ENVIRONMENT CANADA
CONSERVATION AND PROTECTION
ENVIRONMENTAL PROTECTION
PACIFIC AND YUKON REGION
NORTH VANCOUVER, B.C.

BASELINE MONITORING
ESKAY CREEK PROJECT
- July 20, 1990 -

REGIONAL DATA REPORT: DR 91-05

by

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1.0 INTRODUCTION

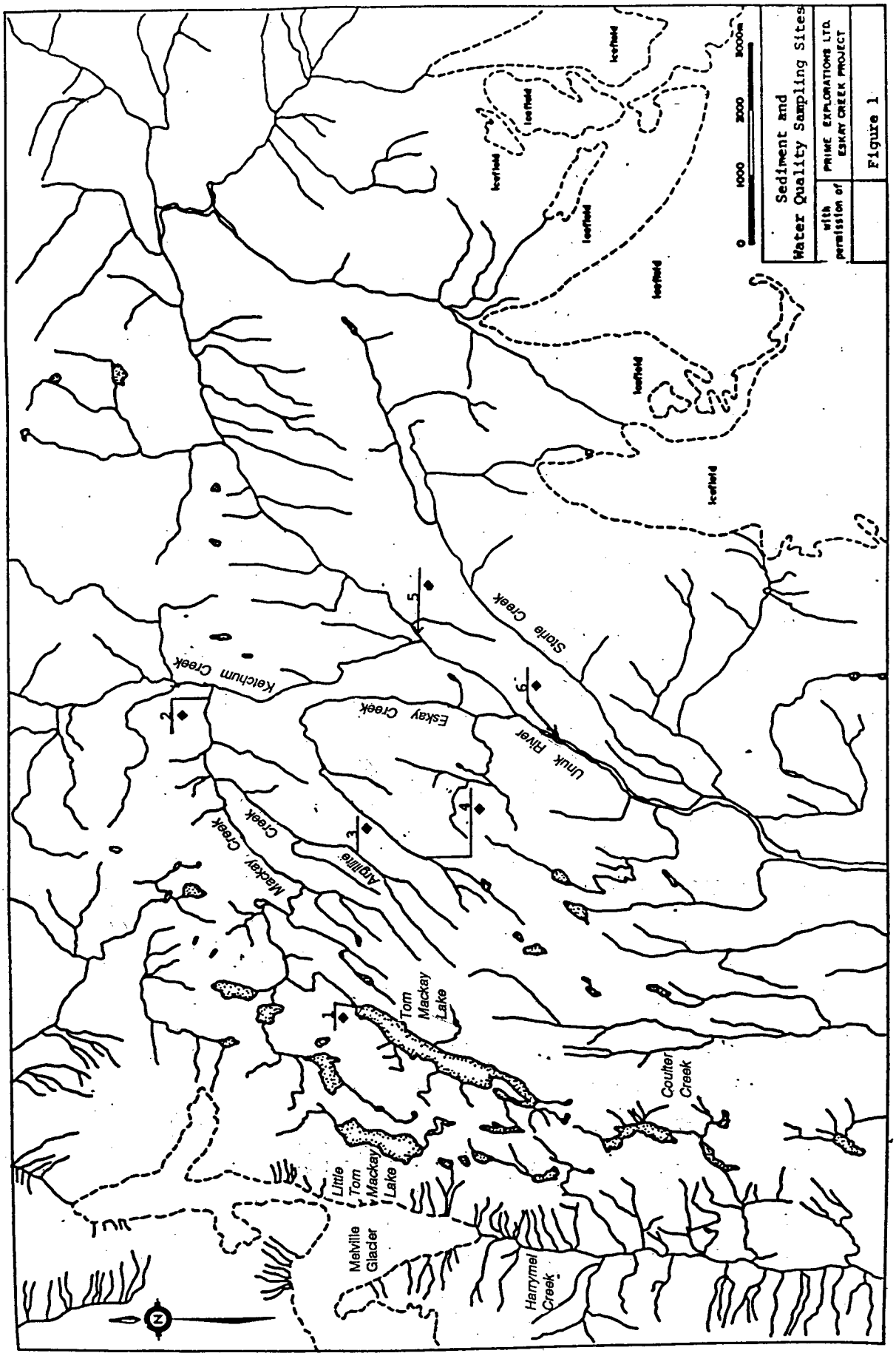
The Eskay Creek Project is located in the Unuk River watershed northwest of Stewart, B.C. The proposed mine is situated at an elevation of approximately 800 metres. The property is drained by Eskay Creek to the south, Mackay Creek to the north, and Ketchum Creek to the east. Mackay Creek is a tributary of Ketchum Creek, and Eskay and Ketchum Creeks are tributaries of the Unuk River which drains southwesterly to the Pacific Ocean after crossing the B.C./Alaska border 38 km downstream of Eskay Creek (Figure 1). Chinook, chum, and sockeye salmon, Dolly Varden char, and cutthroat trout are present in the Unuk River. Eskay Creek and Ketchum Creek contain barriers close to their confluences with the Unuk preventing the upstream migration of fish. Dolly Varden are the only fish species found in the Unuk River upstream of Storie Creek.

The mine will extract gold, silver, and some lead and zinc. The deposit is amenable to both open pit and underground mining; however, a decision on the final mine plan has not yet been made. The company proposes to discharge the tailings into Little Tom Mackay Lake and to dam Tom Mackay Lake for the generation of hydroelectric power. The area has a history of exploration going back to 1932 when the original stake was made.

2.0 SITE DESCRIPTION

Sample stations were established both above and below potential mine influence to determine baseline conditions in the area (Figure 1).

Station	Location	Remarks
1	Tom Mackay Lake outlet	Very clear waters
2	Mackay Creek upstream	Clear waters of Ketchum Creek
3	Argillite Creek	Small creek
4	Eskay Creek upstream of the camp	Small creek
5	Unuk River upstream of Ketchum Creek	Influenced by glaciers
6	Unuk River downstream of Eskay Creek	Influenced by glaciers


Sediment and
Water Quality Sampling Sites
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PRIME EXPLORATIONS LTD.
ESKAY CREEK PROJECT
Figure 1
0
1000
2000
3000m
Icefield
Stonia Creek
Unuk River
Eskay Creek
Kaichum Creek
Mackay Creek
Argillite
Tom Mackay Lake
Little Tom Mackay Lake
Melville Glacier
Harrymel Creek
Coulter Creek
1
2
3
4
5
6

3.0 MATERIAL AND METHODS

The site was visited on July 20, 1990. Water chemistry and sediment samples were collected at all stations except for Station 5 where only water chemistry samples were collected. The following chemical parameters were included in the analysis: alkalinity, pH, filterable residue, non-filterable residue, and sulphate. The samples were packed with ice until analysed. Dissolved metals were filtered the same day through a 0.45 micron cellulose nitrate membrane filter. Total and dissolved metals were preserved with 0.5 ml of nitric acid per 100 ml of sample. All samples were collected in clean polyethylene bottles. The bottles for metal samples were acid washed. Hardness was determined from the dissolved metal sample.

Inductively Coupled Argon Plasma (ICAP) Emission Spectroscopy was used for the total and dissolved metal analysis and gave a reading of twenty-eight metals. For cadmium, copper, and lead the samples were analysed with a graphite furnace when the values were below two times the detection limit of the ICAP procedure. Analytical methods were in accordance with the Environment Canada, Pacific Region, Laboratory Manual (Anon., 1979).

Sediment samples were collected from the streambed with a clean acrylic corer. Four replicates were taken at each site. The samples were transferred into kraft bags and kept cool until analysed. The samples were air dried, sieved to <150 µm, digested with aqua regia, and analysed for heavy metals using ICAP. A portion of the sediments was ignited at 550°C in a muffle furnace. The loss of weight was reported as volatile residue and the remaining residue was reported as fixed residue.

Sediment sequential extraction was performed at three stations (1, 2, and 6) to evaluate the potential mobility of metals in the sediment component. The methodology was based on the work of Tessier et al. (1979). Samples were air dried, sieved to <63 µm, and rolled to homogenise. The samples were then weighed into 50 ml centrifuge tubes and subjected to a sequential leaching procedure designed to partition trace metals into the following fractions:

1) F(a): Exchangeable metals. The sediment sample was extracted with 1M $MgCl_2$ initially at pH 7 at room temperature for one hour on a wrist action shaker.

2) F(b): Metals bound to carbonates or specifically adsorbed. The residue from (a) was leached with 1M sodium acetate adjusted to pH 5 with acetic acid at room temperature for five hours on a wrist action shaker.

3) F(c): Metals bound to Fe-Mn oxides. The residue from (b) was extracted at 96°C for six hours with 0.04M $NH_4OH.HCl$ in 25% (vol/vol) acetic acid.

4) F(d): Metals bound to organic matter and sulphides. The residue from (c) was extracted at 85°C for five hours with 0.02M HNO_3 and 30% H_2O_2 adjusted to pH 2 with HNO_3, and then at room temperature with 3.2M NH_4OAc in 20% (vol/vol) HNO_3 on a wrist action shaker.

5) F(e): Residual metals. The original dried samples were weighed in Teflon digestion vessels and digested with HNO_3 and HCl in a microwave oven, resulting in a total fraction (MT). The residual F(e) is calculated as $F(e) = MT - [F(a) + F(b) + F(c) + F(d)]$.

Analysis was performed via Inductively Coupled Argon Plasma (ICAP) Emission Spectroscopy. The internal laboratory reference material TATS-1 was used for this test to evaluate the performance of the procedure.

Statistical analyses consisted of determining averages and standard deviations for the water quality data. One-way analysis of variance was performed on selected sediment data. A significant difference was determined when the alpha probability was lower than 5% ($p < 0.05$). Multiple comparison procedures using Tukey's harmonic significant differences were used to produce the various plots. For the purpose of statistical analyses, results below the detection limit were represented as being at the detection limit. The standard deviation for Station 1 arsenic samples was zero. A slight variability was arbitrarily introduced so that Tukey's procedure would work. This modification does not introduce appreciable changes in the outcome (Atkinson, pers. comm., 1991).

4.0 RESULTS

The metal concentrations in water are found in Table 1, while other water quality results are found in Table 2. The sediment data are reported in Table 3. Tables 4 - 6 present the sediment sequential extraction for Stations 1, 2, and 6. Figure 2 shows the multiple comparison plots for the sediment separation and Figures 3 - 5 show selected metal distributions in the sediment extraction fractions for the three stations analysed.

Water quality samples from the Tom Mackay Lake outlet (Station 1) had very low alkalinity (8 mg/L) and hardness (9.4 mg/L). Non-filterable residues were not detected while total residue averaged 17 mg/L. Some total copper (2 µg/L) and lead (0.7 µg/L) were detected in the samples.

Total arsenic, copper, mercury, and lead content were low in sediments. Cadmium (2.2 µg/g) and zinc (472 µg/g) levels were slightly elevated for a background location (Table 3). Håkanson (1980) suggests that average pre-industrial values are 1 µg/g for cadmium and 175 µg/g for zinc. Elevated levels of cadmium and zinc at Station 1 could be a reflection of the mineralization in the area.

