITY DATA

STATION NUMBER	Location	SAMPLE DATE	Total Metals													
			Al ₁ (mg/L)	As ₁ (mg/L)	B ₁ (mg/L)	Ba ₁ (mg/L)	Be ₁ (mg/L)	Ca ₁ (mg/L)	Cd ₁ (mg/L)	Co ₁ (mg/L)	Cr ₁ (mg/L)	Cu ₁ (mg/L)	Fe ₁ (mg/L)	Hg (mg/L)	K ₁ (mg/L)	Mg ₁ (mg/L)
1	Klondike River d/s of Lee Creek	31-Jul-91	< 0.06	< 0.06	< 0.01	0.050	< 0.001	30.4	< 0.0001							
2	Klondike River d/s of Brewery Creek	31-Jul-91	< 0.06	< 0.06	0.01	0.046	< 0.001	27.7	0.0001							
3	Lee Creek u/s of Pacific Creek	31-Jul-91	< 0.06	< 0.06	0.01	0.043	< 0.001	56.3	0.0002							
4.1	Lee Creek u/s of Ditch Road bridge	30-Jul-91	< 0.06	< 0.06	0.01	0.044	< 0.001	57.3	0.0003							
4.2	same as above	30-Jul-91	< 0.06	< 0.06	0.01	0.043	< 0.001	57.7	0.0001							
4.3	same as above	30-Jul-91	< 0.06	< 0.06	0.01	0.043	< 0.001	57.4	0.0002							
5	Lee Creek u/s of Klondike River	31-Jul-91	0.07	< 0.06	0.01	0.043	< 0.001	54.4	0.0002							
6	Golden Creek u/s of Klondike River	31-Jul-91	0.09	< 0.06	0.01	0.066	< 0.001	59.6	0.0001							
7	Brewery Creek u/s of Klondike River	31-Jul-91	0.10	< 0.06	0.01	0.044	< 0.001	30.5	0.0003							
8	Laura Creek at Ditch Road Crossing	30-Jul-91	0.08	< 0.06	0.01	0.062	< 0.001	53.6	0.0001							
9	Klondike River d/s near Klondike Hwy.	01-Aug-91	< 0.06	< 0.06	0.01	0.054	< 0.001	28.3	< 0.0001							
	Field Blank (nutrients and metals)		< 0.06	< 0.06	0.01	< 0.001	< 0.001	< 0.1	< 0.0001							
	Field blank (metals only)		< 0.06	< 0.06	0.01	< 0.001	< 0.001	0.3	0.0001							

STATION NUMBER	Location	SAMPLE DATE	Total Metals											
			Co ₁ (mg/L)	Cr ₁ (mg/L)	Cu ₂ (mg/L)	Fe ₁ (mg/L)	Hg (mg/L)	K ₁ (mg/L)	Mg ₁ (mg/L)	Ca ₁ (mg/L)	Be ₁ (mg/L)	Ba ₁ (mg/L)	As ₁ (mg/L)	Al ₁ (mg/L)
1	Klondike River d/s of Lee Creek	31-Jul-91	< 0.006	< 0.006	0.0012	0.048	0.00008	< 2	8.3					
2	Klondike River d/s of Brewery Creek	31-Jul-91	< 0.006	< 0.006	0.0013	0.054	0.00014	< 2	7.0					
3	Lee Creek u/s of Pacific Creek	31-Jul-91	< 0.006	< 0.006	0.0019	0.051	(not done)	< 2	19.3					
4.1	Lee Creek u/s of Ditch Road bridge	30-Jul-91	< 0.006	< 0.006	0.0015	0.069	0.00008	< 2	19.4					
4.2	same as above	30-Jul-91	< 0.006	< 0.006	0.0015	0.051		< 2	19.1					
4.3	same as above	30-Jul-91	0.006	0.012	0.0014	0.051		< 2	19.3					
5	Lee Creek u/s of Klondike River	31-Jul-91	< 0.006	< 0.006	0.0015	0.053	(not done)	< 2	18.6					
6	Golden Creek u/s of Klondike River	31-Jul-91	< 0.006	< 0.006	0.0029	0.119	0.00008	< 2	24.0					
7	Brewery Creek u/s of Klondike River	31-Jul-91	0.006	0.012	0.0014	0.095	0.00007	< 2	8.4					
8	Laura Creek at Ditch Road Crossing	30-Jul-91	< 0.006	< 0.006	0.0029	0.084	0.00007	< 2	19.3					
9	Klondike River d/s near Klondike Hwy.	01-Aug-91	< 0.006	< 0.006	0.0028	0.086	(not done)	< 2	7.5					
	Field Blank (nutrients and metals)		< 0.006	< 0.006	0.0026	0.029	(not done)	< 2	0.1					
	Field blank (metals only)		< 0.006	< 0.006	0.0026	0.007	(not done)	< 2	0.1					

