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**BASELINE STUDY OF STREAM WATER QUALITY AND
SEDIMENTS OF LAURA AND CAROLYN CREEK, YUKON,
LOKI GOLD CORPORATION**

Regional Program Report No. 96-01

by

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ABSTRACT

In May of 1995, staff from the Yukon Division of Environmental Protection conducted a baseline study of the Laura Creek watershed near the proposed Loki Gold Corporation heap leach mine. Laura Creek is a tributary of the Klondike River and is located 60 km. east of Dawson City, Yukon. This study is a continuation of an earlier baseline study conducted in 1991 by Environmental Protection with the purpose of addressing more site specific concerns not raised by the Loki Gold's Initial Environmental Evaluation (IEE). In addition to this the fisheries resources of the lower portion of Laura Creek were assessed.

Contrasts in water quality data between the sites sampled for nutrient parameters were minor. The exception was the differences in organic and inorganic carbon levels between Carolyn Creek and the Laura Creek sites. The total and dissolved metals analysis of samples for each of the surface water sites were similar. The exceptions that were found were typically between Carolyn Creek and the Laura Creek sites however, they were not significant.

The sediment database for the area was increased with additional samples from Laura and Carolyn Creek. Sequential extraction analysis was performed at two new sites for reference prior to development.

The fisheries survey of the lower portion of Laura Creek revealed the presence of salmonid fry.

RÉSUMÉ

Au mois de mai 1995, le personnel du Service de Protection de l'Environnement a conduit une étude de base dans le bassin hydrographique du ruisseau Laura, près du projet lixivation en tas de Loki Gold. Le ruisseau Laura est un tributaire de la rivière Klondike et est situé 60 km à l'est de la ville de Dawson, Yukon. Cette étude est une continuation d'une étude antérieure menée par le Service de Protection de l'Environnement en 1991, et a pour but d'adresser plus spécifiquement certains aspects non couverts par l'évaluation environnementale conduite par Loki Gold. En plus, les ressources ichtyologiques de la partie inférieure du ruisseau ont été évaluées.

Peu de contrastes existent pour les éléments nutritifs contenus dans l'eau entre les sites échantillonnés. Quelques différences existent dans les niveaux de carbone organiques et inorganiques entre les ruisseaux Carolyn et Laura. L'analyse des métaux totaux et dissouts étaient similaires pour chaque site d'échantillonnage. Quelques paramètres font exception entre les ruisseaux Carolyn et Laura, mais ces différences n'étaient pas significatives.

La base de donnée sur les sédiments a été augmentée avec l'ajout d'échantillons provenant des ruisseaux Carolyn et Laura. Une analyse d'extraction séquentielle a été effectuée à deux sites comme base de référence avant le développement du site.

L'évaluation ichtyologique de la portion inférieure du ruisseau Laura a révélé la présence de fretin de la famille des salmonidae.

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1.0 INTRODUCTION

In July, 1991, staff from the Yukon Division of Environmental Protection conducted a baseline inventory study of several Klondike River tributaries in the area of the Brewery Creek mining properties (Davidge, 1995). This study area is situated east of Dawson City (see Figure 1) and encompassed several tributaries on the north side of the Klondike River between Brewery Creek on the east and Lee Creek on the west. The study assessed the baseline stream water quality, stream sediment characteristics and benthic fauna. The work done was in response to a proposed hard rock mine project associated with this property. Sample site selection in 1991 was based on mining exploration activity and proposed mine development plans available at the time and included among other streams, Laura Creek.

Between 1992 and 1994 the Loki Gold Corporation carried out a detailed exploration program to further evaluate the potential ore reserves at the Brewery Creek property. As a result of this exploration work, the company has proposed a detailed mine development plan which includes the construction of a heap leach pad and support facilities on the height of land between Carolyn Creek and Laura Creek. Construction of the heap leach pad commenced in the spring of 1995 and is expected to be completed in 1996. Authorization under the Yukon Waters Act was granted in August, 1995.

In response to the mine development plan and the construction of the heap leach pad, additional baseline water quality data, stream sediment data and fisheries data was collected in May, 1995. This was done to further characterize Laura Creek and its major tributary, Carolyn Creek. In addition to this, there was some uncertainty about the continuity of Laura Creek's surface flow between the Yukon Ditch Road and the Klondike River. This portion of Laura Creek was walked by EP staff also in May, 1995 to assess the creek channel and locate the confluence with the Klondike River.

2.0 STUDY AREA

The study area's location is approximately 57 km. east of Dawson City north of the Klondike River and is limited to the Laura Creek watershed (See Figure 2). Access to the study area was via the Klondike River by river boat for some stations and by vehicle via the Yukon Ditch Road and mining access roads for stations near the heap leach pad site.

The geology is described as "a large, low grade oxide gold deposit hosted by Cretaceous quartz monzonite and underlying greywacke of the Devonian-Mississippian Earn Group. The property is located in un-glaciated terrain on the west edge of the Selwyn Basin, adjacent to the Tintina Fault." (Yukon Minefile, 1991).

Five sample sites were established in the study area (See Figure 2). Only one of the sites (station 3) was sampled in the previous study. Water quality and stream sediments were characterized at Stations 3 and 4. At Stations 1, 2 and 5, 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.

The exact location of Laura Creek between the Yukon Ditch Road and the Klondike River was plotted based on site visits and the use of aerial photography. The coordinates of all sample sites were determined using a Global Positioning System (GPS).