The sequential extraction suggests that 1 µg/g, or 50%, of the total cadmium in the sediment would be expected to leach at a pH of 5 (Table 4), while only 14% (70.3 µg/g) of the zinc in the sediment would likely leach at that pH. This procedure can be an indication of the availability of metals to biota. It suggests that only a small amount of cadmium might be available to the biota from the sediment.

Water quality samples from Tom Mackay Creek (Station 2) had low alkalinity (14 mg/L) and hardness (15.0 mg/L). Non-filterable residues were undetectable while total residues averaged 30 mg/L. No dissolved toxic metals were found in the samples except for natural water constituents such as calcium and magnesium. Total copper (0.9 µg/L) and lead (0.8 µg/L) was detected in the samples.

Total copper and lead content was low in sediments. Cadmium (2.0 µg/g) and zinc (397 µg/g) levels were slightly elevated for a background location. The levels were lower than at Station 1 though this difference

was not significant ($p > 0.05$). Arsenic was slightly elevated (22 µg/g), but was not significantly higher than Station 1. The mercury concentration at Station 2 was the highest level of all stations in the survey (0.692 µg/g), and was significantly higher than at Station 1. The sequential extraction suggested that 0.55 µg/g (or 55%) of the cadmium in the sediment would leach at a pH of 5 (Table 5), while only 13% (48.4 µg/g) of the zinc in the sediment would leach at that pH.

Argillite Creek (Station 3) is a small creek to the north of the ore body. Water quality samples had a low alkalinity and hardness, low total residues, and low total metal content. Sediment metal concentrations were low for copper (48.6 µg/g) and lead (21 µg/g). The arsenic level (42 µg/g) was significantly higher than at Stations 1 and 2, and mercury (0.265 µg/g) was significantly higher than Station 1, but significantly lower than Station 2. Cadmium (2.9 µg/g) was higher and zinc (383 µg/g) was lower than at Stations 1 and 2, but they were not significantly different.

The water quality at Eskay Creek upstream of the camp (Station 4) was similar to that at Station 3; however, sediment concentrations were higher for arsenic (96 µg/g), cadmium (8.0 µg/g), copper (93.3 µg/g), lead (253 µg/g), and zinc (1054 µg/g). All these metals were significantly higher than those found at the other stations. The mercury concentration was also elevated (0.650 µg/g) but was not significantly different than at Station 2. Past mining exploration in zone 22 (Emma adit area) may be responsible for these higher sediment metal concentrations. During the survey some orange seeps were noticed along the creek. This may be an indication of acid rock drainage present above the camp.

Unuk River upstream of Ketchum Creek (Station 5) and Unuk River downstream of Eskay Creek (Station 6) had high levels of suspended sediment in the water samples. The non-filterable residues were 117 mg/L and 71 mg/L, respectively. Total copper concentrations at Stations 5 and 6, respectively, were 19.1 µg/g and 10.7 µg/g; for lead, 8 µg/g and 6.7 µg/g; and for zinc, 23 µg/g and 13 µg/g.

Total cadmium (1.0 µg/g) and zinc (132 µg/g) sediment content were lowest at Station 6 of all stations. Low levels of lead (22 µg/g) and

mercury (0.140 µg/g) were found in the sediments, while substantial arsenic values were found (45 µg/g) at this station. The sequential extraction indicated that 0.6 µg/g (75%) of the total cadmium content would leach at a pH of 5, while only 14.2 µg/g (14%) of zinc would leach. This indicates that a higher proportion of cadmium could potentially be available to the downstream biota. More replications of cadmium sequential extraction analyses should be performed and potential sources of mobile cadmium should be the subject of more investigation.

TABLE 1: METAL WATER QUALITY - ESKAY CREEK PROJECT - July 20, 1990

Station Number		TOTICP AG MG/L	DISICP AG MG/L	TOTICP AL MG/L	DISICP AL MG/L	TOTICP AS MG/L	DISICP AS MG/L	TOTICP BA MG/L	DISICP BA MG/L	TOTICP CA MG/L	DISICP CA MG/L	TOTICP CD MG/L	TOTGF CD MG/L	DISICP CD MG/L	DISGF CD MG/L	TOTICP CR MG/L	DISICP CR MG/L
	Repl.1	<.01	<.01	<.05	<.05	0.05	<.05	0.007	0.005	2.9	2.8	<.005	<.0001	<.005	<.0001	0.006	<.005
1	Repl.2	<.01	<.01	<.05	<.05	<.05	<.05	0.005	0.005	2.9	2.8	<.005	<.0001	<.005	<.0001	0.010	<.005
	Repl.3	<.01	<.01	<.05	<.05	0.08	<.05	0.005	0.005	2.8	2.7	<.005	<.0001	<.005	<.0001	0.006	<.005
	Average	---	---	---	---	0.07	---	0.006	0.005	2.9	2.8	---	---	---	---	0.007	---
	S.D.	---	---	---	---	0.02	---	0.001	0.000	0.1	0.1	---	---	---	---	0.002	---
	Repl.1	<.01	<.01	0.20	<.05	0.11	<.05	0.014	0.011	4.9	4.7	<.005	<.0001	<.005	<.0001	0.008	<.005
2	Repl.2	<.01	<.01	0.16	<.05	0.10	<.05	0.019	0.011	4.9	4.6	<.005	<.0001	<.005	<.0001	0.009	<.005
	Repl.3	<.01	<.01	0.16	0.05	0.08	<.05	0.015	0.011	4.9	4.7	<.005	<.0001	<.005	<.0001	0.005	<.005
	Average	---	---	0.17	---	0.10	---	0.016	0.011	4.9	4.7	---	---	---	---	0.007	---
	S.D.	---	---	0.02	---	0.02	---	0.003	0.000	0.0	0.1	---	---	---	---	0.002	---
	Repl.1	<.01	<.01	<.05	<.05	<.05	<.05	0.007	0.006	3.6	3.5	<.005	<.0001	<.005	<.0001	<.005	<.005
3	Repl.2	<.01	<.01	<.05	<.05	<.05	<.05	0.007	0.006	3.7	3.6	<.005	<.0001	<.005	<.0001	0.009	<.005
	Repl.3	<.01	<.01	<.05	<.05	<.05	<.05	0.008	0.006	3.7	3.6	<.005	<.0001	<.005	<.0001	0.007	<.005
	Average	---	---	---	---	---	---	0.007	0.006	3.7	3.6	---	---	---	---	0.008	---
	S.D.	---	---	---	---	---	---	0.001	0.000	0.1	0.1	---	---	---	---	0.001	---
	Repl.1	<.01	<.01	<.05	<.05	0.08	<.05	0.009	0.008	2.8	2.8	<.005	<.0001	<.005	<.0001	<.005	<.005
4	Repl.2	<.01	<.01	<.05	<.05	<.05	<.05	0.010	0.008	2.7	2.8	<.005	<.0001	<.005	<.0001	0.008	<.005
	Repl.3	<.01	<.01	<.05	<.05	<.05	<.05	0.009	0.008	2.8	2.8	<.005	<.0001	<.005	<.0001	0.005	<.005
	Average	---	---	---	---	---	---	0.009	0.008	2.8	2.8	---	---	---	---	0.007	---
	S.D.	---	---	---	---	---	---	0.001	0.000	0.1	0.0	---	---	---	---	0.002	---
	Repl.1	<.01	<.01	9.39	0.07	<.05	<.05	0.189	0.016	19.4	12.7	<.005	<.0001	<.005	0.0002	0.019	<.005
5	Repl.2	<.01	<.01	9.76	0.07	<.05	<.05	0.195	0.016	20.6	12.7	<.005	<.0001	<.005	<.0001	0.018	<.005
	Repl.3	<.01	<.01	10.10	0.06	<.05	<.05	0.202	0.016	19.9	12.6	<.005	<.0001	<.005	<.0001	0.018	<.005
	Average	---	---	9.75	0.07	---	---	0.195	0.016	20.0	12.7	---	---	---	---	0.018	---
	S.D.	---	---	0.36	0.01	---	---	0.007	0.000	0.6	0.1	---	---	---	---	0.001	---
	Repl.1	<.01	<.01	6.14	0.05	<.05	<.05	0.124	0.015	13.9	11.5	<.005	<.0001	<.005	<.0001	0.017	<.005
6	Repl.2	<.01	<.01	6.32	0.06	<.05	<.05	0.130	0.015	14.8	11.5	<.005	<.0001	<.005	<.0001	0.017	<.005
	Repl.3	<.01	<.01	6.39	0.07	<.05	<.05	0.139	0.015	14.7	11.4	<.005	<.0001	<.005	<.0001	0.013	<.005
	Average	---	---	6.28	0.06	---	---	0.131	0.015	14.5	11.5	---	---	---	---	0.016	---
	S.D.	---	---	0.13	0.01	---	---	0.008	0.000	0.5	0.1	---	---	---	---	0.002	---
Blank	1	<.01	<.01	<.05	<.05	0.05	<.05	<.001	<.001	<.1	<.1	<.005	<.0001	<.005	<.0001	0.008	<.005