n/a - data not collected or analysis not done.

1 ICAP Analysis

2 Graphite Furnace Analysis

APPENDIX I TABLE 1 WATER QUALITY AND QUANTITY DATA

STATION NUMBER	Location	SAMPLE DATE	Total Metals									
			Mn ₁ (mg/L)	Mo ₁ (mg/L)	Na ₁ (mg/L)	Ni ₁ (mg/L)	P ₁ (mg/L)	Pb ₂ (mg/L)	Sb ₁ (mg/L)			
1	Klondike River d/s of Lee Creek	31-Jul-91	0.005	< 0.01	1.7	< 0.02	< 0.1	0.0007	< 0.06			
2	Klondike River d/s of Brewery Creek	31-Jul-91	0.005	< 0.01	1.6	< 0.02	< 0.1	0.0007	< 0.06			
3	Lee Creek u/s of Pacific Creek	31-Jul-91	0.004	< 0.01	1.3	< 0.02	< 0.1	0.0014	< 0.06			
4.1	Lee Creek u/s of Ditch Road bridge	30-Jul-91	0.006	< 0.01	1.3	< 0.02	< 0.1	0.0006	< 0.06			
4.2	same as above	30-Jul-91	0.005	< 0.01	1.3	< 0.02	< 0.1	< 0.0006	< 0.06			
4.3	same as above	30-Jul-91	0.005	< 0.01	1.3	< 0.02	< 0.1	0.0008	< 0.06			
5	Lee Creek u/s of Klondike River	31-Jul-91	0.005	< 0.01	1.3	< 0.02	< 0.1	0.0008	< 0.06			
6	Golden Creek u/s of Klondike River	31-Jul-91	0.007	< 0.01	1.7	< 0.02	< 0.1	0.0011	< 0.06			
7	Brewery Creek u/s of Klondike River	31-Jul-91	0.004	< 0.01	1.5	< 0.02	< 0.1	0.0018	< 0.06			
8	Laura Creek at Ditch Road Crossing	30-Jul-91	0.004	< 0.01	3	< 0.02	< 0.1	0.0007	< 0.06			
9	Klondike River d/s near Klondike Hwy.	01-Aug-91	0.009	< 0.01	1.8	< 0.02	< 0.1	0.0006	< 0.06			
	Field Blank (nutrients and metals)		< 0.001	< 0.01	< 0.1	< 0.02	< 0.1	0.0009	< 0.06			
	Field blank (metals only)		< 0.001	< 0.01	0.2	< 0.02	< 0.1	< 0.0006	< 0.06			

