ENVIRONMENT CANADA
CONSERVATION AND PROTECTION
ENVIRONMENTAL PROTECTION
PACIFIC AND YUKON REGION

BASELINE WATER QUALITY MONITORING AT THE WINGDAM GOLD PLACER PROPERTY
- June 16, 1987 -

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January 1988

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BIB# 193995

Introduction

The Wingdam gold placer deposit owned by Gold Ridge Resources, is located in the Lightning Creek valley approximately 50 km east of Quesnel, in the direction of Barkerville. Lightning Creek is a tributary of the Cottonwood River, which is part of the Fraser River drainage system (figure 1).

Lightning Creek at Wingdam is situated in a v shape valley. The salmon fish resources in the Cottonwood river consist exclusively of chinook salmons. The annual escapement range from 75 to 300. Small escapement from Lightning creek (annual average = 25) was noticed recently, with spawning immediately upstream and downstream of the Wingdam property. The fry are beleived to stay in the creek over the summer (Nassichuck to Ito, July 7, 1987).

The company has proposed a cyanide in situ leaching to extract gold resources in the Ligtning Creek gravels situated about 50 meters underground. Conventional underground mining methods were not successful.

Material and Methods

The site was visited on June 16, 1987. Four stations were sampled. Flow measurements were taken at three sites with a Marsh-McBirney Model 201 portable Water Current Meter. Due to the unknown influence of many tributaries above the last downstream station, no flow measurements were taken.

Conductivity, temperature and pH were recorded at the same water quality sites along the transect across the creek. Field data were taken with a Hydrolab digital 4041 indicator unit and 4021 sonde unit.

Water chemistry data were collected at four stations. A single grab sample was taken at three locations along the transect, and identified as left, center and right. Only one grab sample was taken at Everton Creek due to the relatively small size of the tributary. The following chemical parameters were analysed : alkalinity, pH, chloride, conductivity, total residues, filterable residues, non filterable residues, ammonia, nitrite, nitrate, and sulphate. Samples were kept cool with ice until analysis. Total cyanide and thiocyanide were preserved with sodium hydroxide to raise the pH above 12. Dissolved metals were filtered the same day through a 0.45 micron cellulose nitrate membrane filter. Total and dissolved metals were preserved with nitric acid (0.5 ml/100 ml of sample) All samples were collected with clean polyethelene bottles. The bottles for metal analysis were previously acid washed. The