TABLE 1 (cont): METAL WATER QUALITY - ESKAY CREEK PROJECT - July 20, 1990

Station Number		TOTICP CU MG/L	TOTGF CU MG/L	DISICP CU MG/L	DISGF CU MG/L	TOTICP FE MG/L	DISICP FE MG/L	TOTICP K MG/L	DISICP K MG/L	TOTICP MG MG/L	DISICP MG MG/L	TOTICP MN MG/L	DISICP MN MG/L	TOTICP MO MG/L	DISICP MO MG/L	TOTICP NI MG/L	DISICP NI MG/L
	Repl.1	<.005	0.0044	<.005	<.0005	0.012	<.005	<2	<2	0.6	0.6	<.001	<.001	<.01	<.01	<.02	<.02
1	Repl.2	<.005	0.0007	<.005	<.0005	0.006	<.005	<2	<2	0.6	0.6	<.001	<.001	<.01	<.01	<.02	<.02
	Repl.3	<.005	0.0008	<.005	<.0005	<.005	<.005	<2	<2	0.6	0.6	<.001	<.001	<.01	<.01	<.02	<.02
	Average	---	0.0020	---	---	0.009	---	---	---	0.6	0.6	---	---	---	---	---	---
	S.D.	---	0.0021	---	---	0.004	---	---	---	0.0	0.0	---	---	---	---	---	---
	Repl.1	<.005	0.0014	<.005	<.0005	0.226	0.011	<2	<2	1.0	0.9	0.012	0.009	<.01	<.01	<.02	<.02
2	Repl.2	<.005	0.0007	<.005	<.0005	0.201	0.011	5	<2	1.0	0.8	0.012	0.009	<.01	<.01	<.02	<.02
	Repl.3	<.005	0.0006	<.005	<.0005	0.211	0.011	<2	<2	1.0	0.8	0.012	0.009	<.01	<.01	<.02	<.02
	Average	---	0.0009	---	---	0.213	0.011	---	---	1.0	0.8	0.012	0.009	---	---	---	---
	S.D.	---	0.0004	---	---	0.013	0.000	---	---	0.0	0.1	0.000	0.000	---	---	---	---
	Repl.1	<.005	0.0008	<.005	<.0005	0.010	<.005	<2	<2	0.4	0.4	<.001	<.001	<.01	<.01	<.02	<.02
3	Repl.2	<.005	0.0007	<.005	<.0005	0.009	<.005	<2	<2	0.4	0.4	<.001	<.001	<.01	<.01	<.02	<.02
	Repl.3	<.005	0.0007	<.005	<.0005	0.022	<.005	<2	<2	0.4	0.4	<.001	<.001	<.01	<.01	<.02	<.02
	Average	---	0.0007	---	---	0.014	---	---	---	0.4	0.4	---	---	---	---	---	---
	S.D.	---	0.0001	---	---	0.007	---	---	---	0.0	0.0	---	---	---	---	---	---
	Repl.1	<.005	0.0007	<.005	<.0005	0.035	<.005	<2	<2	0.4	0.4	<.001	<.001	<.01	<.01	<.02	<.02
4	Repl.2	<.005	0.0010	<.005	<.0005	0.019	<.005	<2	<2	0.4	0.4	<.001	<.001	<.01	<.01	<.02	<.02
	Repl.3	<.005	<.0006	<.005	<.0005	0.016	<.005	<2	<2	0.4	0.4	<.001	<.001	<.01	<.01	<.02	<.02
	Average	---	0.0009	---	---	0.023	---	---	---	0.4	0.4	---	---	---	---	---	---
	S.D.	---	0.0002	---	---	0.010	---	---	---	0.0	0.0	---	---	---	---	---	---
	Repl.1	0.020	0.0201	<.005	<.0005	9.520	0.061	2	<2	5.1	1.6	0.239	0.022	<.01	<.01	<.02	<.02
5	Repl.2	0.018	0.0184	<.005	<.0005	9.990	0.083	4	<2	5.4	1.6	0.265	0.023	<.01	<.01	<.02	<.02
	Repl.3	0.017	0.0189	<.005	<.0005	9.810	0.063	3	<2	5.3	1.6	0.255	0.022	<.01	<.01	<.02	<.02
	Average	0.018	0.0191	---	---	9.773	0.069	3	---	5.3	1.6	0.253	0.022	---	---	---	---
	S.D.	0.002	0.0009	---	---	0.237	0.012	1	---	0.2	0.0	0.013	0.001	---	---	---	---
	Repl.1	0.010	0.0100	<.005	<.0005	5.750	0.048	<2	<2	3.7	1.6	0.139	0.018	<.01	<.01	<.02	<.02
6	Repl.2	0.011	0.0110	<.005	<.0005	6.130	0.055	<2	<2	3.9	1.6	0.150	0.018	<.01	<.01	<.02	<.02
	Repl.3	0.011	0.0110	<.005	<.0005	5.990	0.054	<2	<2	3.8	1.6	0.145	0.018	<.01	<.01	<.02	<.02
	Average	0.011	0.0107	---	---	5.957	0.052	---	---	3.8	1.6	0.145	0.018	---	---	---	---
	S.D.	0.001	0.0006	---	---	0.192	0.004	---	---	0.1	0.0	0.006	0.000	---	---	---	---
Blank		<.005	<.0006	<.005	<.0005	<.005	<.005	<2	<2	<.1	<.1	<.001	<.001	<.01	<.01	<.02	<.02

TABLE 1 (cont):

METAL WATER QUALITY - ESKAY CREEK PROJECT -
July 20, 1990

Station Number		TOTICP P MG/L	DISICP P MG/L	TOTICP PB MG/L	TOTGF PB MG/L	DISICP PB MG/L	DISGF PB MG/L	TOTICP SB MG/L	DISICP SB MG/L	TOTICP SI MG/L	DISICP SI MG/L	TOTICP SN MG/L	DISICP SN MG/L	TOTICP SR MG/L	DISICP SR MG/L	TOTICP ZN MG/L	DISICP ZN MG/L
	Repl.1	<.1	<.1	<.05	0.0008	<.05	<.0005	<.05	<.05	0.74	0.74	<.05	<.05	0.036	0.035	<.002	<.002
1	Repl.2	<.1	<.1	<.05	0.0006	<.05	<.0005	<.05	<.05	0.74	0.73	<.05	<.05	0.036	0.035	<.002	<.002
	Repl.3	<.1	<.1	<.05	<.0006	<.05	<.0005	<.05	<.05	0.73	0.72	<.05	<.05	0.036	0.035	<.002	<.002
	Average	---	---	---	0.0007	---	---	---	---	0.74	0.73	---	---	0.036	0.035	---	---
	S.D.	---	---	---	0.0001	---	---	---	---	0.01	0.01	---	---	0.000	0.000	---	---
	Repl.1	<.1	<.1	<.05	<.0006	<.05	<.0005	<.05	<.05	1.19	0.97	<.05	<.05	0.044	0.043	<.002	<.002
2	Repl.2	<.1	<.1	<.05	0.0010	<.05	<.0005	<.05	<.05	1.17	0.96	<.05	<.05	0.044	0.042	<.002	<.002
	Repl.3	<.1	<.1	<.05	0.0006	<.05	<.0005	<.05	<.05	1.19	0.94	<.05	<.05	0.044	0.042	<.002	0.003
	Average	---	---	---	0.0008	---	---	---	---	1.18	0.96	---	---	0.044	0.042	---	---
	S.D.	---	---	---	0.0003	---	---	---	---	0.01	0.02	---	---	0.000	0.001	---	---
	Repl.1	<.1	<.1	<.05	<.0006	<.05	<.0005	<.05	<.05	0.76	0.75	<.05	<.05	0.028	0.028	<.002	<.002
3	Repl.2	<.1	<.1	<.05	<.0006	<.05	<.0005	<.05	<.05	0.74	0.75	<.05	<.05	0.029	0.029	<.002	<.002
	Repl.3	<.1	<.1	<.05	<.0006	<.05	<.0005	<.05	<.05	0.74	0.75	<.05	<.05	0.029	0.028	<.002	<.002
	Average	---	---	---	---	---	---	---	---	0.75	0.75	---	---	0.029	0.028	---	---
	S.D.	---	---	---	---	---	---	---	---	0.01	0.00	---	---	0.001	0.001	---	---
	Repl.1	<.1	<.1	<.05	0.0009	<.05	<.0005	<.05	<.05	0.72	0.71	<.05	<.05	0.020	0.020	<.002	0.002
4	Repl.2	<.1	<.1	<.05	<.0006	<.05	<.0005	<.05	<.05	0.70	0.72	<.05	<.05	0.020	0.020	<.002	0.003
	Repl.3	<.1	<.1	<.05	<.0006	<.05	<.0005	<.05	<.05	0.70	0.71	<.05	<.05	0.020	0.020	<.002	0.002
	Average	---	---	---	---	---	---	---	---	0.71	0.71	---	---	0.020	0.020	---	---
	S.D.	---	---	---	---	---	---	---	---	0.01	0.01	---	---	0.000	0.000	---	---
	Repl.1	0.4	<.1	<.05	0.0072	<.05	<.0005	<.05	<.05	18.50	0.66	<.05	<.05	0.153	0.100	0.022	<.002
5	Repl.2	0.5	<.1	<.05	0.0086	<.05	<.0005	<.05	<.05	19.20	0.66	<.05	<.05	0.161	0.099	0.024	<.002
	Repl.3	0.4	<.1	<.05	0.0083	<.05	<.0005	<.05	<.05	23.80	0.64	<.05	<.05	0.157	0.099	0.022	<.002
	Average	0.4	---	---	0.0080	---	---	---	---	20.50	0.65	---	---	0.157	0.099	0.023	---
	S.D.	0.1	---	---	0.0007	---	---	---	---	2.88	0.01	---	---	0.004	0.001	0.001	---
	Repl.1	0.2	<.1	<.05	0.0067	<.05	<.0005	<.05	<.05	12.20	0.73	<.05	<.05	0.124	0.097	0.014	<.002
6	Repl.2	0.3	<.1	<.05	0.0062	<.05	<.0005	<.05	<.05	12.50	0.74	<.05	<.05	0.130	0.097	0.013	<.002
	Repl.3	0.2	<.1	<.05	0.0073	<.05	<.0005	<.05	<.05	12.70	0.75	<.05	<.05	0.128	0.096	0.013	<.002
	Average	0.2	---	---	0.0067	---	---	---	---	12.47	0.74	---	---	0.127	0.097	0.013	---
	S.D.	0.1	---	---	0.0006	---	---	---	---	0.25	0.01	---	---	0.003	0.001	0.001	---
Blank		<.1	<.1	<.05	<.0006	<.05	<.0005	<.05	<.05	0.08	<.05	<.05	<.05	<.001	<.001	<.002	<.002

TABLE 2:

WATER QUALITY - IMMEDIATES - ESKAY CREEK PROJECT - July 20, 1990

Station Number		ALK MG/L	PH REL.U.	DISICP HC MG/L	DISICP HT MG/L	SO4 MG/L	NFR MG/L	TR MG/L
	Repl.1	8	6.9	9.5	9.6	3.7	<5	20
1	Repl.2	8	7.1	9.4	9.5	3.3	<5	20
	Repl.3	8	7.0	9.2	9.2	2.9	<5	10
	Average	8	7.0	9.4	9.4	3.3	---	17
	S.D.	0	0.1	0.2	0.2	0.4	---	6
	Repl.1	14	7.3	15.2	15.5	4.0	<5	30
2	Repl.2	14	7.3	15.0	15.3	3.7	<5	30
	Repl.3	15	7.4	14.8	15.2	3.6	<5	30
	Average	14	7.3	15.0	15.3	3.8	---	30
	S.D.	1	0.1	0.2	0.2	0.2	---	0
	Repl.1	10	7.2	10.5	10.4	2.3	<5	<10
3	Repl.2	10	7.2	10.7	10.8	1.9	<5	<10
	Repl.3	10	7.1	10.6	10.6	1.9	<5	10
	Average	10	7.2	10.6	10.6	2.0	---	---
	S.D.	0	0.1	0.1	0.2	0.2	---	---
	Repl.1	7	7.0	8.6	8.7	2.4	<5	10
4	Repl.2	7	7.0	8.8	8.9	2.5	<5	<10
	Repl.3	7	7.0	8.9	8.9	2.5	<5	20
	Average	7	7.0	8.8	8.8	2.5	---	15
	S.D.	0	0.0	0.2	0.1	0.1	---	7
	Repl.1	48	7.9	38.5	39.1	9.0	121	206
5	Repl.2	39	7.9	38.5	39.2	9.3	110	211
	Repl.3	39	7.9	38.0	38.6	9.5	120	230
	Average	42	7.9	38.3	39.0	9.3	117	216
	S.D.	5	0.0	0.3	0.3	0.3	6	13
	Repl.1	34	7.8	35.3	35.8	8.2	72	160
6	Repl.2	33	7.8	35.3	35.9	8.7	70	150
	Repl.3	33	7.8	35.0	35.6	8.8	70	150
	Average	33	7.8	35.2	35.8	8.6	71	153
	S.D.	1	0.0	0.2	0.2	0.3	1	6
Blank		<1	5.4	<.4	<.4	<.5	<5	<10