STATION NUMBER	Location	SAMPLE DATE	Total Metals									
			Se ₁ (mg/L)	Si ₁ (mg/L)	Sn ₁ (mg/L)	Sr ₁ (mg/L)	Ti ₁ (mg/L)	V ₁ (mg/L)	Zn ₁ (mg/L)			
1	Klondike River d/s of Lee Creek	31-Jul-91	< 0.06	2.83	< 0.06	0.173	0.004	< 0.01	0.002			
2	Klondike River d/s of Brewery Creek	31-Jul-91	< 0.06	2.69	< 0.06	0.167	0.003	< 0.01	0.003			
3	Lee Creek u/s of Pacific Creek	31-Jul-91	< 0.06	3.29	< 0.06	0.214	0.002	< 0.01	0.048			
4.1	Lee Creek u/s of Ditch Road bridge	30-Jul-91	< 0.06	3.08	< 0.06	0.216	< 0.002	< 0.01	0.010			
4.2	same as above	30-Jul-91	< 0.06	3.29	< 0.06	0.210	< 0.002	< 0.01	0.007			
4.3	same as above	30-Jul-91	< 0.06	3.21	< 0.06	0.213	0.003	< 0.01	0.018			
5	Lee Creek u/s of Klondike River	31-Jul-91	< 0.06	2.92	< 0.06	0.209	< 0.002	< 0.01	0.008			
6	Golden Creek u/s of Klondike River	31-Jul-91	< 0.06	3.88	< 0.06	0.263	0.005	< 0.01	0.007			
7	Brewery Creek u/s of Klondike River	31-Jul-91	< 0.06	3.13	< 0.06	0.159	0.007	< 0.01	0.004			
8	Laura Creek at Ditch Road Crossing	30-Jul-91	< 0.06	4.60	< 0.06	0.250	0.002	< 0.01	0.017			
9	Klondike River d/s near Klondike Hwy.	01-Aug-91	< 0.06	2.73	< 0.06	0.169	0.012	< 0.01	0.003			
	Field Blank (nutrients and metals)		< 0.06	< 0.06	< 0.06	< 0.001	< 0.002	< 0.01	0.004			
	Field blank (metals only)		< 0.06	< 0.06	< 0.06	0.001	< 0.002	< 0.01	0.006			

1 ICAP Analysis

2 Graphite Furnace Analysis

APPENDIX II

SEDIMENT METALS AND PARTICLE SIZE ANALYSIS DATA

APPENDIX II TABLE 1 MEAN AND STANDARD DEVIATION OF SEDIMENT METALS SAMPLES (n=3)

STATION	LOCATION	Ag (ug/g)	Al (ug/g)	As (ug/g)	Ba (ug/g)	Be (ug/g)	Ca (ug/g)	Cd (ug/g)	Co (ug/g)	Cr (ug/g)	Cu (ug/g)	Fe (ug/g)
1	Klondike River d/s of Lee Creek	< 2.0 ± 0.0	15033.3 ± 1222.9	< 16.0 ± 5.7	2513.3 ± 340.8	0.4 ± 0.0	6523.3 ± 415.2	< 0.8 ± 0.0	20.0 ± 0.0	44.3 ± 7.5	35.2 ± 2.4	27133.3 ± 1465.9
2	Klondike River d/s of Brewery Creek	< 2.0 ± 0.0	15033.3 ± 849.8	24.7 ± 4.8	960.7 ± 75.8	0.4 ± 0.0	5633.3 ± 318.4	< 0.9 ± 0.1	20.0 ± 0.0	35.0 ± 4.1	27.0 ± 1.4	24366.7 ± 1020.9
3	Lee Creek u/s of Pacific Creek	< 2.0 ± 0.0	16400.0 ± 454.6	< 8.0 ± 0.0	1703.3 ± 245.7	0.3 ± 0.0	9673.3 ± 62.4	2.9 ± 0.4	20.0 ± 0.0	45.8 ± 1.3	59.4 ± 2.1	27600.0 ± 509.9
4	Lee Creek u/s of Ditch Road bridge	< 2.0 ± 0.0	18400.0 ± 852.4	< 8.0 ± 0.0	1360.0 ± 89.8	0.4 ± 0.0	10900.0 ± 294.4	3.2 ± 0.1	20.0 ± 0.0	54.5 ± 4.8	66.0 ± 3.2	29933.3 ± 2739.0
5	Lee Creek u/s of Klondike River	< 2.0 ± 0.0	17100.0 ± 864.1	< 8.7 ± 0.9	2373.3 ± 251.0	0.4 ± 0.0	9500.0 ± 212.8	2.0 ± 0.3	20.0 ± 0.0	47.7 ± 1.9	53.5 ± 2.4	28166.7 ± 419.0
6	Golden Creek u/s of Klondike River	< 2.0 ± 0.0	18300.0 ± 778.9	52.3 ± 16.9	1880.0 ± 86.4	0.5 ± 0.0	7570.0 ± 312.1	1.7 ± 0.5	20.0 ± 0.0	42.0 ± 2.7	37.9 ± 2.6	26633.3 ± 1236.5
7	Brewery Creek u/s of Klondike River	< 2.0 ± 0.0	16300.0 ± 489.9	41.0 ± 1.6	460.7 ± 16.5	0.5 ± 0.0	6493.3 ± 69.4	< 0.9 ± 0.1	20.0 ± 0.0	30.7 ± 0.5	32.2 ± 0.2	28000.0 ± 5020.6
8	Laura Creek at Ditch Road Crossing	< 2.0 ± 0.0	17166.7 ± 1819.0	15.3 ± 7.5	770.0 ± 15.1	0.5 ± 0.1	7583.3 ± 670.3	< 1.1 ± 0.4	20.0 ± 0.0	36.6 ± 3.7	32.8 ± 6.4	27100.0 ± 711.8