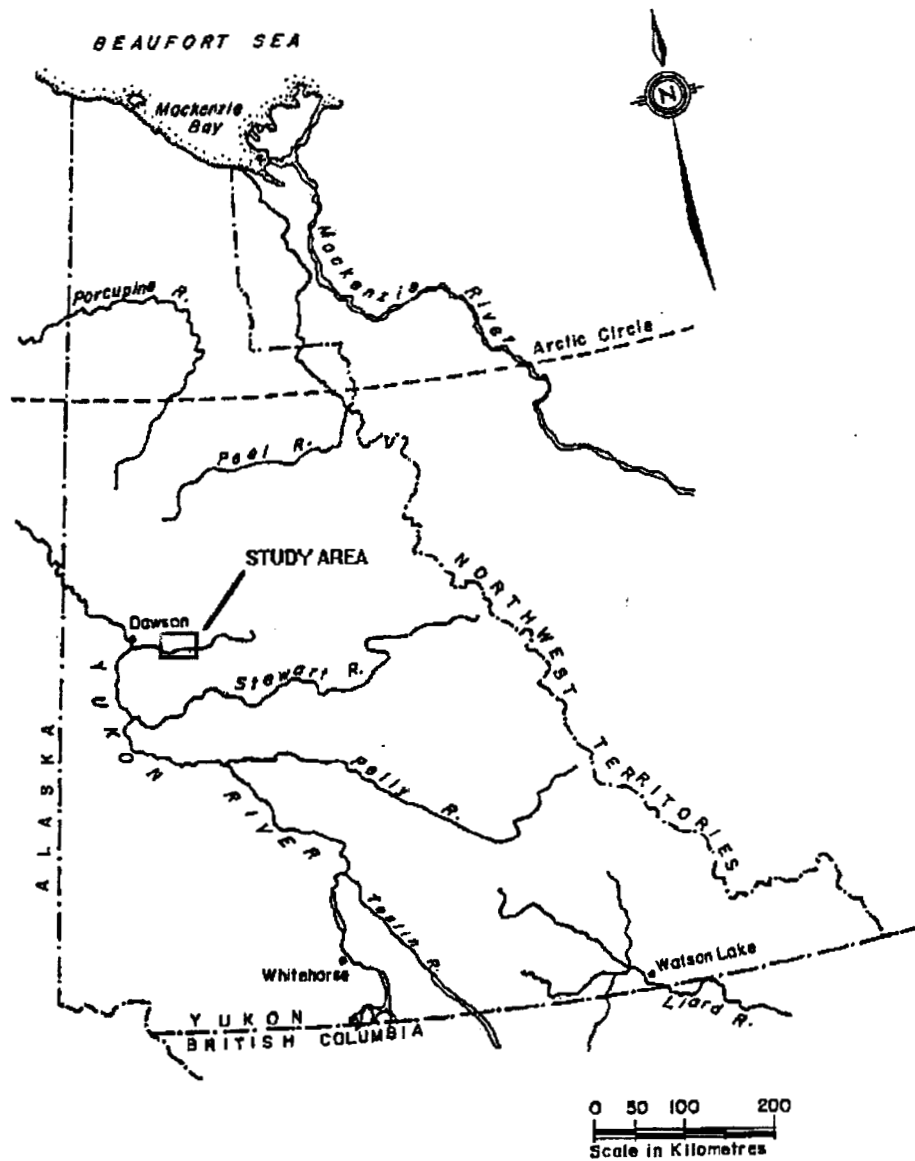


FIGURE 1: LOCATION OF STUDY AREA

TABLE 1 SAMPLE STATION DESCRIPTIONS

Station	Location	Description
1	64°01.53'N 138°17.47'W, Laura Creek ~100m upstream of Carolyn Creek.	Water samples were collected only. Continuous ice cover over creek bed at sample location. No sediment samples could be collected. Tree cover primarily willow with some black spruce, moss floor cover.
2	64°01.46'N 138°17.55'W, Carolyn Creek ~10m upstream from confluence with Laura Creek.	Water and sediment samples were collected. Creek channel inundated with undergrowth, primarily willow and black spruce. Substrate mostly moss covered inter-dispersed with fine sands and organic material.
3	63°59.91'N 138°15.68'W, Laura Creek at Yukon Ditch road crossing.	Water and sediment samples were collected ~20m downstream of road crossing. Vegetation consists mainly of aspen and willow with some grasses along stable stream banks. Substrate composed largely of gravel, sands and fines; some small cobble present.
4	63°59.24'N 138°19.12'W, Laura Creek ~200m upstream from confluence with Klondike River.	Creek channel follows an abandoned river channel for the last 200m. Water and sediment samples were collected ~60m upstream of old river channel. Substrate primarily fine gravel and sands mixed with organic material. Cover stand is primarily deciduous (Poplar and Aspen) with tall stands of willow exceeding 15m in height.
5	63°58.24'N 138°19.59'W, ~0.5km west of Laura Creek, ~300m from Klondike River along an inactive river channel.	Water samples were collected from an Artesian spring along a river channel embankment. Cover stand is mixed deciduous and spruce with some willows.

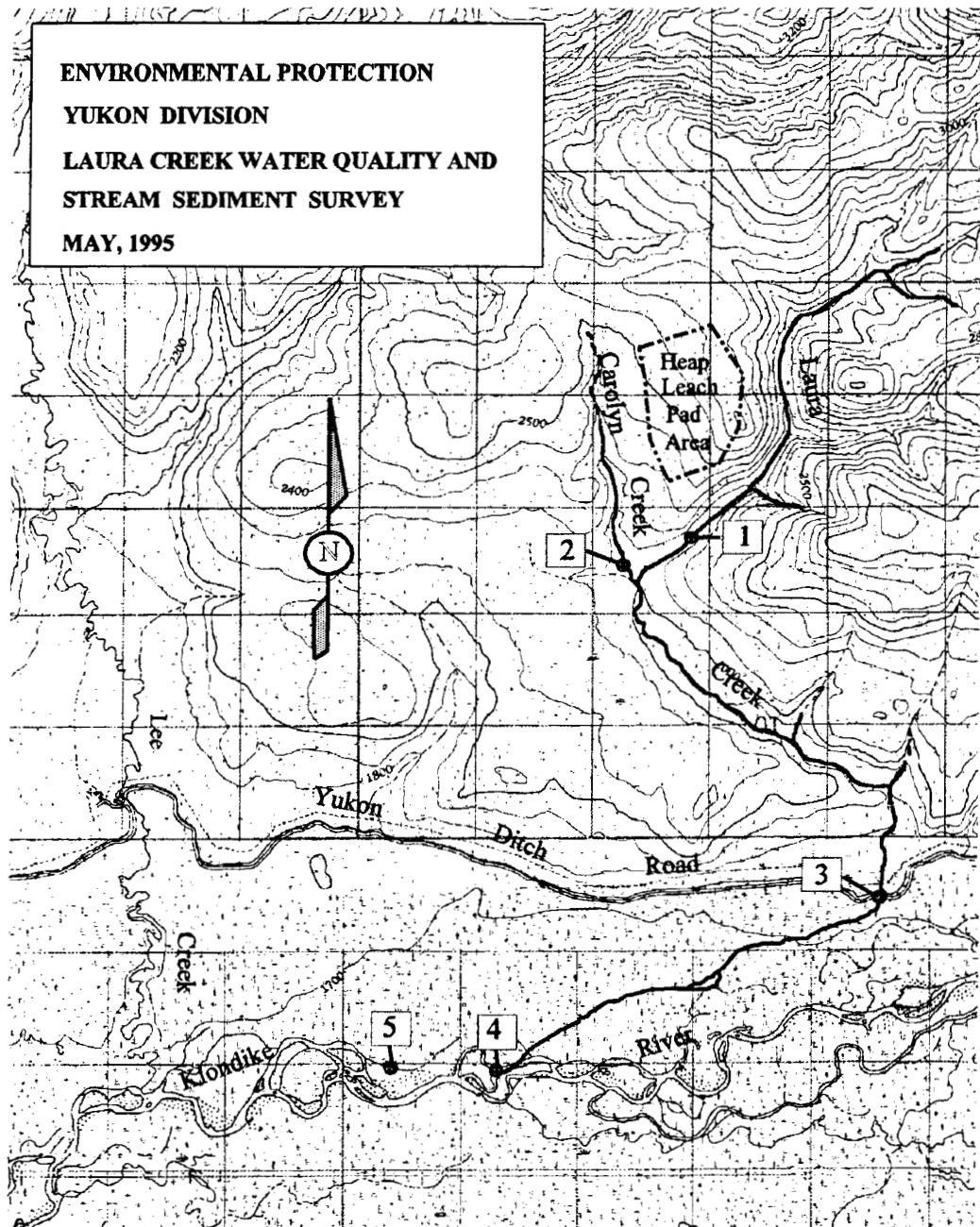


Figure 2: Station Locations

3.0 METHODS

In situ measurements and sample collection occurred between May 24 and 25th, 1995. Access to the sites was either by vehicle, all-terrain vehicle (ATV), or river boat.

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 (Ag)
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, sulphate, colour, turbidity, hardness, chloride and total phosphorus were also analyzed in each of the water samples. 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). In situ temperature, pH, conductivity and dissolved oxygen measurements were obtained using an Applied Microsystems Ltd. Aquamate 1000 multi probe and data logger. The instrumentation was deployed at each site for a minimum period of 20 minutes allowing for the collection and logging of data at 10 second intervals. In situ measurements

given are based on a mean value of the interval measurements recorded by the data logger.

For the purpose of quality control, hidden blanks were included in the sample set that was shipped to the lab for chemical analysis. Water samples were submitted to the Pacific Environmental Science Centre in Vancouver for analysis.

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

3.2 Sediments

Sediment samples were collected in triplicate at Stations 1, 3 and 4 using a plexiglass core tube. Each individual sediment grab sample was placed in acid washed 250ml glass jars. Sediment samples were analyzed for the following metals concentrations:

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

Sediment samples were submitted to the Pacific Environmental Science Centre in Vancouver for metals analysis and fixed and volatile residue analysis (SFR and SVR).