TABLE 3: SEDIMENT QUALITY - ESKAY CREEK PROJECT - July 20, 1990

Station Number		SEDICP AG UG/G	SEDICP AL UG/G	SEDICP AS UG/G	SEDICP BA UG/G	SEDICP BE UG/G	SEDICP CA UG/G	SEDICP CD UG/G	SEDICP CO UG/G	SEDICP CR UG/G	SEDICP CU UG/G	SEDICP FE UG/G	SEDHG HG UG/G	SEDICP K UG/G	SEDICP MG UG/G	SEDICP MN UG/G
	Repl.1	<2	29800	<8	187	2.0	3990	2.1	<20	76.4	49.2	46800	0.067	3200	14300	648
	Repl.2	<2	31700	<8	186	1.7	4330	2.6	<20	78.8	56.2	50800	0.071	3100	15100	722
1	Repl.3	<2	28100	<8	198	2.0	4070	2.0	<20	77.3	46.4	46900	0.054	3000	13500	553
	Repl.4	<2	31900	<8	324	1.7	2740	2.0	<20	87.4	51.5	47000	0.067	3500	14300	705
	Average	---	30375	---	224	1.9	3783	2.2	---	80.0	50.8	47875	0.065	3200	14800	657
	S.D.	---	1788	---	67	0.2	710	0.3	---	5.0	4.1	1952	0.007	216	600	76
	Repl.1	<2	17300	28	540	1.0	6250	1.9	<20	58.0	62.3	42900	0.661	2900	10000	430
	Repl.2	<2	15200	29	480	1.0	6150	2.0	<20	53.4	59.1	41700	0.690	2200	9680	425
2	Repl.3	<2	15200	17	509	1.0	6580	1.9	<20	54.7	74.4	44400	0.719	2000	10200	440
	Repl.4	<2	15700	15	445	1.0	5250	2.0	<20	54.6	58.1	41400	0.699	2500	9240	441
	Average	---	15850	22	494	1.0	6058	2.0	---	55.2	63.5	42600	0.692	2400	9780	434
	S.D.	---	995	7	41	0.0	569	0.1	---	2.0	7.5	1364	0.024	392	410	8
	Repl.1	<2	28400	55	220	2.0	4430	2.8	<20	95.7	48.1	55700	0.272	2400	14500	2380
	Repl.2	<2	29700	41	211	2.0	4320	2.1	<20	106.0	48.7	58500	0.245	2500	16100	2050
3	Repl.3	<2	27800	45	209	2.0	4490	3.4	<20	101.0	45.1	55400	0.262	2500	14600	2230
	Repl.4	<2	31200	27	273	2.2	4900	3.2	<20	102.0	52.4	60900	0.281	2600	15300	2670
	Average	---	29275	42	228	2.1	4535	2.9	---	101.2	48.6	57625	0.265	2500	15125	2383
	S.D.	---	1509	12	30	0.1	253	0.6	---	4.2	3.0	2591	0.015	82	741	352
	Repl.1	<2	27300	95	390	2.4	4000	13.0	<20	51.6	103.0	62300	0.610	2300	9970	14900
	Repl.2	<2	29000	96	293	2.6	4260	6.1	<20	56.4	87.9	62800	0.672	2400	11300	5790
4	Repl.3	<2	30500	97	335	2.9	4320	6.8	<20	56.8	91.3	63800	0.657	2800	11300	5870
	Repl.4	<2	29300	96	297	2.6	4120	5.9	<20	56.0	91.0	62900	0.660	2400	11000	5620
	Average	---	29025	96	329	2.6	4175	8.0	---	55.2	93.3	62950	0.650	2475	10893	8045
	S.D.	---	1320	1	45	0.2	144	3.4	---	2.4	6.6	624	0.027	222	631	4571
	Repl.1	<2	15700	56	290	1.0	34900	1.0	<20	41.6	75.9	40200	0.130	2000	12900	742
	Repl.2	<2	16400	28	242	1.0	32900	1.0	<20	44.4	62.9	35600	0.110	1900	12700	714
6	Repl.3	<2	15100	46	317	0.9	32500	1.0	<20	41.1	73.8	39400	0.170	2000	11900	711
	Repl.4	<2	17900	50	358	1.0	34600	0.9	<20	48.1	68.5	41200	0.150	2100	13400	763
	Average	---	16275	45	302	1.0	33725	1.0	---	43.8	70.3	39100	0.140	2000	12725	733
	S.D.	---	1207	12	49	0.0	1201	0.0	---	3.2	5.8	2447	0.026	82	624	25

TABLE 3 (cont):

SEDIMENT QUALITY - ESKAY CREEK PROJECT -
July 20, 1990

Station Number		SEDICP MO UG/G	SEDICP NA UG/G	SEDICP NI UG/G	SEDICP P UG/G	SEDICP PB UG/G	SEDICP SB UG/G	SEDICP SI UG/G	SEDICP SN UG/G	SEDICP SR UG/G	SEDICP TI UG/G	SEDICP V UG/G	SEDICP ZN UG/G	SFR MG/KG	SVR MG/KG
	Repl.1	<2	1100	120	920	22	<8	1120	<8	42.9	986	70	499	943000	56500
	Repl.2	<2	1300	130	970	25	<8	1200	<8	48.1	1150	75	473	952000	48400
1	Repl.3	<2	1500	130	830	30	<8	1170	<8	46.0	913	69	394	962000	38300
	Repl.4	<2	510	130	910	23	<8	1160	<8	36.2	363	70	523	947000	53200
	Average	---	1103	128	908	25	---	1163	---	43.3	853	71	472	951000	49100
	S.D.	---	427	5	58	4	---	33	---	5.2	341	3	56	8206	7931
	Repl.1	6	100	120	590	19	10	943	<8	60.4	21	51	387	962000	38200
	Repl.2	6	200	120	600	10	10	944	<8	59.2	16	45	386	961000	38600
2	Repl.3	6	180	120	620	19	17	1030	<8	62.3	23	47	409	964000	36000
	Repl.4	5	220	120	570	19	10	968	<8	51.3	19	46	407	963000	37300
	Average	6	175	120	595	17	12	971	---	58.3	20	47	397	962500	37525
	S.D.	1	53	0	21	5	3	41	---	4.8	3	3	12	1291	1153
	Repl.1	6	680	93	1000	22	20	1130	<8	36.6	1420	110	355	926000	74400
	Repl.2	5	890	96	1000	20	20	1150	<8	38.1	1410	120	365	940000	60200
3	Repl.3	6	740	98	1000	24	23	1060	<8	36.2	1300	110	370	930000	69800
	Repl.4	7	1000	110	1200	17	19	1160	<8	41.5	1480	120	442	928000	71900
	Average	6	828	99	1050	21	21	1125	---	38.1	1403	115	383	931000	69075
	S.D.	1	145	7	100	3	2	45	---	2.4	75	6	40	6218	6208
	Repl.1	20	830	81	1200	250	<8	1040	<8	38.1	898	56	1310	913000	86700
	Repl.2	7	1100	82	1200	263	10	1160	<8	38.3	1110	64	965	916000	84300
4	Repl.3	7	850	65	1200	253	<8	1050	<8	36.8	1080	66	1050	916000	83600
	Repl.4	8	910	75	1200	247	10	1140	<8	37.6	1050	64	891	913000	86700
	Average	11	923	76	1200	253	10	1098	---	37.7	1035	63	1054	914500	85325
	S.D.	6	123	8	0	7	0	61	---	0.7	94	4	183	1732	1613
	Repl.1	<2	370	32	1760	25	<8	892	<8	134.0	1520	110	137	984000	15700
	Repl.2	<2	370	31	1600	10	<8	789	<8	124.0	1480	100	109	985000	15100
6	Repl.3	<2	370	34	1700	27	<8	824	<8	127.0	1430	100	160	983000	17000
	Repl.4	<2	390	36	1700	27	8	792	<8	136.0	1560	120	121	983000	16600
	Average	---	375	33	1690	22	---	824	---	130.3	1498	108	132	983750	16100
	S.D.	---	10	2	66	8	---	48	---	5.7	56	10	22	957	860

TABLE 4: SEDIMENT SEQUENTIAL EXTRACTION - STATION 1, TOM MACKAY LAKE OUTLET - JULY 20, 1990

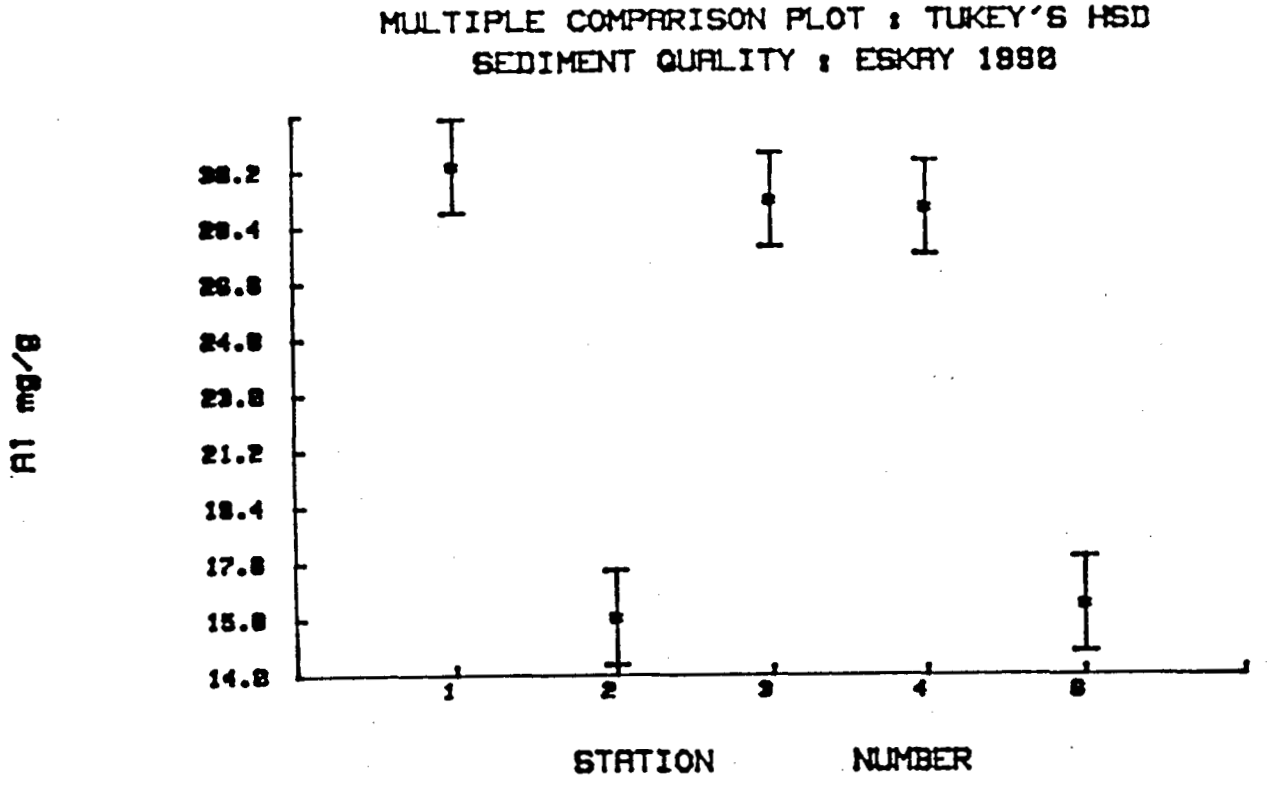
Metals (µg/g)	Exchange-able	Carbonates	Fe+Mn Oxide	Organic & Sulphides	Residual	Total
Ag	<0.4	<0.4	<0.4	<0.4	<2	<2
Al	<2	247	1760	1600	32100	35700
As	<2	<2	<2	<2	<8	<8
Ba	16.2	18.4	18.8	5.94	235	294
Be	<0.04	0.1	0.64	0.1	0.86	1.7
Ca	950	93	140	806	1430	3420
Cd	0.66	0.3	0.61	<0.2	<0.8	2
Co	<4	<4	10	<4	<10	<20
Cr	<0.2	0.3	2.4	2.2	89	93.9
Cu	<0.2	1.4	10.2	14.4	29.4	55.4
Fe	<2	20	7040	2070	38000	47100
K	<80	<80	930	<80	4370	5300
Mn	13.4	66.7	353	12.8	490	936
Mo	<0.4	<0.4	<0.4	0.8	<2.2	3
Ni	<0.8	4.4	14	5.7	106	130
P	<4	<4	80	737	283	1100
Pb	<2	<2	<2	3	<15	18
Sb	<2	<2	8.1	<2	<8	<8
Sn	<2	<2	<2	<2	<8	<8
Sr	12.6	2.3	2.7	7.29	15.7	40.6
Ti	<0.08	<0.08	<0.08	278	473	751
V	<0.4	<0.4	4	3	77	84
Zn	26	44.3	154	47.6	237	509