APPENDIX II TABLE 1 MEAN AND STANDARD DEVIATION OF SEDIMENT METALS SAMPLES (n=3)

STATION	LOCATION	K (ug/g)	Mg (ug/g)	Mn (ug/g)	Mo (ug/g)	Na (ug/g)	Ni (ug/g)	P (ug/g)	Pb (ug/g)	Sb (ug/g)	Si (ug/g)	Sh (ug/g)
1	Klondike River d/s of Lee Creek	2666.7 ± 249.4	5493.3 ± 261.4	474.0 ± 67.2	6.3 ± 1.2	100.0 ± 0.0	43.3 ± 3.7	1400.0 ± 81.6	10.3 ± 0.5	8.0 ± 0.0	586.0 ± 15.9	<15.3 ± 10.4
2	Klondike River d/s of Brewery Creek	2500.0 ± 244.9	4996.7 ± 162.1	493.0 ± 65.9	6.0 ± 0.8	190.0 ± 14.1	31.0 ± 1.6	956.7 ± 33.0	9.0 ± 0.8	8.0 ± 0.0	560.3 ± 11.5	< 8.0 ± 0.0
3	Lee Creek u/s of Pacific Creek	3266.7 ± 124.7	7166.7 ± 12.5	508.3 ± 32.3	8.3 ± 0.5	100.0 ± 0.0	59.3 ± 1.9	1740.0 ± 102.0	9.0 ± 0.8	8.0 ± 0.0	704.7 ± 12.2	< 8.0 ± 0.0
4	Lee Creek u/s of Ditch Road bridge	3933.3 ± 235.7	7173.3 ± 160.5	830.3 ± 41.8	9.3 ± 0.5	100.0 ± 0.0	71.3 ± 4.6	1686.7 ± 12.5	10.0 ± 0.0	8.0 ± 0.0	648.3 ± 5.7	<20.7 ± 16.5
5	Lee Creek u/s of Klondike River	3500.0 ± 216.0	7010.0 ± 187.8	512.0 ± 75.2	8.7 ± 0.5	100.0 ± 0.0	58.7 ± 2.1	2036.7 ± 153.3	8.0 ± 0.0	8.0 ± 0.0	675.7 ± 15.4	< 8.0 ± 0.0
6	Golden Creek u/s of Klondike River	3466.7 ± 188.6	5410.0 ± 115.2	576.0 ± 65.7	7.3 ± 0.5	166.7 ± 47.1	44.7 ± 4.2	1133.3 ± 47.1	15.7 ± 4.2	13.3 ± 4.7	647.0 ± 22.0	< 8.7 ± 0.9
7	Brewery Creek u/s of Klondike River	2800.0 ± 141.4	5440.0 ± 58.9	600.7 ± 39.6	5.7 ± 0.5	196.7 ± 17.0	28.3 ± 1.2	980.0 ± 14.1	15.7 ± 4.2	8.0 ± 0.0	585.0 ± 4.5	< 8.0 ± 0.0
8	Laura Creek at Ditch Road Crossing	2233.3 ± 249.4	5540.0 ± 564.0	312.0 ± 21.0	4.3 ± 0.9	186.7 ± 9.4	38.3 ± 4.9	916.7 ± 38.6	16.0 ± 4.3	9.3 ± 0.9	577.3 ± 9.5	< 8.0 ± 0.0