A sequential extraction analysis was performed on an additional grab sample from Station 3 and 4 for As, Cd, Cu, Fe, Pb and Zn. The sequential extract procedure results in five fractions for the evaluation of speciation of particulate metals. The test is designed to partition trace metals into the following fractions:

- Fraction (1): **Exchangeable Metals.** Sediment sample is extracted with 1M MgCl_2 initially at pH 7 at room temperature for one hour on a wrist action shaker.
- Fraction (2): **Metals bound to a carbonates or specifically absorbed.** The residue from (1) is leached with 1M sodium acetate adjusted to pH 5 with acetic acid at room temperature for five hours on a wrist action shaker.
- Fraction (3): **Metals bound to Fe-Mn Oxides.** The residue from (2) is extracted at 96°C for six hours with 0.04 $\text{NH}_2\text{OH} \cdot \text{HCl}$ in 25% (v/v) acetic acid.
- Fraction (4): **Metals bound to organic matter and sulfides.** The residue from (3) is extracted at 85°C for five hours with 0.02 M HNO_3 + 30% H_2O_2 adjusted to pH 2 with HNO_3 and then at room temperature with 3.2 M NH_4Ac in 20% (v/v) HNO_3 on a wrist action shaker.
- Fraction (5): **Residual Metals.** The original dried samples are weighed in Teflon PFA digestion vessels and digested with HNO_3 and HCl in a microwave oven, resulting in a total fraction (MT). The residual fraction (E) is calculated via:

$$\text{Fraction (5)} = \text{MT} - [(\text{A}) + (\text{B}) + (\text{C}) + (\text{D})]$$

Sequential extraction analysis for Cu, Zn, As and Cd is preformed via Inductively Coupled Argon Plasma (ICAP) Emission Spectrometry (simultaneous multi-element analysis). Analysis for Pb and Fe is performed via Atomic Absorption (AA) Spectrometry.

The procedures used in the metals and sequential extraction analysis of sediment samples are in accordance with the Environment Canada - Laboratories Standard Operating Procedures Manual and performed by Quanta Trace Laboratories.

3.3 Fisheries

The current study also conducted a preliminary fisheries survey to determine if fish were present in Laura Creek. Electroshocking equipment was on hand for fish capturing, however, it was not deployed. Reports on fish sightings and habitat in the study area was based solely on visual observations.

4.0 RESULTS

4.1 Water Quantity and Quality

Water quality data for samples collected are provided in Appendix I, Table 1. The water quality data presented includes data for all single and replicate samples collected at the sites visited.

Stream flows were measured at Carolyn Creek and the three Laura Creek sample sites (see Table 2). Refer to Appendix I, Table 1 for details on stream width, average depth and average velocity.

TABLE 2 FLOW DATA

STATION	NAME	COORDINATES	DISCHARGE (m ³ /s)
1	Laura Creek u/s of Carolyn	64°01.53'N 138°17.47'W	0.196
2	Carolyn Creek u/s of Laura	64°01.46'N 138°17.55'W	0.0005
3	Laura Creek at Ditch Road	63°59.91'N 138°15.68'W	0.159
4	Laura Creek at Klondike River	63°59.24'N 138°19.12'W	0.003

Stream flows at the time of sampling ranged from 0.0005 m³/sec at Station 2, Carolyn Creek, to 0.196 m³/sec at Station 1, Laura Creek upstream of the confluence with Carolyn Creek. It is apparent from the flow data collected that the flow of Laura Creek at the Klondike river site (0.003 m³/sec) is substantially lower than the two other upstream sample points. The most probable explanation for this decrease in flow is the exfiltration of water into the groundwater table from the active channel as well as the Yukon Ditch is possibly acting as an impoundment where it intercepts Laura Creek. Observations made by other EP Staff of Laura Creek between Station 3 and 4 reported the surface flow diverts into several smaller channels and that there are several natural

impoundments such as beaver dams and log jams that may also cause a reduced flow at Station 4 (Vic Enns, personal communication, 1995).

High water marks observed on the staff gauge at Carolyn Creek indicated that water levels were significantly higher earlier in the spring prior to sampling. The presence of glaciated ice throughout the stream channel areas observed in headwater areas of both Laura and Carolyn Creek suggests freshet melt water flowed on the surface of the ice initially before channelling through to the natural stream bed. This would explain the high water marks that were observed. At Station 1 on Laura Creek all stream flow at the time of sampling was contained within an ice channel and that ice still completely covered the stream bed.

No flow measurements were taken at Station 5, however, the discharge was estimated at approximately 15 litres per minute. The source of this ground water flow is not known.

A summary of in situ measurements is given in Appendix I, Table 2. All in situ measurements such as temperature, conductivity, pH and dissolved oxygen showed that the streams are typical of small to medium size drainages found in other parts of the Yukon (Mathers, et al, 1981). The greatest contrast was noted at Station 2, Carolyn Creek, where water temperatures were much warmer than other sites. This is due, in part, to the difference in the aspect between Carolyn Creek and the other sites. Carolyn Creek drains a slope with a southerly aspect. On the other hand, the upper portion of Laura Creek has a more westerly aspect and still contained a great deal of ice. In situ measurements at Station 5, the ground water site, were similar to the surface water sites except for pH (5.9), which was below the expected range of surface waters in this area but not uncommon for ground water sources.

All surface water sites sampled reflected little contrast between sites for nutrient parameters and heavy metals analyzed. Organic and inorganic carbon levels were an exception. Both forms were present primarily in a dissolved state with greatest contrast in levels being between Carolyn Creek and the Laura Creek sites. Nitrite levels were variable within the study area. They ranged from

0.049 mg/L to 0.069 mg/L between stations 1 and 3, however, at Station 4 nitrites were below detection limits.

The metals analysis for each of the surface water sites reflected few anomalies. The exceptions that were found were typically between Carolyn Creek and the Laura Creek sites. Trace levels of dissolved Al and Fe in Carolyn Creek were notably higher than in Laura Creek. There was only one case where Canadian Drinking Water Quality Guidelines were exceeded in the study area. Total Fe at Station 1 and Station 2, ranging from 0.735 to 0.935 mg/l, exceeded the guideline of 0.3 mg/L.

4.2 Stream Sediments

Stream sediment data is provided in Appendix II, Table 1. Due to the ice conditions encountered at Station 1, no sediment samples were obtained for metals or sequential extraction analysis.

Generally the stream sediment data collected during this study were comparable to other sites previously sampled in the area. The Carolyn Creek sediments tended to be slightly lower in metals concentrations than the Laura Creek sediments. When the sediment data from Laura Creek at Station 3 is compared to sediment data from the same site collected in July, 1991 (Davidge, 1995), most metals exhibit increases in concentrations. The greatest change was noted in As, Mn, Pb and Si (shown in Table 1) with Mn and Si being significantly higher.

Table 3 Mean Sediment Metals Concentrations at Station 3

(Sample Size = 3, all values $\mu\text{g/g}$)

Metals	July, 1991	May, 1995
As	15.3 ± 7.5	41.7 ± 2.5
Mn	312.0 ± 21.0	569.3* ± 5.9
Pb	16.0 ± 4.3	23.0 ± 2.2
Si	577.3 ± 9.5	962.3* ± 42.4

\pm standard deviation

* significantly different

The reason for the increase in the above metals, and others to a lesser degree, is unexplained. It is known, however, that construction activity in the Laura/Carolyn Creek watershed increased dramatically during 1994 and 1995 (such as clearing the heap leach pad area) and is one factor to consider as a possible source in future impact assessments. Other potential sources would include natural disturbances upstream of Station 3 such as stream bank erosion into the creek channel.

In addition to a sediment metals analysis, a sequential extraction analysis of stream sediments in baseline studies provides a basis or tool for evaluating downstream impacts following the establishment of hard rock mining developments. The analysis evaluates the strength of the association between heavy metals and the sediment particles. Sequential extraction analysis was conducted on sediment samples from two Laura Creek sample stations and is provided in Appendix II Table 2. The reference material TATS was included in the analysis for QA/QC purposes and is also presented in Appendix II, Table 2.

The data for both Station 3 and Station 4, Laura Creek (with the exception of Ca, K and Na), shows there is no or very little evidence of trace metals availability as shown by the exchangeable and carbonates Fractions (1) and (2).

This is consistent with most natural stream environments. Heavy metals extraction in the iron/manganese oxides and the sulphide/organic fractions indicate the presence of Cd, Cu, Pb and Zn. Their availability is somewhat reduced since higher oxidation, temperature and acidity is required to solubilize the elements.

4.3 Fisheries

At the time of sampling, salmonid fry were observed in Laura Creek (Station 4) upstream of where the creek channel enters a seasonal side channel of the Klondike River. The fry were approximately 2-3 cm in length and were tentatively identified as Arctic Grayling. None of the fish were captured or collected to confirm identification. It is suspected that the fry originated from the Klondike River and may have been using the creek channel for refuge during the spring high water period in the Klondike River. As river levels dropped the creek flow downstream became blocked off at the outlet and may have prevented the fry from exiting the creek channel. Several drop pools 1 to 1.5 m in height, which were located a short distance upstream on Laura Creek, also presented a barrier for fish passage further upstream. No fish were observed at any of the upstream sites sampled as well as none were observed during a previous visit by Environmental Protection and Department of Fisheries and Oceans staff (personal communication, Vic Enns and Gail Faulkner).