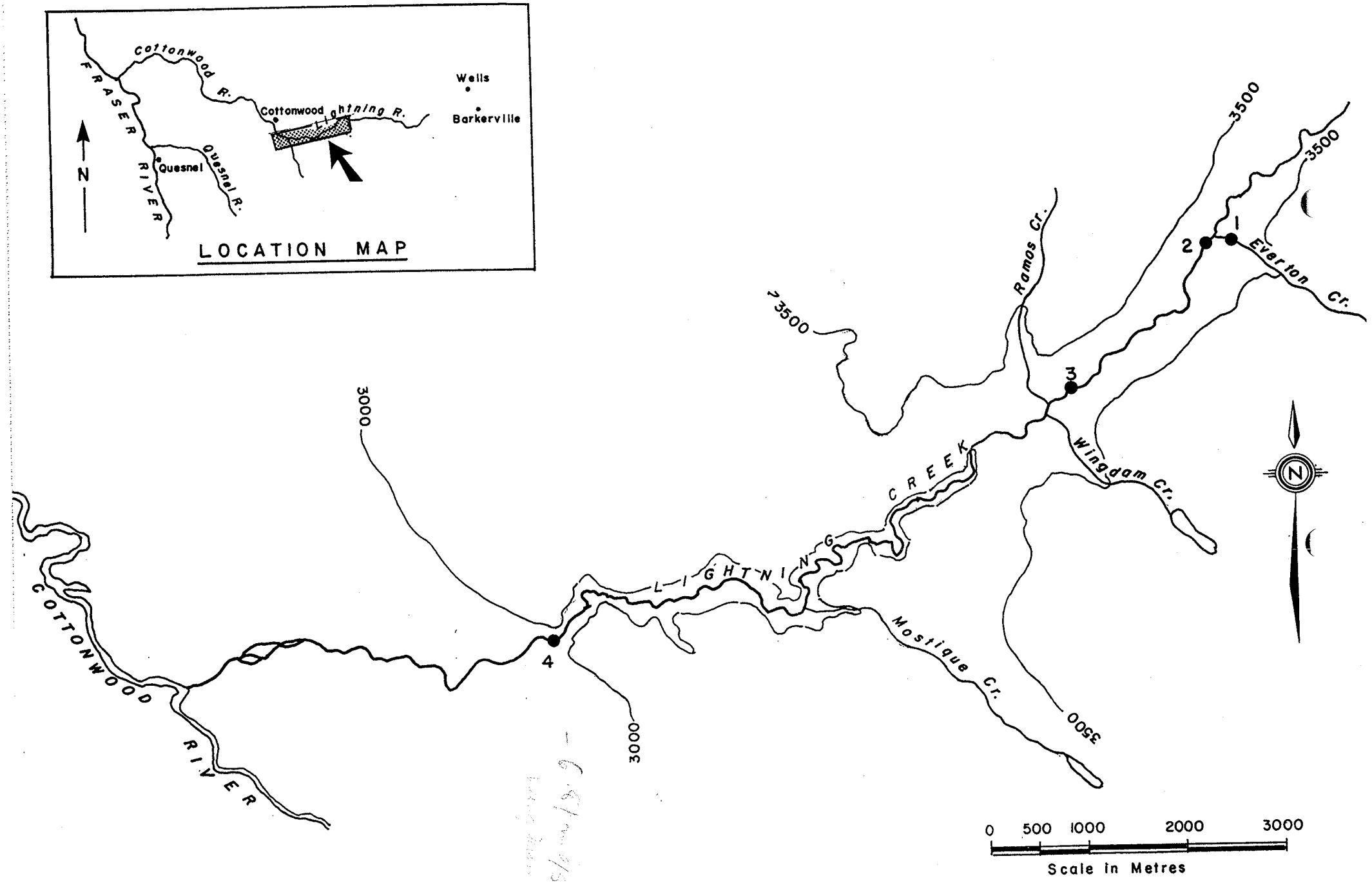

FIGURE 1 LIGHTNING CREEK - SAMPLING STATION LOCATIONS

hardness was determined from the dissolved metal sample.

Inductively Coupled Plasma (ICP) was used for the total and dissolved metal analysis and gave a reading of twenty -six metals. Potassium analysis was performed with the atomic absorption spectrometry procedure. For cadmium and copper the samples were reanalysed with the graphite furnace when the values were below two times the detection limit on the ICP procedure.

Results

The sampling locations are described in table 1, the field data in table 2, and the laboratory results in table 3.

There was no tributaries between station 2 and 3 other than the groundwater wells flowing from the property. The flows show a significant input of fresh water between these two points.

The total cadmium values for station 3 (centre) and 4 (right) were not analysed with the graphite furnace and may be below the detection limit. The total ICP copper value for station 4 (left) may be due to the sampling error or contamination, while contamination might be the cause of the difference between total and dissolved. However both concentrations were higher than the other samples across the creek. The cyanide value of 0.06 on the left side of the creek at station 2 seems very high for a prestine environment. It should be mentionned that no verification of these samples were possible.

The Lightning creek water at that time can be considered prestine with generally low metal levels, low nutrients, relatively good alkalinity and low hardness.

Table 1 Description of sample sites

Station	Location	Remarks
1	Everton Creek upstream of the Wingdam property	Small tributary of Lightning Creek
2	Lightning Creek upstream of the Wingdam property	Placer mining activity
3	Lightning Creek downstream of the Wingdam property	Creek with a small side channel, about 3200 feet level
4	Lightning Creek downstream of the Wingdam property	Creek about at the 2800 feet level

(6.8 km d/s of property)

Table 2 Field data

Station		Flow (m^3/s)	pH (rel. u.)	Temp. (^oC)	Conductivity (umhos/cm)
1		0.01	8.1	8.0	129
2	left	--	7.7	9.5	77
2	center	3.95	7.8	9.5	77
2	right	--	---	---	--
3	left	--	7.0	11.0	89
3	center	4.70	7.8	11.0	88
3	right	--	7.0	11.0	89
4	left	--	7.9	13.0	94
4	center	--	7.8	13.0	94
4	right	--	7.8	13.0	94