APPENDIX II TABLE 1 MEAN AND STANDARD DEVIATION OF SEDIMENT METALS SAMPLES (n=3)

STATION	LOCATION	Sr (ug/g)	Tl (ug/g)	V (ug/g)	Zn (ug/g)
1	Klondike River d/s of Lee Creek	63.2 ± 3.9	600.0 ± 42.4	92.3 ± 10.1	202.7 ± 14.0
2	Klondike River d/s of Brewery Creek	47.0 ± 2.8	537.7 ± 33.7	63.7 ± 4.6	125.3 ± 3.8
3	Lee Creek u/s of Pacific Creek	84.5 ± 1.6	615.3 ± 49.9	169.3 ± 4.8	400.3 ± 8.7
4	Lee Creek u/s of Ditch Road bridge	85.8 ± 1.6	584.0 ± 17.7	172.7 ± 9.1	437.3 ± 9.1
5	Lee Creek u/s of Klondike River	84.8 ± 1.5	778.0 ± 55.4	163.3 ± 4.7	376.7 ± 15.2
6	Golden Creek u/s of Klondike River	89.4 ± 7.1	419.7 ± 20.1	110.0 ± 8.2	232.7 ± 12.0
7	Brewery Creek u/s of Klondike River	52.0 ± 0.9	586.0 ± 28.9	62.3 ± 2.1	116.7 ± 0.9
8	Laura Creek at Ditch Road Crossing	61.9 ± 3.4	740.7 ± 47.3	77.0 ± 7.0	168.3 ± 20.8

APPENDIX III

BENTHIC INVERTEBRATE DATA

APPENDIX III TABLE 1. FRESHWATER INVERTEBRATE TAXONOMIC LIST

NUMBER	INVERTEBRATE	NUMBER	INVERTEBRATE
	Phylum: Coelenterata		Family: Spechontidae
	Class: Hydrozoa	17	Sperchon sp
	Order: Hydroida		Family: Torrenticolidae
1	Hydra sp	18	Torrenticola sp
	Phylum: Platyhelminthes		Family: Wandesiinae
	Class: Turbellaria	19	Wandesia sp
	Order: Tricladida	20	Oribatei
2	Polycelis coronata	21	Arachnida
3	Nematoda		Class Entognatha
	Phylum: Annelida		Order: Collembola
	Class/Order: Oligochaeta		Family: Hypogastruridae
4	Enchytraeidae	22	Hypogastrura sp
5	Lumbriculidae		Family: Isotomidae
6	Kincaidiana hexatheca	23	Isotomurus sp
7	Tubificidae		Family: Poduridae
8	Chaetogaster sp	24	Podura aquatica
9	Haplotaxa gordioides		Class: Insecta
	Phylum: Arthropoda		Order: Plecoptera
	Class: Copepoda		Plecoptera, Unid, J/D
10	Cyclopoida		Family: Perlidae
11	Harpacticoida	26	Aconeuria sp
12	Ostracoda		Family: Periodidae
13	Hydracarina, unid J/D	27	Arcynopteryx sp
	Family: Kawamuracarinae	28	Diura sp
14	Kawamuracarus sp	29	Kogotus sp
	Family: Libertiidae		
15	Lebertia sp		
	Family: Unionicolidae		
16	Neumannia sp		