TABLE 5: SEDIMENT SEQUENTIAL EXTRACTION - STATION 2, TOM MACKAY CREEK ABOVE KETCHUM CREEK - JULY 20, 1990

Metals (µg/g)	Exchange-able	Carbonates	Fe+Mn Oxide	Organic & Sulphides	Residual	Total
Ag	<0.4	<0.4	<0.4	<0.4	<2	<2
Al	<2	66.8	464	978	14000	15500
As	<2	<2	<2	<2	<29	29
Ba	37.1	75.7	50.4	11.6	362	537
Be	<0.04	0.1	0.45	0.1	0.35	1
Ca	1200	3020	596	568	1430	6810
Cd	<0.2	0.55	0.4	<0.2	<0.05	1
Co	<4	9	<4	<4	<11	<20
Cr	<0.2	0.3	3.2	2.3	49.9	55.7
Cu	<0.2	2.8	7.25	25.6	26.8	62.4
Fe	<2	315	5200	5970	34400	45900
K	<80	<80	1300	<80	900	2200
Mn	9.07	232	44.8	12.9	146	445
Mo	<0.4	<0.4	<0.4	0.5	<5.5	6
Ni	<0.8	11	11	15	93	130
P	<4	<4	40	370	290	700
Pb	<2	<2	2	<2	<18	20
Sb	<2	<2	6.4	<2	<3.6	10
Sn	<2	<2	<2	<2	<8	<8
Sr	10.9	20.7	10	5.32	17.9	64.8
Ti	<0.08	<0.08	<0.08	1.2	14.8	16
V	<0.4	<0.4	3	2	42	47
Zn	1.6	46.8	68.9	31.6	221	370

TABLE 6: SEDIMENT SEQUENTIAL EXTRACTION - STATION 6, UNUK RIVER BELOW ESKAY CREEK - JULY 20, 1990

Metals (µg/g)	Exchange-able	Carbonates	Fe+Mn Oxide	Organic & Sulphides	Residual	Total
Ag	<0.4	<0.4	<0.4	<0.4	<2	<2
Al	<2	46.4	668	977	13600	15300
As	4	<2	7.8	6.9	<1.3	20
Ba	23.1	58.1	20.2	7.76	81.8	191
Be	<0.04	0.08	0.3	0.05	0.47	0.9
Ca	1080	26600	706	2310	1400	32100
Cd	0.2	0.4	<0.2	<0.2	<0.2	<0.8
Co	<4	<4	<4	<4	<20	<20
Cr	0.2	<0.2	3	1.9	38.4	43.5
Cu	<0.2	3.4	2.7	42.7	14.7	63.5
Fe	<2	238	5670	4650	25500	36100
K	<80	550	2000	<80	<80	2000
Mn	4.59	363	48.7	25.1	316	757
Mo	<0.4	<0.4	<0.4	0.5	<1.5	<2
Ni	<0.8	3	3	6.4	20.6	33
P	<4	4	200	1490	<4	1700
Pb	<2	<2	<2	<2	<20	20
Sb	<2	<2	<2	<2	<8	<8
Sn	<2	<2	<2	<2	<8	<8
Sr	6.66	80.1	6.23	12.8	17.2	123
Ti	<0.08	<0.08	<0.08	13.3	1210	1220
V	<0.4	<0.4	7.3	5.9	85.8	99
Zn	<0.08	14.2	17.5	10.4	53.2	95.3



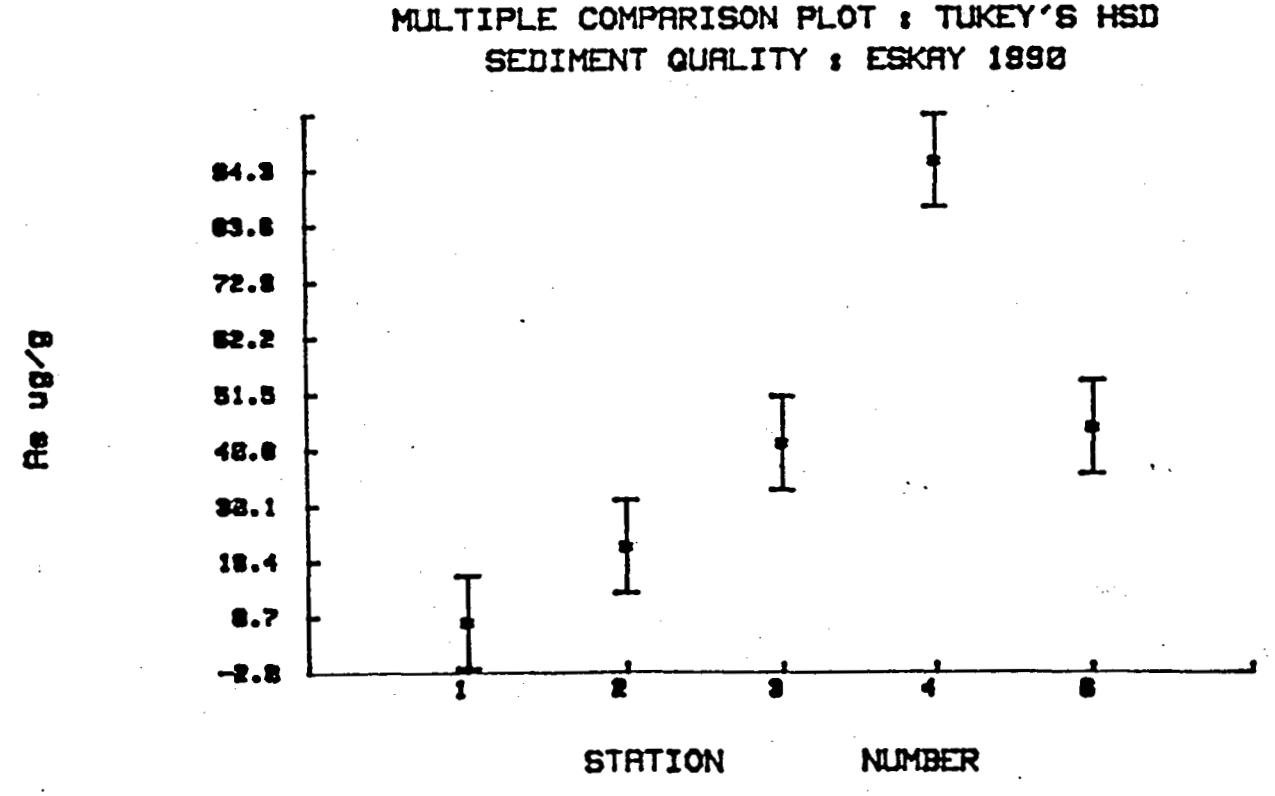
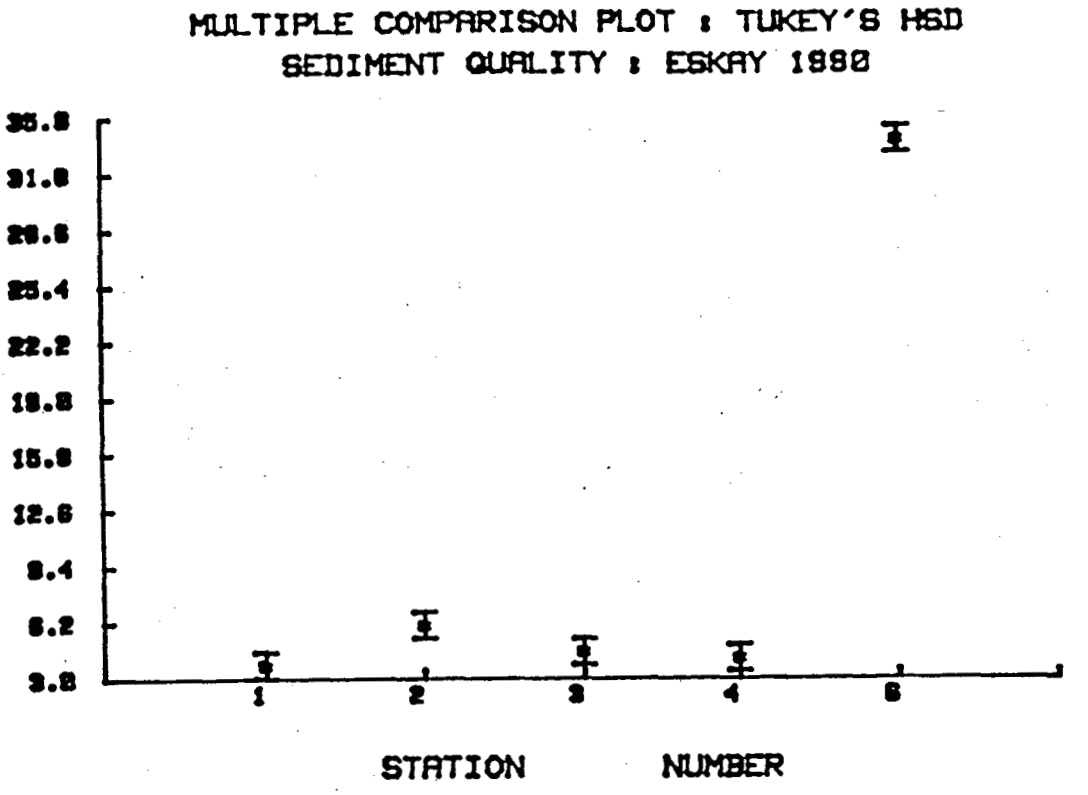