Table 3 Water Quality Data

Water quality - Wingdam gold -
June 16, 1987

Station		TOTICP AL MG/L	DISICP AL 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 CO MG/L	DISICP CO MG/L	TOTICP CR MG/L	DISICP CR MG/L	TOTICP CU MG/L	TOTGF CU MG/L	DISICP CU MG/L	DISGF CU MG/L
1		1.19	<.05	0.028	0.011	18.2	12.7	<.002	<0.0001	<.002	<0.0001	0.008	<.005	<.005	<.005	<.005	0.0012	<.005	0.0006
2	left	0.43	<.05	0.010	0.005	12.4	8.4	<.002	<0.0001	<.002	<0.0001	<.005	<.005	<.005	<.005	<.005	0.0009	<.005	<0.0005
	center	0.52	<.05	0.012	0.005	12.5	8.4	0.002	<0.0001	<.002	<0.0001	0.008	<.005	0.005	<.005	<.005	0.0008	<.005	<0.0005
	right	0.34	<.05	0.010	0.005	12.3	8.4	<.002	<0.0001	<.002	<0.0001	<.005	<.005	<.005	<.005	<.005	0.0040	<.005	0.0064
3	left	0.71	<.05	0.014	0.005	12.3	8.5	<.002	<0.0001	<.002	<0.0001	0.007	<.005	<.005	<.005	<.005	0.0012	<.005	<0.0005
	center	0.42	<.05	0.013	0.005	12.3	8.8	0.004	---	<.002	<0.0001	0.010	<.005	0.008	<.005	0.008	0.0011	<.005	0.0009
	right	0.48	<.05	0.014	0.006	13.9	10.4	<.002	<0.0001	<.002	0.0001	0.008	<.005	<.005	<.005	<.005	0.0015	<.005	0.0017
4	left	0.63	<.05	0.014	0.006	13.1	9.7	<.002	<0.0001	<.002	<0.0001	0.008	<.005	<.005	<.005	0.019	---	<.005	0.0007
	center	0.52	<.05	0.013	0.006	13.5	9.7	0.004	<0.0001	<.002	<0.0001	0.010	<.005	0.006	<.005	0.007	0.0008	<.005	<0.0005
	right	0.48	<.05	0.013	0.006	13.6	9.2	0.006	---	<.002	<0.0001	0.013	<.005	0.009	<.005	0.008	0.0008	<.005	0.0006

Water quality - Wingdam gold -
June 16, 1987

Station		TOTICP FE MG/L	DISICP FE MG/L	TOTAA K MG/L	DISAA 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 NA MG/L	DISICP NA MG/L	TOTICP P MG/L	DISICP P MG/L	TOTICP PB MG/L	DISICP PB MG/L	TOTICP SB MG/L	DISICP SB MG/L
1		1.160	0.010	0.50	0.44	4.7	3.0	0.036	0.003	<.005	<.005	1.6	1.0	0.08	<.05	<.02	<.02	<.05	<.05
2	left	0.805	0.151	0.20	0.17	2.6	1.8	0.097	0.053	<.005	<.005	0.9	1.0	0.08	<.05	<.02	<.02	<.05	<.05
	center	0.937	0.149	0.23	0.19	2.7	1.8	0.094	0.053	0.007	<.005	0.9	1.0	0.07	<.05	0.02	<.02	0.05	<.05
	right	0.704	0.191	0.18	0.18	2.7	1.9	0.088	0.054	<.005	<.005	1.1	1.0	<.05	<.05	<.02	<.02	<.05	<.05
3	left	1.200	0.154	0.30	0.16	2.8	1.9	0.107	0.049	<.005	0.006	1.3	1.0	<.05	<.05	<.02	<.02	<.05	<.05
	center	0.804	0.157	0.27	0.16	2.7	1.8	0.086	0.049	0.013	<.005	1.2	0.8	<.05	<.05	0.05	<.02	0.05	<.05
	right	0.922	0.173	0.30	0.23	2.9	1.9	0.094	0.057	<.005	<.005	1.3	0.8	<.05	<.05	<.02	<.02	<.05	<.05
4	left	0.918	0.136	0.23	0.18	2.9	1.8	0.081	0.046	<.005	<.005	1.2	0.7	<.05	<.05	<.02	<.02	<.05	<.05
	center	0.888	0.134	0.27	0.24	2.9	1.9	0.084	0.047	0.007	<.005	1.1	0.7	0.11	0.06	0.03	<.02	<.05	<.05
	right	0.859	0.127	0.25	0.18	2.8	1.9	0.084	0.045	<.005	<.005	0.9	0.8	0.09	<.05	0.05	<.02	0.05	<.05