5.0 Conclusions

1. Stream flow in Laura Creek decreased significantly between Station 3 and Station 4. The cause may be do to the increased holding capacity of the wetland area located between the two stations. There may also be a loss of surface flow through exfiltration into the groundwater table, however, this could not substantiated.
2. The variability in water chemistry for Laura Creek and Carolyn Creek was not significant. The range of dissolved and total metals concentrations were typical of small mountain streams in the Yukon.
3. Stream sediments collected from Laura Creek and Carolyn generally had similar metals concentrations. Concentrations of sediment metals at Station 3 did show an increased between 1991 and 1996. No direct cause could be linked to this increase, however, exploration activity after 1991 and heap leach pad construction in 1995 in the area of Laura and Carolyn Creek may be a contributing factor.
4. Fisheries observations made during this survey and by others were not conclusive. It was determined that the lower reach of Laura Creek is, at the least, of limited fisheries value. The extent of useable or potential fisheries habitat throughout the Laura Creek watershed was not determined, however, the presence of salmonid fry (tentatively identified as Arctic Grayling) provides some evidence that creek does support fish at certain times of the year.

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APPENDIX I

APPENDIX I TABLE 1

WATER QUALITY DATA FOR MAY 24 AND 25, 1995

STATION	DESCRIPTION	COORDINATES		SAMPLE SIZE (metals and nutrients only)	MEAN DEPTH (m)	STREAM WIDTH (m)	MEAN VELOCITY (m/sec)	DISCHARGE (m ³ /sec)
		LAT (N)	LONG. (W)					
1	Laura Creek u/s of Carolyn Creek	64° 01.53	138° 17.47	3	0.330	1.4	0.346	0.196
2	Carolyn Creek u/s of Laura Creek	64° 01.46'	138° 17.55'	3	0.060	0.2	0.050	0.0005
3	Laura Creek @ Yukon Ditch Road	63° 59.91	138° 15.68	3	0.141	3.2	0.309	0.159
4	Laura Creek @ Klondike River	63° 59.24'	138° 19.12'	3	0.108	2.0	0.008	0.003
5	Klondike River groundwater site	63° 59.24'	138° 19.59'	1	N/A	N/A	N/A	0.0003 (visual estimate)
	Field Blank	N/A	N/A		N/A	N/A	N/A	N/A

N/A - not available

STATION	DESCRIPTION	TEMP (C)	pH INSITU (R.U.)	DISOLVED OXYGEN (mg/L)	pH LAB (R.U.)	IN SITU COND. (µmhos/cm)
1	Laura Creek u/s of Carolyn Creek	0.17	7.07	12.9	7.9 7.9 7.89	169.06
2	Carolyn Creek u/s of Laura Creek	4.56	6.4	12.37	7.29 7.32 7.32	169.06
3	Laura Creek @ Yukon Ditch Road	1.96	7.2	12.9	7.92 7.93 7.93	188.93
4	Laura Creek @ Klondike River	N/A	N/A	N/A	7.9 7.92 7.92	N/A
5	Klondike River groundwater site	1.6	5.9	9.29	7.38	136.55
	Field Blank	N/A	N/A		5.83 5.87 5.78	N/A

STATION	DESCRIPTION	LAB COND. (µmhos/cm)	DIC (mg/L)	DOC (mg/L)	TIC (mg/L)	TOC (mg/L)	TOTAL ALK. (asCaCO ₃) (mg/L)
1	Laura Creek u/s of Carolyn Creek	317	11.3	4.9	23.4	4.9	96.1
		313	23.1	5.0	23.1	5.0	95.9
		318	23.3	4.9	23.5	4.9	95.8
2	Carolyn Creek u/s of Laura Creek	284	6.7	19.9	6.8	20.9	51.9
		289	7.5	20.7	7.5	21.6	50.4
		278	12.3	20.6	13.5	21.8	50.6
3	Laura Creek @ Yukon Ditch Road	334	23.3	7.5	23.3	7.5	97.5
		335	23.4	7.1	23.6	7.1	97.1
		335	23.2	7.1	23.5	7.2	97.2
4	Laura Creek @ Klondike River	318	21.8	11.0	21.8	11.0	92.2
		308	21.9	10.7	21.9	10.7	92.7
		319	21.7	10.9	21.9	10.9	91.9
5	Klondike River groundwater site	252	20.0	1.6	21.4	1.6	73.7
	Field Blank	3.38	< 0.5	< 0.5	< 0.5	< 0.5	< 1
		1.48	< 0.5	< 0.5	< 0.5	< 0.5	< 1
		1.45	< 0.5	< 0.5	< 0.5	< 0.5	< 1

APPENDIX I TABLE 1

WATER QUALITY DATA FOR MAY 24 AND 25, 1995

STATION	DESCRIPTION	(Diss.)			(Diss.)			CHLORIDE (mg/L)	Ortho PO4 (mg/L)	TOTAL PO4 (mg/L)
		COLOR (mg/L)	HARDNESS (asCaCO3) (mg/L)	HARDNESS TOTAL (mg/L)	SULFATE (mg/L)					
1	Laura Creek u/s of Carolyn Creek	25	159	160	62.8	0.36	< 0.005	0.026		
		25	160	160	63.9	0.45	< 0.005	0.025		
		20	158	159	62.2	0.36	< 0.005	0.026		
2	Carolyn Creek u/s of Laura Creek	75	142	144	84.9	0.26	< 0.005	0.024		
		75	142	143	84.5	0.23	< 0.005	0.026		
		75	142	143	84.0	0.23	< 0.005	0.025		
3	Laura Creek @ Yukon Ditch Road	30	171	172	71.6	0.44	< 0.005	0.016		
		25	171	172	71.5	0.41	< 0.005	0.017		
		25	171	171	70.8	0.62	< 0.005	0.016		
4	Laura Creek @ Klondike River	45	160	160	66.9	0.35	< 0.005	0.015		
		45	164	164	67.1	0.44	< 0.005	0.014		
		45	162	162	66.8	0.43	< 0.005	0.011		
5	Klondike River groundwater site	< 5	121	121	45.6	0.46	< 0.005	0.003		
Field Blank		< 5	< 0.4	< 0.4	< 0.5	< 0.10	< 0.005	< 0.002		
		< 5	< 0.4	< 0.4	< 0.5	< 0.10	< 0.005	< 0.002		
		< 5	< 0.4	< 0.4	< 0.5	< 0.27	< 0.005	< 0.002		

N/A - not available

APPENDIX I TABLE 1

WATER QUALITY DATA FOR MAY 24 AND 25, 1995

STATION	DESCRIPTION	NITRITE+			FR (mg/L)	NFR (mg/L)	ICP Diss.			GF Diss.	ICP Diss.
		NITRITE (mg/L)	NITRATE (mg/L)	AMMONIA (mg/L)			Ag (mg/L)	Ag (mg/L)	Ag (mg/L)		
1	Laura Creek u/s of Carolyn Creek	0.069	0.003	0.011	230	10	< 0.01	< 0.0005	< 0.05		
		0.067	0.004	0.013	220	10	< 0.01	< 0.0005	< 0.05		
		0.068	0.003	0.013	200	10	< 0.01	< 0.0005	< 0.05		
2	Carolyn Creek u/s of Laura Creek	0.052	< 0.002	0.021	250	< 10	< 0.01	< 0.0005	0.11		
		0.054	0.002	0.019	250	10	< 0.01	< 0.0005	0.13		
		0.054	< 0.002	0.021	250	10	< 0.01	< 0.0005	0.11		
3	Laura Creek @ Yukon Ditch Road	0.049	0.004	0.012	220	< 10	< 0.01	< 0.0005	< 0.05		
		0.049	0.004	0.012	230	< 10	< 0.01	< 0.0005	< 0.05		
		0.049	0.003	0.011	220	< 10	< 0.01	< 0.0005	< 0.05		
4	Laura Creek @ Klondike River	< 0.002	0.003	0.011	240	< 10	< 0.01	< 0.0005	< 0.05		
		< 0.002	0.003	0.01	250	< 10	< 0.01	< 0.0005	< 0.05		
		< 0.002	< 0.002	0.007	240	< 10	< 0.01	< 0.0005	< 0.05		
5	Klondike River groundwater site	0.173	0.002	< 0.002	170	< 10	< 0.01	< 0.0005	< 0.05		
	Field Blank	< 0.002	< 0.002	< 0.002	< 10	< 10	< 0.01	< 0.0005	< 0.05		
		< 0.002	< 0.002	< 0.002	< 10	< 10	< 0.01	< 0.0005	< 0.05		
		0.012	< 0.002	< 0.002	< 10	< 10	< 0.01	< 0.0005	< 0.05		