FIGURE 2: SEDIMENT MULTIPLE COMPARISON PLOT - ESKAY 1990 - Al, As



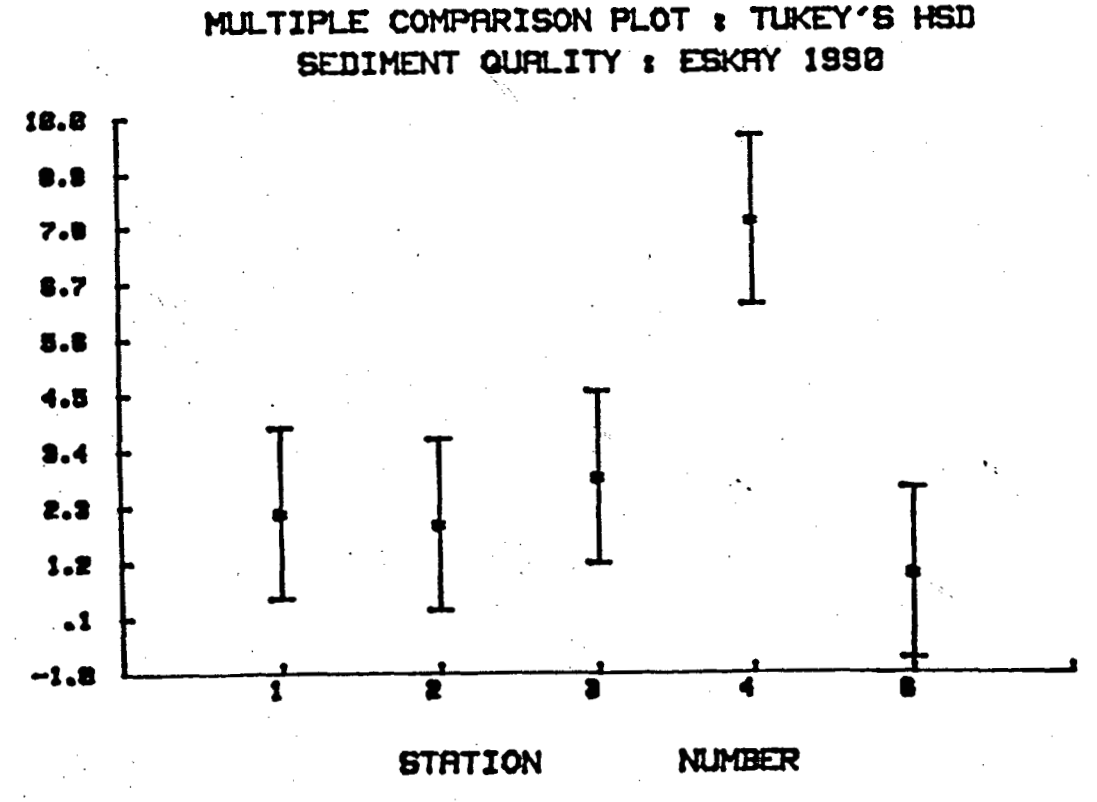
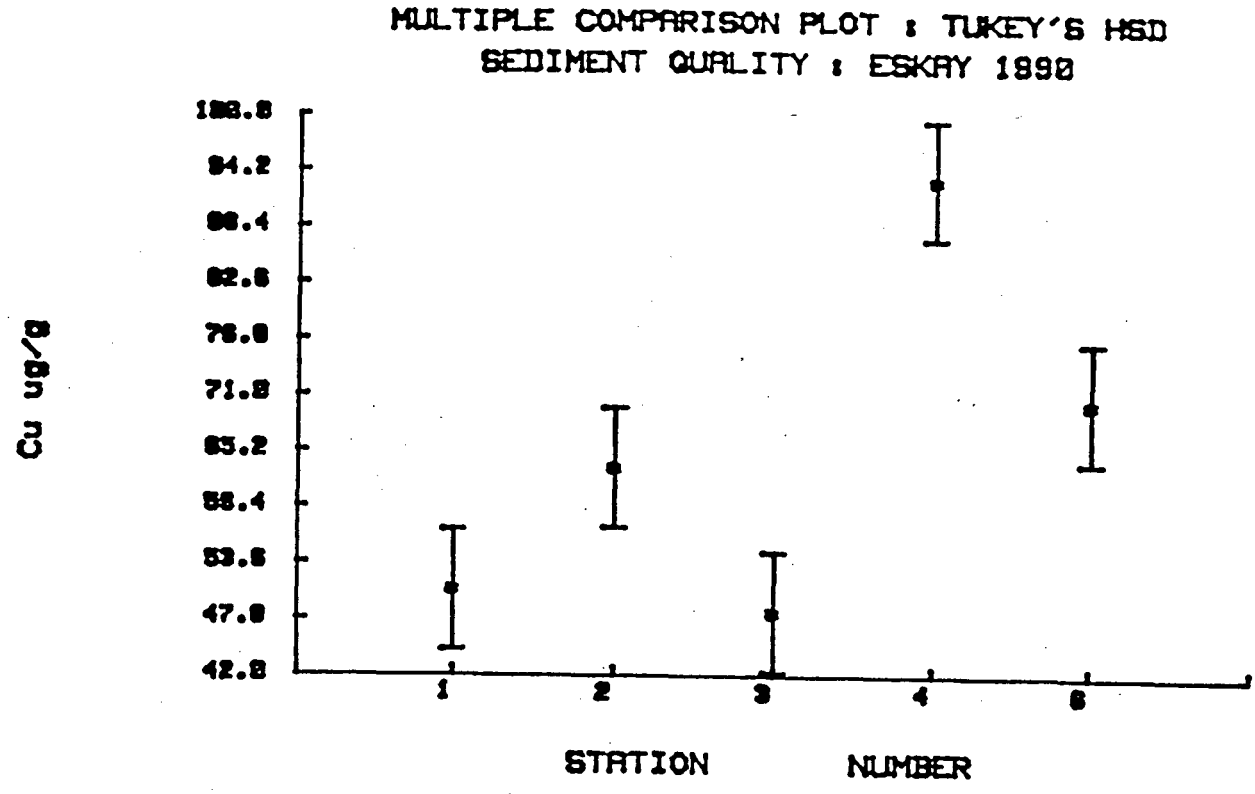


FIGURE 2 (cont): SEDIMENT MULTIPLE COMPARISON PLOT - ESKAY 1990 - Ca, Cd



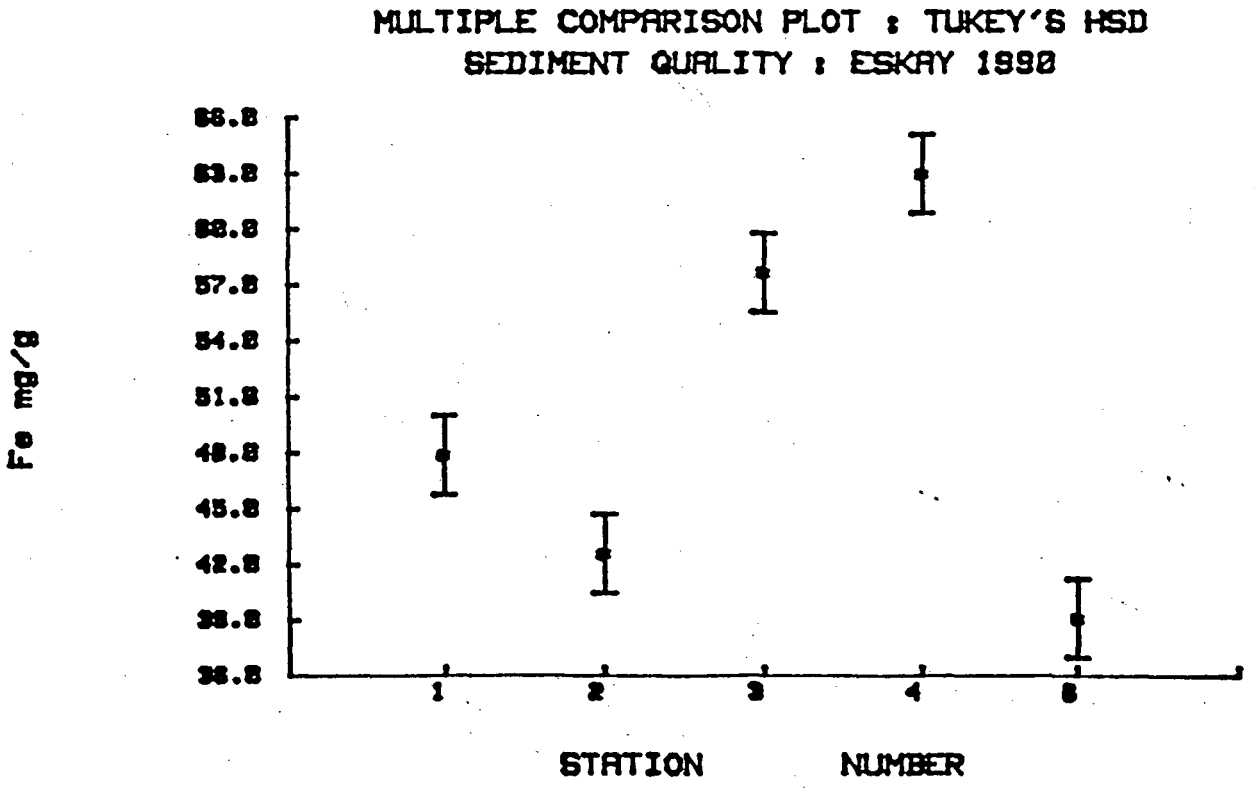
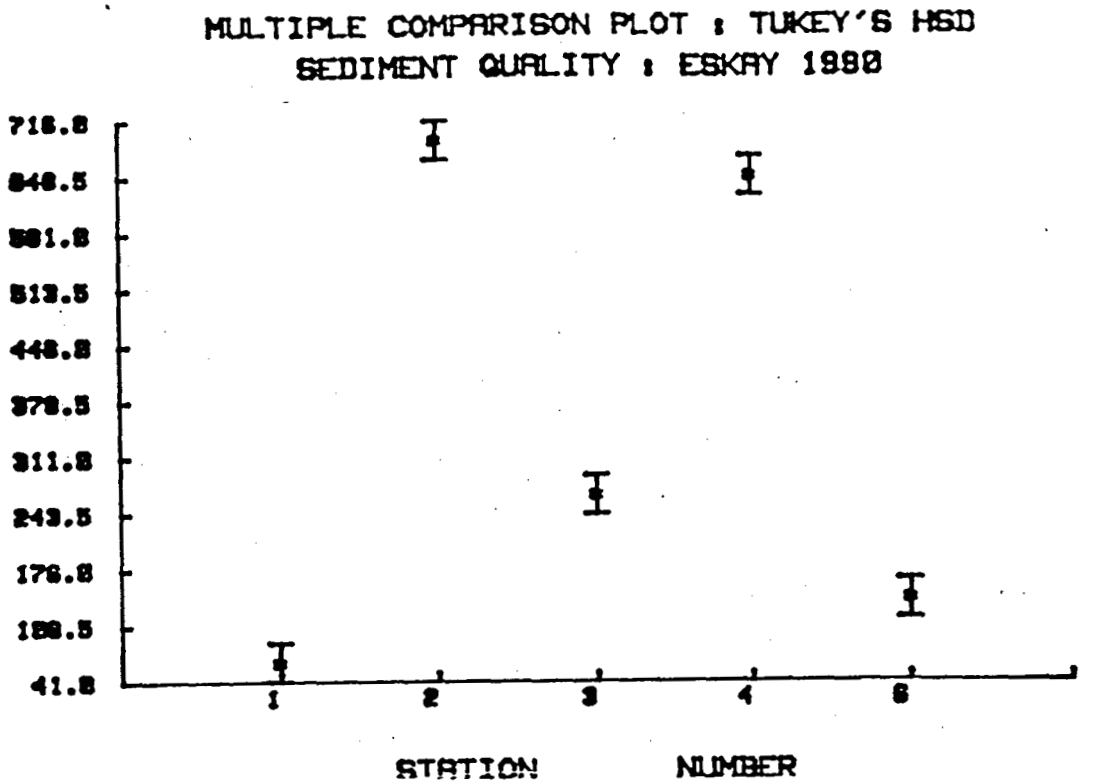