APPENDIX III TABLE 1 FRESHWATER INVERTEBRATE TAXONOMIC LIST

NUMBER	INVERTEBRATE	NUMBER	INVERTEBRATE
30	Capnia sp Family: Capniidae	50	Trichoptera, Unid J/D Order: Trichoptera
31	Malenka sp Family: Nemouridae	51	Limnephilidae, unid dam Family: Limnephilidae
32	Podmosta sp	52	Eccilsomyia sp
33	Zapada sp	53	Grensia sp
34	Sweitsa sp.gp Family: Chloroperlidae	54	Onocosmoecus sp
35	Utaperla sp	55	Glossosoma sp Family: Glossosomatidae
36	Taenionema sp Family: Taeniopterygidae	56	Rhyacophila angelita Family: Rhyacophiliidae
37	Ephemeroptera adult Order: Ephemeroptera	57	Rhyacophila vaccua
38	Ameletus sp Family: Siphonuridae	58	Rhyacophila (vao\acropedes)
39	Baetis sp Family: Baetidae	59	Lepidoptera, unid L Order: Diptera
40	Cinygmula sp Family: Heptageniidae	60	Diptera, Unid adult
41	Epeorus deceptivus	61	Unid larvae
42	Epeorus (albertae)	62	Deuterophlebia sp Family: Deuterophlebiidae
43	Rithrogena sp	63	Blepharicera sp Family: Blephariceridae
44	Ephemerella doddsi Family: Ephemerellidae	64	Antocha sp Family: Tipulidae
45	Ephemerella flavilinea	65	Dicranota sp
46	Ephemerella grandis	66	Erioptera sp
47	Ephemerella inermis	67	Hexatoma sp
48	Ephemerella mollitia	68	Rhabdomastix sp
49	Ephemerella sp	69	Tipula sp

APPENDIX III TABLE 1 FRESHWATER INVERTEBRATE TAXONOMIC LIST

NUMBER	INVERTEBRATE	NUMBER	INVERTEBRATE
70	Pericoma sp Family: Psychodidae	97	Weidemanna sp
71	Prosimulium sp Family: Simuliidae	98	Hydrellia sp Family: Ephydriidae
72	Simulium sp	99	Limnophora sp Family: Anthomyiidae
73	Simulium sp P		
74	Chironomidae adults Family: Chironomidae	100	Coleoptera, unid L
75	Chironomidae pupae	101	Hymenoptera, unid adult
76	Chironomidae unid J/D	102	Formicidae
77	Thienemanniomyia sp		
78	Cardiocladius sp		
79	Corynoneura sp		
80	Cricotopus sp		
81	Eukiefferiella sp		
82	Gymnometriocnemus sp	103	Phylum: Mollusca Class: Gastropoda Gastropoda, unid dam.
83	Orthocladius sp		
84	Psectrocladius sp		
85	Synorthocladius sp	104	Family: Valvatidae Valvata sincera
86	Thienemanniella sp		
87	Damesa sp		
88	Constempelina sp		
89	Microsectra sp		
90	Phaenopsectra sp		
91	Polypedilum (Polypedilum) sp		
92	Palpomyia sp Family: Ceratopogonidae		
93	Chrysops sp Family: Tabanidae		
94	Syrphidae? (terr, unid)		
95	Chelifera sp Family: Empididae		
96	Hemerodromia sp		

APPENDIX III TABLE 2 BENTHIC INVERTEBRATE NUMBERS AND PERCENTAGE ABUNDANCE

NUMBER	INVERTEBRATE	Stations				
		1	2	3	4	5
		Lower Klondike	Upper Klondike	Lee Creek u/s	Lee Creek @ road	Lee Creek d/s
		%	%	%	%	%
37	Ephemeroptera adult					
38	Ameletus sp	27	2	9	11	3
39	Baetis sp		39			28
40	Cinygmula sp	336	142	94	276	275
41	Epeorus deceptivus	4	9	140	374	32
42	Epeorus (albertae)		3	62	63	8
43	Rithrogena sp	476	33	1		
44	Ephemerella doddsi	95	57	9	7	19
45	Ephemerella flavilinea		1		1	1
46	Ephemerella grandis	2	1			
47	Ephemerella inermis	18	5	1		
48	Ephemerella mollitia				0.06	
49	Ephemerella sp	43	42	15	3	15
50	Trichoptera, Unid J/D					1
51	Limnephilidae, unid dam					
52	Ecclisomyia sp	1		1		
53	Grensia sp	83	4.73			
54	Onocosmoecus sp					
55	Glossosma sp	19	25	61	25	3
56	Rhyacophila angelita	3	2	3		
57	Rhyacophila vaccua			1		
58	Rhyacophila (vao\acropedes)			1		
59	Lepidoptera, unid L					
60	Diptera, Unid adult	2	1	2	1	1
61	Unid larvae		2			
62	Deuterophlebia sp		21			
63	Blepharicera sp		1			
64	Antocha sp	5			5	12
65	Dicranota sp					
66	Erioptera sp	4	7	1		
67	Hexatoma sp	3	4	1		
68	Rhabdomastix sp		2	1		
69	Tipula sp					
70	Pericoma sp	10	8	9	3	2
71	Prosimulium sp			2	10	13
72	Simulium sp	15	35	4	2	12
73	Simulium sp P	2	6			2
74	Chironomidae adults	19	73	12	7	5
75	Chironomidae pupae	64	67	63	199	23