N/A - not available

STATION	DESCRIPTION	ICP Diss.										GF Diss.									
		As (mg/L)	B (mg/L)	Ba (mg/L)	Be (mg/L)	Ca (mg/L)	Cd (mg/L)	Cd (mg/L)	Cd (mg/L)	Co (mg/L)		As (mg/L)	B (mg/L)	Ba (mg/L)	Be (mg/L)	Ca (mg/L)	Cd (mg/L)	Cd (mg/L)	Cd (mg/L)	Co (mg/L)	
1	Laura Creek u/s of Carolyn Creek	< 0.05	< 0.01	0.056	< 0.001	39.3	< 0.005	< 0.0002	< 0.0002	< 0.005		< 0.05	< 0.01	0.056	< 0.001	39.3	< 0.005	< 0.0002	< 0.0002	< 0.005	
		< 0.05	< 0.01	0.055	< 0.001	39.4	< 0.005	< 0.0002	< 0.0002	< 0.005		< 0.05	< 0.01	0.055	< 0.001	39.4	< 0.005	< 0.0002	< 0.0002	< 0.005	
		< 0.05	< 0.01	0.055	< 0.001	39.1	< 0.005	< 0.0002	< 0.0002	< 0.005		< 0.05	< 0.01	0.055	< 0.001	39.1	< 0.005	< 0.0002	< 0.0002	< 0.005	
2	Carolyn Creek u/s of Laura Creek	< 0.05	< 0.01	0.082	< 0.001	33.3	< 0.005	< 0.0002	< 0.0002	< 0.005		< 0.05	< 0.01	0.082	< 0.001	33.3	< 0.005	< 0.0002	< 0.0002	< 0.005	
		< 0.05	< 0.01	0.081	< 0.001	33.2	< 0.005	< 0.0002	< 0.0002	< 0.005		< 0.05	< 0.01	0.081	< 0.001	33.2	< 0.005	< 0.0002	< 0.0002	< 0.005	
		< 0.05	< 0.01	0.081	< 0.001	33.3	< 0.005	< 0.0002	< 0.0002	< 0.005		< 0.05	< 0.01	0.081	< 0.001	33.3	< 0.005	< 0.0002	< 0.0002	< 0.005	
3	Laura Creek @ Yukon Ditch Road	< 0.05	< 0.01	0.062	< 0.001	42.0	< 0.005	< 0.0002	< 0.0002	< 0.005		< 0.05	< 0.01	0.062	< 0.001	42.0	< 0.005	< 0.0002	< 0.0002	< 0.005	
		< 0.05	< 0.01	0.062	< 0.001	42.0	< 0.005	< 0.0002	< 0.0002	< 0.005		< 0.05	< 0.01	0.062	< 0.001	42.0	< 0.005	< 0.0002	< 0.0002	< 0.005	
		< 0.05	< 0.01	0.062	< 0.001	41.8	< 0.005	< 0.0002	< 0.0002	< 0.005		< 0.05	< 0.01	0.062	< 0.001	41.8	< 0.005	< 0.0002	< 0.0002	< 0.005	
4	Laura Creek @ Klondike River	< 0.05	< 0.01	0.086	< 0.001	39.7	< 0.005	0.0002	< 0.0002	< 0.005		< 0.05	< 0.01	0.086	< 0.001	39.7	< 0.005	0.0002	< 0.0002	< 0.005	
		< 0.05	< 0.01	0.089	< 0.001	40.7	< 0.005	< 0.0002	< 0.0002	< 0.005		< 0.05	< 0.01	0.089	< 0.001	40.7	< 0.005	< 0.0002	< 0.0002	< 0.005	
		< 0.05	< 0.01	0.087	< 0.001	40.1	< 0.005	< 0.0002	< 0.0002	< 0.005		< 0.05	< 0.01	0.087	< 0.001	40.1	< 0.005	< 0.0002	< 0.0002	< 0.005	
5	Klondike River groundwater site	< 0.05	< 0.01	0.078	< 0.001	33.1	< 0.005	< 0.0002	< 0.0002	< 0.005		< 0.05	< 0.01	0.078	< 0.001	33.1	< 0.005	< 0.0002	< 0.0002	< 0.005	
	Field Blank	< 0.05	< 0.01	< 0.001	< 0.001	< 0.1	< 0.005	< 0.0002	< 0.0002	< 0.005		< 0.05	< 0.01	< 0.001	< 0.001	< 0.1	< 0.005	< 0.0002	< 0.0002	< 0.005	
		< 0.05	< 0.01	< 0.001	< 0.001	< 0.1	< 0.005	< 0.0002	< 0.0002	< 0.005		< 0.05	< 0.01	< 0.001	< 0.001	< 0.1	< 0.005	< 0.0002	< 0.0002	< 0.005	
		< 0.05	< 0.01	< 0.001	< 0.001	< 0.1	< 0.005	< 0.0002	< 0.0002	< 0.005		< 0.05	< 0.01	< 0.001	< 0.001	< 0.1	< 0.005	< 0.0002	< 0.0002	< 0.005	

APPENDIX I TABLE 1

WATER QUALITY DATA FOR MAY 24 AND 25, 1995

STATION	DESCRIPTION	ICP Diss.		GF Diss.	ICP Diss.	ICP Diss.	ICP Diss.	ICP Diss.	ICP Diss.	ICP Diss.
		Cr (mg/L)	Cu (mg/L)	Cu (mg/L)	Fe (mg/L)	K (mg/L)	Mg (mg/L)	Mn (mg/L)	Mo (mg/L)	
1	Laura Creek u/s of Carolyn Creek	< 0.005	< 0.005	0.0006	0.157	1.0	14.9	0.085	< 0.01	
		0.006	< 0.005	< 0.0005	0.151	0.9	14.8	0.083	< 0.01	
		< 0.005	< 0.005	0.0008	0.159	0.9	14.7	0.085	< 0.01	
2	Carolyn Creek u/s of Laura Creek	< 0.005	< 0.005	0.0021	0.356	0.7	14.3	0.102	< 0.01	
		0.005	< 0.005	0.0016	0.357	0.6	14.2	0.102	< 0.01	
		< 0.005	< 0.005	0.0017	0.357	0.7	14.3	0.102	< 0.01	
3	Laura Creek @ Yukon Ditch Road	< 0.005	< 0.005	0.0007	0.147	1.0	16.1	0.054	< 0.01	
		< 0.005	< 0.005	0.0006	0.146	1.0	16.1	0.055	< 0.01	
		< 0.005	0.006	0.0010	0.142	1.1	16.1	0.055	< 0.01	
4	Laura Creek @ Klondike River	< 0.005	< 0.005	0.0012	0.057	1.0	14.7	0.001	< 0.01	
		< 0.005	< 0.005	0.0012	0.057	1.0	15.1	0.001	< 0.01	
		< 0.005	< 0.005	0.0013	0.057	0.9	14.9	0.002	< 0.01	
5	Klondike River groundwater site	0.007	0.006	< 0.0005	0.010	0.7	9.3	0.001	< 0.01	
	Field Blank	< 0.005	< 0.005	< 0.0005	< 0.005	< 0.1	< 0.1	< 0.001	< 0.01	
		< 0.005	< 0.005	0.0012	< 0.005	< 0.1	< 0.1	< 0.001	< 0.01	
		< 0.005	< 0.005	0.0007	< 0.005	< 0.1	< 0.1	< 0.001	< 0.01	