FIGURE 2 (cont): SEDIMENT MULTIPLE COMPARISON PLOT - ESKAY 1990 - Cu, Fe



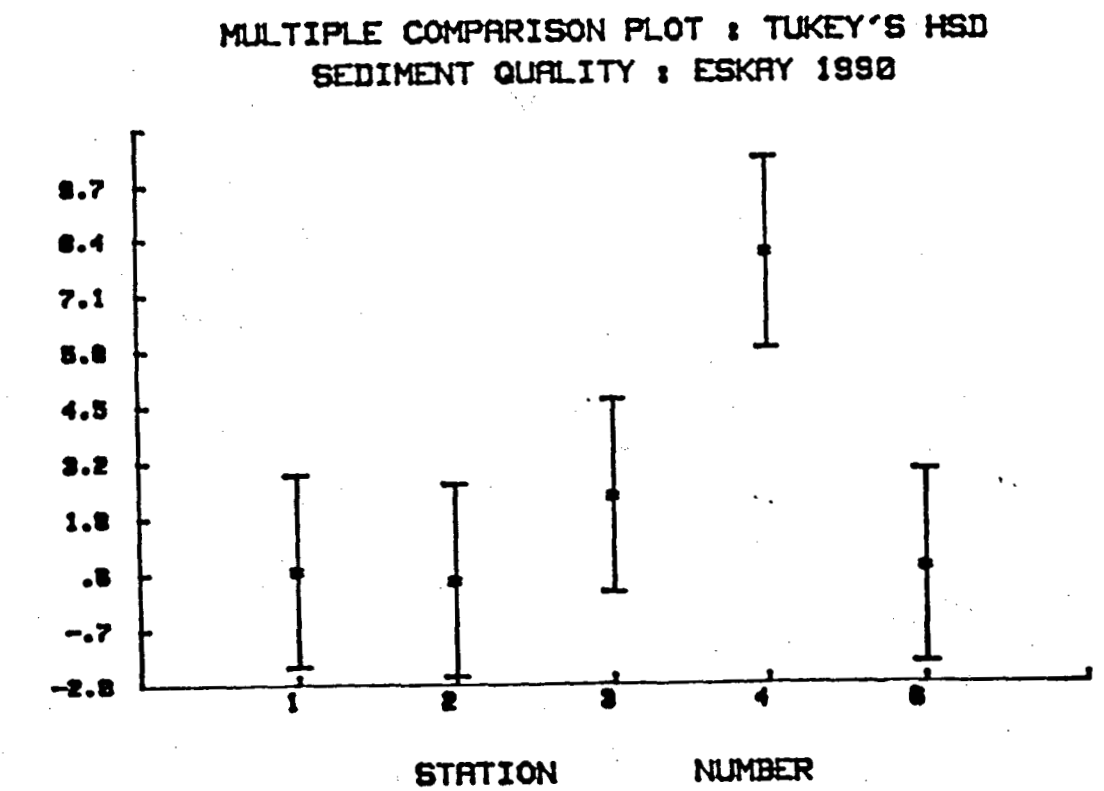
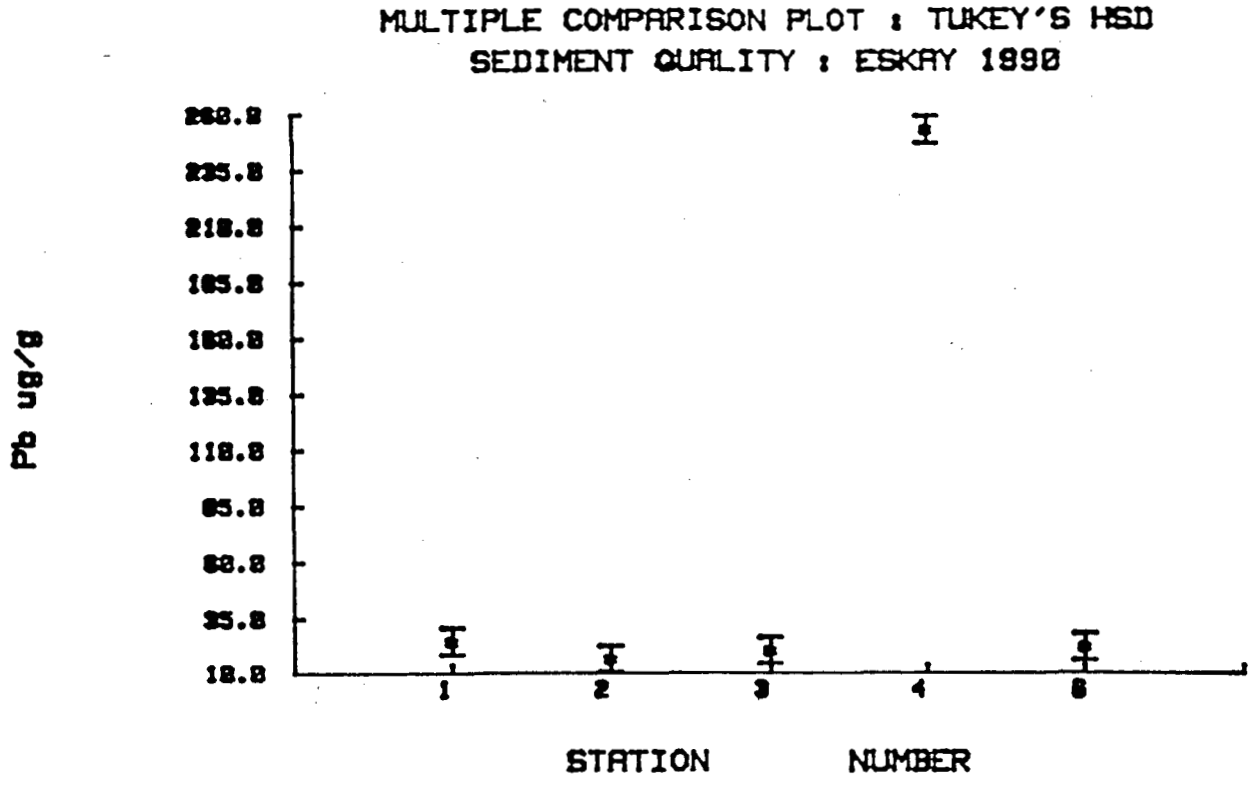