APPENDIX III TABLE 2 BENTHIC INVERTEBRATE NUMBERS AND PERCENTAGE ABUNDANCE

NUMBER	INVERTEBRATE	Stations				
		1	2	3	4	5
		Lower Klondike	Upper Klondike	Lee Creek u/s	Lee Creek @ road	Lee Creek d/s
		%	%	%	%	%
76	Chironomidae unid J/D	14	70	50	63	70
		0.80	5.19	2.88	1.39	2.50
77	Thienemannimyia sp		4			
			0.30			
78	Cardiocladius sp	14	20	14	106	19
		0.80	1.48	0.81	2.34	0.68
79	Corynoneura sp	6	2	12	17	142
		0.34	0.15	0.69	0.38	5.08
80	Cricotopus sp	183	232	277	2029	346
		10.43	17.19	15.94	44.88	12.37
81	Eukiefferiella sp	109	189	64	236	84
		6.21	14.00	3.68	5.22	3.00
82	Gymnometriocnemus sp	1	2	2	6	2
		0.06	0.15	0.12	0.13	0.07
83	Orthocladius sp	5	16	17	49	23
		0.28	1.19	0.98	1.08	0.82
84	Psectrocladius sp	5	3		1	1
		0.28	0.22		0.02	0.04
85	Synorthocladius sp	2		129	154	32
		0.11		7.42	3.41	1.14
86	Thienemannella sp	15	33	18	124	111
		0.85	2.44	1.04	2.74	3.97
87	Damesa sp			183	279	18
				10.53	6.17	0.64
88	Constempelina sp	4	3		1	1
		0.23	0.22		0.02	0.04
89	Micropsectra sp					
90	Phaenopsectra sp					
91	Polypedilum (Polypedilum) sp	1			1	
		0.06			0.02	
92	Palpomyia sp	11	19		1	
		0.63	1.41		0.02	
93	Chrysops sp					
94	Syrphidae? (terr, unid)					
95	Chelifera sp	6	4	3	3	4
		0.34	0.30	0.17	0.07	0.14
96	Hemerodromia sp	1			1	
		0.06			0.02	
97	Weidemannia sp					
98	Hydrellia sp	1				
		0.06				
99	Limnophora sp					
100	Coleoptera, unid L					
101	Hymenoptera, unid adult		1	1		1
			0.07	0.06		0.04
102	Formicidae					
103	Gastropoda, unid dam.					
104	Valvata sincera					
	Total Numbers	1751	1349	1728	4516	2794