N/A - not available

STATION	DESCRIPTION	ICP Diss.		ICP Diss.		ICP Diss.		GF Diss.		ICP Diss.		ICP Diss.	
		Na (mg/L)	Ni (mg/L)	P (mg/L)	Pb (mg/L)	Pb (mg/L)	Pb (mg/L)	Sb (mg/L)	Se (mg/L)	Si (mg/L)			
1	Laura Creek u/s of Carolyn Creek	1.5	< 0.02	< 0.1	< 0.05	0.0009	< 0.05	< 0.05	< 0.05	2.89			
		1.5	< 0.02	< 0.1	< 0.05	0.0009	< 0.05	< 0.05	< 0.05	2.90			
		1.5	< 0.02	< 0.1	< 0.05	0.0006	< 0.05	< 0.05	< 0.05	2.87			
2	Carolyn Creek u/s of Laura Creek	2.7	< 0.02	< 0.1	< 0.05	0.0009	< 0.05	< 0.05	< 0.05	4.68			
		2.8	< 0.02	< 0.1	< 0.05	0.0007	< 0.05	< 0.05	< 0.05	4.66			
		2.7	< 0.02	< 0.1	< 0.05	0.0010	< 0.05	< 0.05	< 0.05	4.67			
3	Laura Creek @ Yukon Ditch Road	2.0	< 0.02	< 0.1	< 0.05	0.0010	< 0.05	< 0.05	< 0.05	3.60			
		2.0	< 0.02	< 0.1	< 0.05	0.0014	< 0.05	< 0.05	< 0.05	3.59			
		2.0	< 0.02	< 0.1	< 0.05	0.0012	< 0.05	< 0.05	< 0.05	3.59			
4	Laura Creek @ Klondike River	2.0	< 0.02	< 0.1	< 0.05	0.0005	< 0.05	< 0.05	< 0.05	3.53			
		2.0	< 0.02	< 0.1	< 0.05	< 0.0005	< 0.05	< 0.05	< 0.05	3.63			
		2.0	< 0.02	< 0.1	< 0.05	0.0008	< 0.05	< 0.05	< 0.05	3.58			
5	Klondike River groundwater site	2.0	< 0.02	< 0.1	< 0.05	< 0.0005	< 0.05	< 0.05	< 0.05	3.21			
	Field Blank	< 0.1	< 0.02	< 0.1	< 0.05	< 0.0005	< 0.05	< 0.05	< 0.05	< 0.05			
		< 0.1	< 0.02	< 0.1	< 0.05	< 0.0005	< 0.05	< 0.05	< 0.05	< 0.05			
		< 0.1	< 0.02	< 0.1	< 0.05	< 0.0005	< 0.05	< 0.05	< 0.05	< 0.05			

APPENDIX I TABLE 1

WATER QUALITY DATA FOR MAY 24 AND 25, 1995

STATION	DESCRIPTION	Sn (mg/L)	Sr (mg/L)	Ti (mg/L)	V (mg/L)	Zn (mg/L)	Ag (mg/L)	GF Total	ICP Total
1	Laura Creek u/s of Carolyn Creek	< 0.05	0.197	0.004	< 0.01	0.002	< 0.01	< 0.0006	0.49
		< 0.05	0.197	< 0.002	< 0.01	< 0.002	< 0.01	< 0.0006	0.71
		< 0.05	0.196	< 0.002	< 0.01	0.003	< 0.01	< 0.0006	0.52
2	Carolyn Creek u/s of Laura Creek	< 0.05	0.109	< 0.002	< 0.01	0.002	< 0.01	< 0.0006	0.59
		< 0.05	0.108	0.003	< 0.01	< 0.002	< 0.01	< 0.0006	0.56
		< 0.05	0.108	< 0.002	< 0.01	< 0.002	< 0.01	< 0.0006	0.51
3	Laura Creek @ Yukon Ditch Road	< 0.05	0.209	< 0.002	< 0.01	< 0.002	< 0.01	< 0.0006	0.21
		< 0.05	0.209	< 0.002	< 0.01	0.002	< 0.01	< 0.0006	0.19
		< 0.05	0.209	0.004	< 0.01	< 0.002	< 0.01	< 0.0006	0.22
4	Laura Creek @ Klondike River	< 0.05	0.196	< 0.002	< 0.01	< 0.002	< 0.01	< 0.0006	0.10
		< 0.05	0.202	< 0.002	< 0.01	< 0.002	< 0.01	< 0.0006	0.28
		< 0.05	0.199	< 0.002	< 0.01	0.002	< 0.01	< 0.0006	0.30
5	Klondike River groundwater site	< 0.05	0.18	0.004	< 0.01	0.006	< 0.01	< 0.0006	< 0.05
	Field Blank	< 0.05	< 0.001	< 0.002	< 0.01	< 0.002	< 0.01	< 0.0006	< 0.05
		< 0.05	< 0.001	< 0.002	< 0.01	< 0.002	< 0.01	< 0.0006	< 0.05
		< 0.05	< 0.001	< 0.002	< 0.01	< 0.002	< 0.01	< 0.0006	< 0.05

N/A - not available

STATION	DESCRIPTION	As (mg/L)	B (mg/L)	Ba (mg/L)	Be (mg/L)	Ca (mg/L)	Cd (mg/L)	GF Total	ICP Total	Co (mg/L)
1	Laura Creek u/s of Carolyn Creek	< 0.05	< 0.01	0.073	0.001	39.2	< 0.005	< 0.0002	< 0.005	0.009
		< 0.05	< 0.01	0.079	< 0.001	39.2	< 0.005	< 0.0002	< 0.005	< 0.005
		< 0.05	< 0.01	0.073	0.001	39.3	< 0.005	< 0.0002	< 0.005	0.006
2	Carolyn Creek u/s of Laura Creek	< 0.05	< 0.01	0.096	0.001	33	< 0.005	< 0.0002	< 0.005	0.006
		< 0.05	< 0.01	0.096	< 0.001	32.5	< 0.005	< 0.0002	< 0.005	< 0.005
		< 0.05	< 0.01	0.095	< 0.001	32.5	< 0.005	< 0.0002	< 0.005	0.005
3	Laura Creek @ Yukon Ditch Road	< 0.05	< 0.01	0.068	0.001	41.6	< 0.005	< 0.0002	< 0.005	< 0.005
		< 0.05	< 0.01	0.068	0.001	41.5	< 0.005	< 0.0002	< 0.005	0.007
		< 0.05	< 0.01	0.067	0.001	41.5	< 0.005	< 0.0002	< 0.005	< 0.005
4	Laura Creek @ Klondike River	< 0.05	< 0.01	0.088	0.001	39.5	< 0.005	< 0.0002	< 0.005	< 0.005
		< 0.05	< 0.01	0.093	0.001	39.3	< 0.005	< 0.0002	< 0.005	0.006
		< 0.05	< 0.01	0.094	< 0.001	39.1	< 0.005	< 0.0002	< 0.005	0.008
5	Klondike River groundwater site	< 0.05	< 0.01	0.075	< 0.001	32.2	< 0.005	< 0.0002	< 0.005	0.005
	Field Blank	< 0.05	< 0.01	< 0.001	< 0.001	< 0.1	< 0.005	< 0.0002	< 0.005	< 0.005
		< 0.05	< 0.01	< 0.001	< 0.001	< 0.1	< 0.005	< 0.0002	< 0.005	< 0.005
		< 0.05	< 0.01	< 0.001	< 0.001	< 0.1	< 0.005	< 0.0002	< 0.005	0.007