FIGURE 2 (cont): SEDIMENT MULTIPLE COMPARISON PLOT - ESKAY 1990 - Hg, Mn



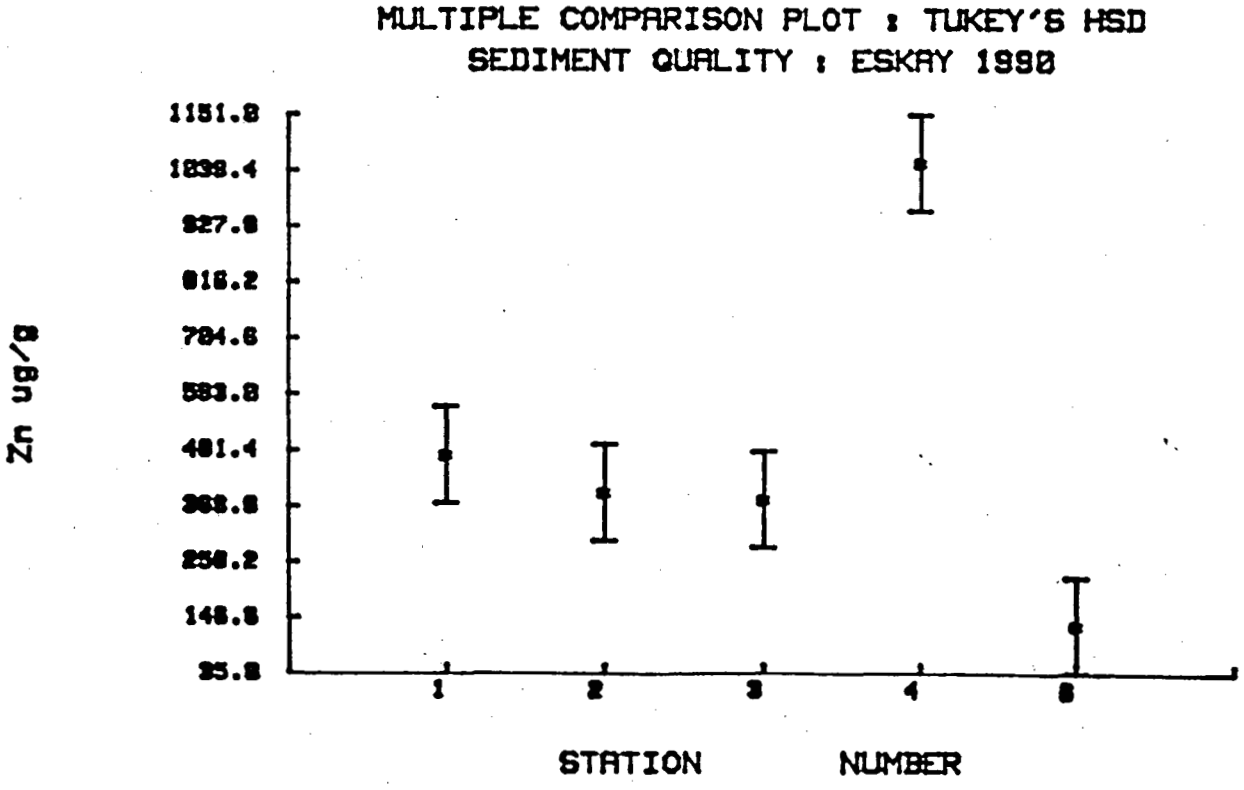


FIGURE 2 (cont): SEDIMENT MULTIPLE COMPARISON PLOT - ESKAY 1990 - Pb, Zn

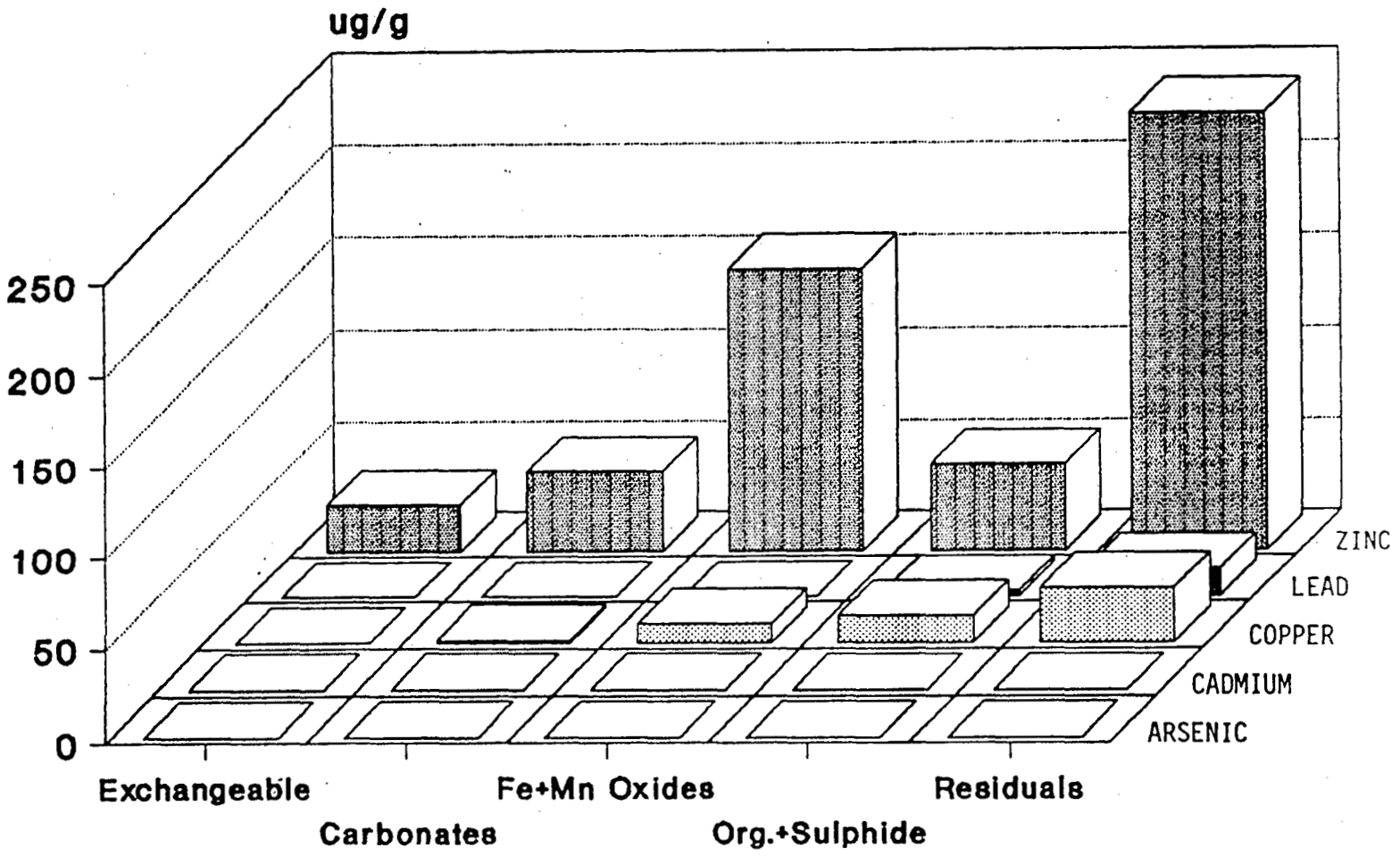


FIGURE 3: ESKAY CREEK SEDIMENT SEQUENTIAL EXTRACTIONS - STATION 1, TOM MCKAY LAKE OUTLET - JULY 1990

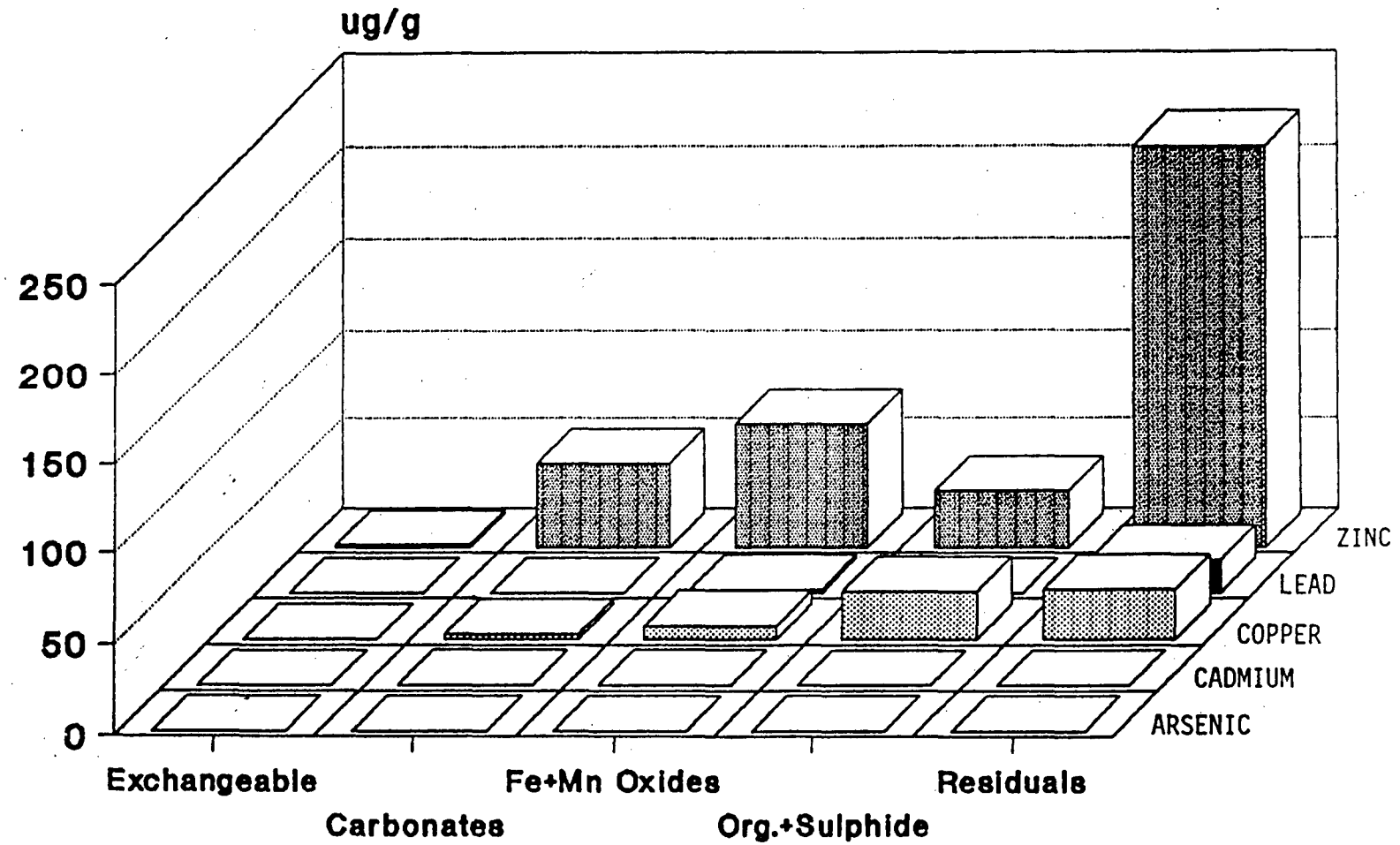


FIGURE 4: ESKAY CREEK SEDIMENT SEQUENTIAL EXTRACTIONS - STATION 2, MCKAY CREEK - JULY 1990

Station 6, Unuk River d/s of Eskay Creek
July 20, 1990

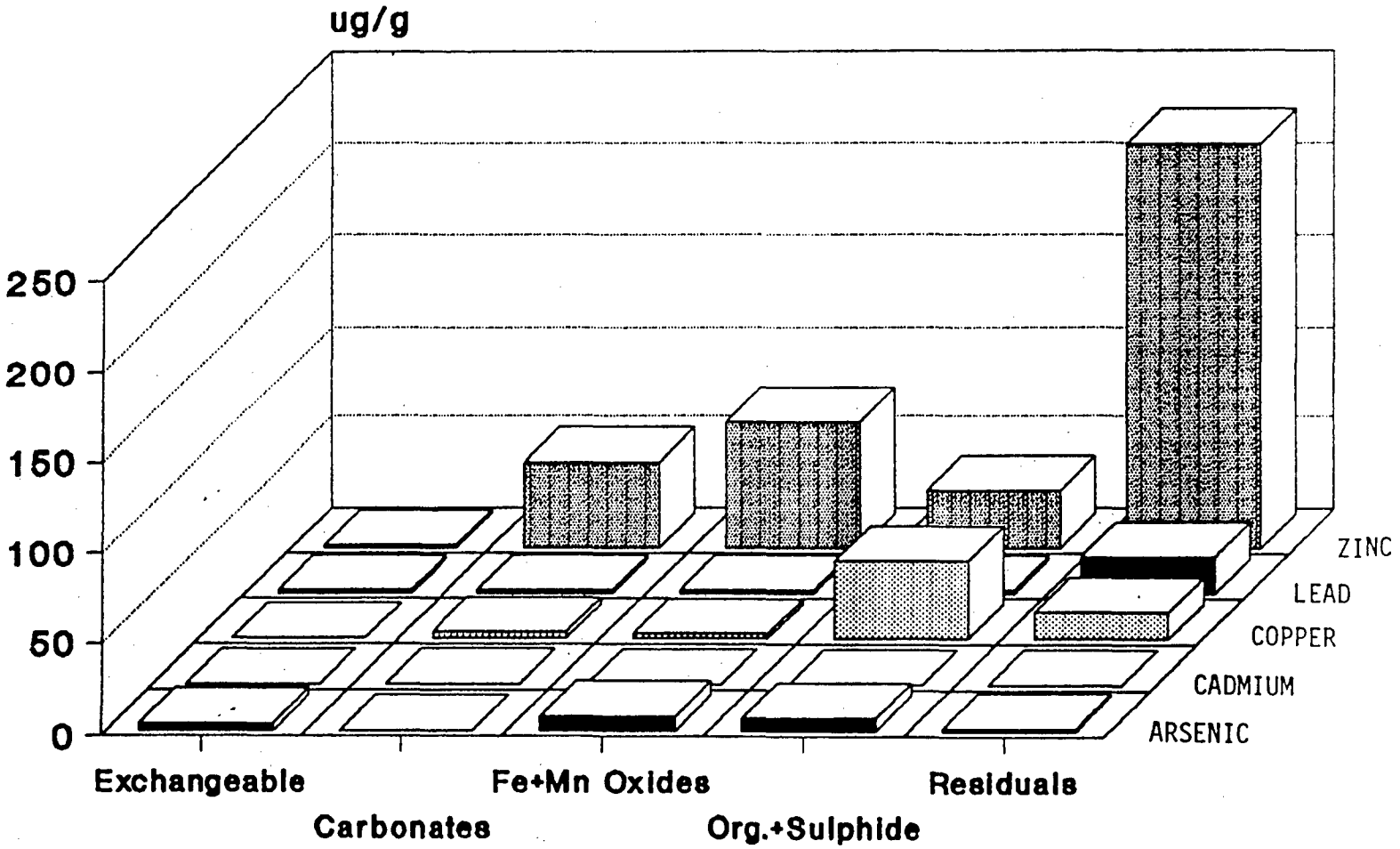


FIGURE 5: ESKAY CREEK SEDIMENT SEQUENTIAL EXTRACTIONS - STATION 6, UNUK RIVER D/S OF ESKAY CREEK - JULY 1990

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