APPENDIX III TABLE 2 BENTHIC INVERTEBRATE NUMBERS AND PERCENTAGE ABUNDANCE

NUMBER	INVERTEBRATE	Stations		
		Golden Creek	Brewery Creek	Laura Creek
		6	7	8
		%	%	%
1	Hydra sp			
2	Polycelis coronata			
3	Nematoda	14	13	40
4	Enchytraeidae	36	7	69
5	Lumbriculidae	293	13	168
6	Kincaidiana hexatheca	5	4	11
7	Tubificidae	81		1
8	Chaetogaster sp			
9	Haplotaxa gordioides			
10	Cyclopoidea		1	15
11	Harpacticoida		1	8
12	Ostracoda		5	5
13	Hydracarina, unid J/D	4	11	7
14	Kawamuracarus sp		1	
15	Lebertia sp	1	3	
16	Neumannia sp	1	3	
17	Sperchon sp		19	
18	Torrenticola sp	3	11	2
19	Wandesia sp			
20	Oribatei	1		1
21	Arachnida	1	1	
22	Hypogastrura sp	9	1	2
23	Isotomurus sp	6	2	4
24	Podura aquatica			
25	Plecoptera, Unid, J/D	30		
26	Aconeuria sp	8	6	3
27	Arcynopteryx sp			
28	Diura sp			
29	Kogotus sp	26	63	47
30	Capnia sp			
31	Malenka sp			
32	Podmosta sp	1	1	56
33	Zapada sp	9	1	1
34	Sweltsa sp gp	2	41	
34	Utaperla sp	10	36	
36	Taenionema sp			
37	Ephemeroptera adult	1	1	1
38	Ameletus sp	2		

APPENDIX III TABLE 2 BENTHIC INVERTEBRATE NUMBERS AND PERCENTAGE ABUNDANCE

NUMBER	INVERTEBRATE	Stations		
		6	7	8
		Golden Creek	Brewery Creek	Laura Creek
		%	%	%
39	Baetis sp	1	52	305
40	Cinygmula sp	60	91	13
41	Epeorus deceptivus	21	17	3
42	Epeorus (albertae)	4	10	
43	Rithrogena sp			
44	Ephemerella doddsi		49	
45	Ephemerella flavilinea		2	
46	Ephemerella grandis		1	
47	Ephemerella inermis		20	
48	Ephemerella mollitia	1		3
49	Ephemerella sp			
50	Trichoptera, Unid J/D	0.12	1.89	0.11
51	Limnephilidae, unid dam			
52	Ecclisomyia sp			
53	Grensia sp			
54	Onocosmoecus sp			
55	Glossosma sp		43	
56	Rhyacophila angelita		8	
57	Rhyacophila vaccua		1	
58	Rhyacophila (vao\acropedes)		3	
59	Lepidoptera, unid L			
60	Diptera, Unid adult		1	
61	Unid larvae		3	
62	Deuterophlebia sp		13	
63	Blepharicera sp			
64	Antocha sp	4	1	4
65	Dicranota sp			
66	Erioptera sp			
67	Hexatoma sp			
68	Rhabdomastix sp			
69	Tipula sp			
70	Pericoma sp	3	1	2
71	Prosimulium sp		9	3
72	Simulium sp		3	46
73	Simulium sp P		36	122
74	Chironomidae adults	9	3	38
75	Chironomidae pupae	7	60	121
76	Chironomidae unid J/D	31	31	155

APPENDIX III TABLE 2 BENTHIC INVERTEBRATE NUMBERS AND PERCENTAGE ABUNDANCE

NUMBER	INVERTEBRATE	Stations		
		6	7	8
		Golden Creek	Brewery Creek	Laura Creek
		%	%	%
77	Thienemannimyia sp		22	7
78	Cardiocladius sp		4	22
79	Corynoneura sp	3	176	250
80	Cricotopus sp	28	90	1220
81	Eukiefferiella sp	13	1	8
82	Gymnometriocnemus sp		17	12
83	Orthocladius sp	3	3	1
84	Psectrocladius sp		6	17
85	Synorthocladius sp	45	5	7
86	Thienemannella sp	4	3	5
87	Diamesa sp	7	1	8
88	Constempelina sp		3	5
89	Micropectra sp	1	1	1
90	Phaenopsectra sp		14	3
91	Polypedilum (Polypedilum) sp		3	1
92	Palpomyia sp		1	1
93	Chrysops sp		3	2
94	Syrphidae? (terr, unid)		2	1
95	Chelifera sp		3	1
96	Hemerodromia sp		6	2
97	Weidemannia sp			
98	Hydrellia sp			
99	Limnophora sp			7
100	Coleoptera, unid L			
101	Hymenoptera, unid adult			6
102	Formicidae	1		1
103	Gastropoda, unid dam.	1		
104	Valvata sincera	1		
Total Numbers		794	1050	2845