APPENDIX I TABLE 1

WATER QUALITY DATA FOR MAY 24 AND 25, 1995

STATION	DESCRIPTION	ICP Total	ICP Total	GF Total	ICP Total	ICP Total	ICP Total	ICP Total	ICP Total	ICP Total
		Cr (mg/L)	Cu (mg/L)	Cu (mg/L)	Fe (mg/L)	K (mg/L)	Mg (mg/L)	Mn (mg/L)	Mo (mg/L)	
1	Laura Creek u/s of Carolyn Creek	< 0.005	0.005	0.0016	0.735	0.9	15.2	0.088	< 0.01	
		< 0.005	0.007	0.0018	0.825	1.0	15.2	0.091	< 0.01	
		0.012	0.007	0.0017	0.741	0.9	15.2	0.09	< 0.01	
2	Carolyn Creek u/s of Laura Creek	< 0.005	0.007	0.0025	0.935	0.6	14.6	0.109	< 0.01	
		< 0.005	0.005	0.0024	0.869	0.6	14.5	0.107	< 0.01	
		0.010	0.005	0.0022	0.849	0.5	14.4	0.105	< 0.01	
3	Laura Creek @ Yukon Ditch Road	0.013	< 0.005	0.0017	0.365	0.8	16.3	0.061	< 0.01	
		< 0.005	< 0.005	0.0013	0.355	0.8	16.3	0.061	< 0.01	
		< 0.005	< 0.005	0.0014	0.361	0.7	16.4	0.06	< 0.01	
4	Laura Creek @ Klondike River	0.010	0.005	0.0026	0.112	0.9	15.2	0.001	< 0.01	
		< 0.005	0.005	0.0017	0.257	1.0	15.2	0.006	< 0.01	
		< 0.005	0.006	0.0022	0.281	1.0	15.1	0.007	< 0.01	
5	Klondike River groundwater site	< 0.005	< 0.005	0.0007	0.027	0.5	9.3	0.001	< 0.01	
	Field Blank	< 0.005	< 0.005	0.0009	0.016	< 0.1	< 0.1	< 0.001	< 0.01	
		< 0.005	< 0.005	0.0009	< 0.005	< 0.1	< 0.1	< 0.001	< 0.01	
		< 0.005	< 0.005	0.0008	< 0.005	< 0.1	< 0.1	< 0.001	< 0.01	

N/A - not available

STATION	DESCRIPTION	ICP Total										GF Total				ICP Total			
		Na (mg/L)	Ni (mg/L)	P (mg/L)	Pb (mg/L)	Pb (mg/L)	Pb (mg/L)	Sb (mg/L)	Se (mg/L)										
1	Laura Creek u/s of Carolyn Creek	1.6	< 0.02	< 0.1	< 0.05	0.0009	< 0.05	< 0.05	< 0.05										
		1.7	< 0.02	< 0.1	< 0.05	0.0010	< 0.05	< 0.05	< 0.05										
		1.6	< 0.02	< 0.1	< 0.05	0.0010	< 0.05	< 0.05	< 0.05										
2	Carolyn Creek u/s of Laura Creek	2.9	0.03	< 0.1	< 0.05	0.0010	< 0.05	< 0.05	< 0.05										
		2.9	< 0.02	< 0.1	< 0.05	0.0010	< 0.05	< 0.05	< 0.05										
		2.8	< 0.02	< 0.1	< 0.05	0.0012	< 0.05	< 0.05	< 0.05										
3	Laura Creek @ Yukon Ditch Road	2.1	< 0.02	< 0.1	< 0.05	0.0010	< 0.05	< 0.05	< 0.05										
		2.1	< 0.02	< 0.1	< 0.05	0.0007	< 0.05	< 0.05	< 0.05										
		2.1	< 0.02	< 0.1	< 0.05	0.0006	< 0.05	< 0.05	< 0.05										
4	Laura Creek @ Klondike River	2.0	< 0.02	< 0.1	< 0.05	< 0.0006	< 0.05	< 0.05	< 0.05										
		2.0	< 0.02	< 0.1	< 0.05	0.0007	< 0.05	< 0.05	< 0.05										
		2.0	< 0.02	< 0.1	< 0.05	0.0007	< 0.05	< 0.05	< 0.05										
5	Klondike River groundwater site	2.0	< 0.02	< 0.1	< 0.05	< 0.0006	< 0.05	< 0.05	< 0.05										
	Field Blank	< 0.1	< 0.02	< 0.1	< 0.05	< 0.0006	< 0.05	< 0.05	< 0.05										
		< 0.1	< 0.02	< 0.1	< 0.05	< 0.0006	< 0.05	< 0.05	< 0.05										
		< 0.1	< 0.02	< 0.1	< 0.05	< 0.0006	< 0.05	< 0.05	< 0.05										

STATION	DESCRIPTION	Si (mg/L)	Sn (mg/L)	Sr (mg/L)	Ti (mg/L)	V (mg/L)	Zn (mg/L)
1	Laura Creek u/s of Carolyn Creek	3.83	< 0.05	0.199	0.015	< 0.01	0.004
		4.29	< 0.05	0.200	0.027	< 0.01	0.005
		3.83	< 0.05	0.199	0.017	< 0.01	0.004
2	Carolyn Creek u/s of Laura Creek	5.40	< 0.05	0.109	0.015	< 0.01	0.003
		5.33	< 0.05	0.107	0.016	< 0.01	0.002
		5.26	< 0.05	0.107	0.012	< 0.01	0.002
3	Laura Creek @ Yukon Ditch Road	3.96	< 0.05	0.209	0.006	< 0.01	0.002
		3.90	< 0.05	0.209	0.006	< 0.01	0.002
		3.92	< 0.05	0.209	0.003	< 0.01	< 0.002
4	Laura Creek @ Klondike River	3.69	< 0.05	0.198	0.003	< 0.01	< 0.002
		4.01	< 0.05	0.197	0.012	< 0.01	0.002
		4.07	< 0.05	0.196	0.011	< 0.01	0.002
5	Klondike River groundwater site	3.13	< 0.05	0.177	< 0.002	< 0.01	< 0.002
	Field Blank	< 0.05	< 0.05	< 0.001	0.002	< 0.01	< 0.002
		< 0.05	< 0.05	< 0.001	< 0.002	< 0.01	< 0.002
		< 0.05	< 0.05	< 0.001	< 0.002	< 0.01	< 0.002

APPENDIX II

STREAM SEDIMENT DATA

STATION		ICP Total	ICP Total	ICP Total	ICP Total	ICP Total	ICP Total	ICP Total
		Ag (ug/g)	Al (ug/g)	As (ug/g)	Ba (ug/g)	Be (ug/g)	Ca (ug/g)	
2	Carolyn Creek u/s of Laura Creek	< 2	18420	< 8	444.6	0.5	6690	
		< 2	19410	9	497.6	0.5	6690	
		< 2	17570	9	433.9	0.5	6540	
3	Laura Creek @ Yukon Ditch Road	< 2	24620	45	936.2	0.9	8800	
		< 2	26490	39	877.8	1	9220	
		< 2	28590	41	945.6	1	9460	
4	Laura Creek @ Klondike River	< 2	29740	61	911.6	1	6990	
		< 2	35930	60	1072	1	7460	
		< 2	32670	57	1002	1	7230	

STATION		ICP Total	ICP Total	ICP Total	ICP Total	ICP Total	ICP Total	ICP Total
		Cd (ug/g)	Co (ug/g)	Cr (ug/g)	Cu (ug/g)	Fe (ug/g)	K (ug/g)	
2	Carolyn Creek u/s of Laura Creek	< 0.8	5.5	29.3	11	19400	2795	
		< 0.8	6.6	30.2	13	23010	2797	
		< 0.8	5.2	26.3	11	19340	2516	
3	Laura Creek @ Yukon Ditch Road	1	11	46.3	24.6	27530	4660	
		< 0.8	10	44.8	23.7	26360	5219	
		< 0.8	13	49.2	28.8	30810	5490	
4	Laura Creek @ Klondike River	1	14	46.4	33.5	33960	5724	
		1	15	59.6	36.5	36620	7708	
		0.9	14	56.8	35	35410	6682	

STATION	ICP Total	Mg (ug/g)	Mn (ug/g)	ICP Total	Mo (ug/g)	Na (ug/g)	Ni (ug/g)	ICP Total	P (ug/g)
2	Carolyn Creek u/s of Laura Creek	3990	262.1	<	2	250	10	770	
		4320	311.4	<	2	250	17	760	
		3970	255.5	<	2	230	10	790	
3	Laura Creek @ Yukon Ditch Road	5900	561.2		2	340	36	1000	
		5970	575.1		2	380	34	960	
		6600	571.7	<	2	360	41	1000	
4	Laura Creek @ Klondike River	6470	1118		3	250	40	1100	
		7180	1324		4	370	47	1100	
		6850	1282		4	300	45	1100	

STATION		ICP Total		ICP Total		ICP Total		ICP Total		ICP Total		ICP Total	
		Pb (ug/g)	Sb (ug/g)	Si (ug/g)	Sn (ug/g)	Sr (ug/g)	Ti (ug/g)						
2	Carolyn Creek u/s of Laura Creek	18	<	997	<	8	50.2	1477					
		20	<	974	<	8	49.4	1340					
		18	<	1030	<	8	47.1	1413					
3	Laura Creek @ Yukon Ditch Road	24	18	1010	<	8	82.6	1481					
		20	10	907	27	85.7	1575						
		25	20	970	<	8	87.1	1656					
4	Laura Creek @ Klondike River	31	20	1170	9	69.6	806.6						
		42	19	1700	20	75.7	1001						
		33	20	1779	10	73.1	931.2						

STREAM SEDIMENT DATA

STATION	ICP Total		ICP Total		SFR (mg/Kg)	SVR (mg/Kg)
	V (ug/g)	Zn (ug/g)	V (ug/g)	Zn (ug/g)		
2	Carolyn Creek u/s of Laura Creek					
	64	55			962000	38100
	65	61.7			949000	50900
3	61	55.7			962000	38400
	Laura Creek @ Yukon Ditch Road					
	110	150			933000	67300
	110	143			929000	71400
	120	197.8			919000	80900
4	Laura Creek @ Klondike River					
	120	200.1			909000	91200
	140	209			910000	89700
	130	205.4			912000	88100

APPENDIX II TABLE 2

SEQUENTIAL EXTRACTION DATA FOR STATION 3

Station 3		Fraction 1	Fraction 2	Fraction 3	Fraction 4	Fraction 5
Metals		Exchangable	Carbonates	Fe+Mn Oxide	Sulphides+ Organic	Residual
		(µg/g)	(µg/g)	(µg/g)	(µg/g)	(µg/g)
Ag	<	2	<	2	<	0.2
Al	<	20	<	20		380
As	<	9	<	9		6.3
Ba		18.6		34.1		69.4
Be	<	0.4	<	0.4		0.2
Bi	<	20	<	20	<	2
Ca		2180		1450		533
Cd	<	0.4	<	0.4		0.42
Co	<	0.4		0.6		3
Cr	<	2	<	2		0.91
Cu	<	2	<	2		0.71
Fe	<	4		67		3890
Hg	<	0.04	<	0.04	<	0.04
K		200	<	90	<	8
Li	<	4		6	<	0.2
Mg		-		140		103
Mn		4.6		138		114
Mo	<	4	<	4	<	0.4
Na		75		-		4
Ni	<	0.9		2		7.44
P	<	20	<	20		23
Pb	<	9	<	9		1
S	<	40	<	40		30
Sb	<	9	<	9	<	0.8
Se	<	9	<	9	<	0.6
Si	<	20		100		458
Sn	<	4	<	4	<	0.4
Sr		10		9		4.6
Th	<	4	<	4		0.4
Ti	<	0.9	<	0.9		0.4
U	<	20	<	20	<	4
V	<	4	<	4		6
Zn	<	2		11		35.9
Zr	<	0.4	<	0.4		0.3

APPENDIX II TABLE 2

SEQUENTIAL EXTRACTION DATA FOR STATION 4

Station 4						
	Fraction 1		Fraction 2		Fraction 3	
	Exchangable		Carbonates		Fe+Mn	
Metals	(µg/g)	(µg/g)	(µg/g)	(µg/g)	Oxide	Sulphides+
	(µg/g)	(µg/g)	(µg/g)	(µg/g)	(µg/g)	Organic
						Residual
						(µg/g)
Ag	< 2	< 2	< 0.2	< 0.2	< 0.8	
Al	< 20	< 30	< 602	< 1160	< 14600	
As	< 9	< 9	< 6.1	< 9.1	< 35	
Ba	31.2	36.4	70.2	51.5	655	
Be	< 0.5	< 0.5	< 0.3	< 0.07	< 1	
Bi	< 20	< 20	< 2	< 2	< 8	
Ca	2130	1240	412	760	4720	
Cd	< 0.5	< 0.5	< 0.44	< 0.05	< 1	
Co	< 0.5	< 0.5	< 3.1	< 0.69	< 11	
Cr	< 2	< 2	< 1.3	< 3	< 26	
Cu	< 2	< 2	< 1.1	< 6.98	< 30.3	
Fe	< 5	< 30	< 3570	< 1360	< 25300	
Hg	< 0.04	< 0.04	< 0.04	< 0.04	< 0.2	
K	100	< 90	< 20	< 20	< 1930	
Li	10	< 4	< 0.2	< 0.2	< 21	
Mg	-	140	114	199	4380	
Mn	12	266	331	20.8	1030	
Mo	< 5	< 5	< 0.4	< 0.7	< 3	
Na	40	-	95	16	140	
Ni	< 0.9	< 1	< 5.36	< 2.8	< 29.9	
P	< 20	< 20	< 31	< 531	< 800	
Pb	< 9	< 9	< 2	< 5.3	< 10	
S	< 50	< 50	< 30	< 190	< 460	
Sb	< 9	< 9	< 1	< 0.8	< 6	
Se	< 9	< 9	< 0.8	< 0.8	< 3	
Si	< 20	< 140	< 543	< 548	< 217	
Sn	< 5	< 5	< 0.4	< 0.4	< 2	
Sr	10	8	4	5.2	45	
Th	< 5	< 5	< 0.7	< 1	< 5	
Ti	< 0.9	< 0.9	< 0.4	< 120	< 248	
U	< 20	< 20	< 5.3	< 2	< 8	
V	< 5	< 5	< 6.9	< 6.6	< 62	
Zn	< 2	< 11	< 31.8	< 9.65	< 160	
Zr	< 0.5	< 0.5	< 0.4	< 3.8	< 1	

APPENDIX II TABLE 2 SEQUENTIAL EXTRACTION DATA FOR TATS REFERENCE MATERIAL

TATS		Fraction 1		Fraction 2		Fraction 3		Fraction 4		Fraction 5	
Metals		Exchangable		Carbonates		Fe+Mn Oxide		Sulphides+ Organic		Residual	
		(µg/g)		(µg/g)		(µg/g)		(µg/g)		(µg/g)	
Ag	<	2	<	2	<	0.2	<	0.2	<	0.8	
Al	<	20	<	20		487		1140		11600	
As	<	9	<	9		3	<	0.8		3	
Ba		3.5		19.5		4.16		2.22		59.8	
Be	<	0.4	<	0.4	<	0.04	<	0.04		0.3	
Bi	<	20	<	20	<	2	<	2	<	8	
Ca		899				888		4330		37400	
Cd	<	0.4	<	0.4	<	0.04	<	0.04	<	0.2	
Co	<	0.4		2		1		2.3		14	
Cr	<	2	<	2		0.94		0.44		30.1	
Cu	<	2		4		3.1		28.6		64.4	
Fe	<	4		20		4240		1900		27200	
Hg	<	0.04	<	0.04	<	0.04	<	0.04	<	0.004	
K		200	<	90		20		41		880	
Li		2	<	2	<	0.2	<	0.2		6	
Mg		-		140		315		150		7780	
Mn	<	2		190		24		8.48		374	
Mo	<	4	<	4	<	0.4	<	0.4	<	2	
Na		130		-		58		17		227	
Ni	<	0.9		2		2.4		3.9		22.8	
P	<	20	<	20		41.6		1200		1340	
Pb	<	9	<	9		1		0.8		3	
S		100	<	40		7		1650		2750	
Sb	<	9	<	9	<	0.8	<	0.8	<	3	
Se		10	<	9	<	0.8	<	0.8	<	3	
Si	<	20		30		1940		2400		205	
Sn	<	4	<	4	<	0.4	<	0.4	<	2	
Sr		5		86		4.9		12		120	
Th	<	4	<	4	<	0.4		1	<	2	
Ti	<	0.9	<	0.9		0.42		16.9		1270	
U		20	<	20		2	<	2	<	8	
V	<	4	<	4		2		1		51	
Zn	<	2		3		4.06		5.81		49.5	
Zr	<	0.4	<	0.4	<	0.04		0.08		2	