Table 3 Water Quality Data

Water quality - Wingdam gold -
June 16, 1987

Station		TOTICP SE MG/L	DISICP SE 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 TI MG/L	DISICP TI MG/L	TOTICP V MG/L	DISICP V MG/L	TOTICP ZN MG/L	DISICP ZN MG/L	DISICP HC MG/L	DISICP HT MG/L
1		<.05	<.05	5.5	2.7	0.03	<.01	0.060	0.041	0.044	<.002	<.005	<.005	0.004	<.002	43.9	44.0
	left	<.05	<.05	2.9	1.9	<.01	<.01	0.060	0.049	0.010	<.002	<.005	<.005	<.002	<.002	28.6	29.1
2	center	<.05	<.05	3.1	1.9	<.01	<.01	0.063	0.050	0.018	<.002	0.008	<.005	0.004	<.002	28.6	29.0
	right	<.05	<.05	2.9	1.9	0.01	<.01	0.064	0.049	0.009	<.002	<.005	<.005	<.002	<.002	28.8	29.3
	left	<.05	<.05	3.4	1.9	0.02	<.01	0.067	0.049	0.023	<.002	<.005	<.005	0.004	<.002	29.0	29.4
3	center	0.07	<.05	3.1	1.8	0.02	<.01	0.066	0.048	0.014	<.002	0.012	<.005	0.005	<.002	29.4	29.9
	right	<.05	<.05	3.2	1.9	0.03	<.01	0.071	0.052	0.014	<.002	<.005	<.005	0.004	<.002	33.9	34.6
	left	<.05	<.05	3.4	1.9	0.03	<.01	0.065	0.049	0.024	<.002	<.005	<.005	0.006	<.002	31.7	32.4
4	center	0.07	<.05	3.2	1.9	<.01	<.01	0.065	0.049	0.016	<.002	0.010	<.005	0.004	<.002	31.9	32.5
	right	<.05	<.05	3.1	1.9	0.04	<.01	0.065	0.050	0.015	<.002	0.013	<.005	0.003	<.002	30.8	31.0

Water quality - Wingdam gold -
June 16, 1987

Station		ALK MG/L	PH REL.U.	CL MG/L	COND UMHO/C	TR MG/L	NFR MG/L	NH3 MG/L	NO2 MG/L	NO2/3 MG/L	CN MG/L	CNS MG/L	SO4 MG/L
1		46.4	7.9	0.7	98	76	15	0.028	<.005	0.091	--	--	5
	left	30.9	7.6	0.5	68	55	18	0.023	<.005	<.005	0.06	<0.5	3
2	center	30.9	7.7	0.5	68	54	<5	0.032	<.005	<.005	<0.03	<0.5	3
	right	30.9	7.7	0.5	68	54	14	0.028	<.005	<.005	<0.03	<0.5	3
	left	32.0	7.7	0.6	68	56	15	0.026	<.005	<.005	<0.03	<0.5	3
3	center	31.4	7.7	<.5	68	60	7	0.025	<.005	<.005	<0.03	<0.5	3
	right	35.6	7.7	0.8	75	65	<5	0.026	<.005	<.005	<0.03	<0.5	3
	left	33.0	7.7	0.7	73	63	<5	0.026	<.005	<.005	<0.03	<0.5	3
4	center	32.6	7.9	0.9	73	62	9	0.027	<.005	<.005	<0.03	<0.5	4
	right	33.0	7.9	0.6	73	42	<5	0.028	<.005	<.005	<0.03	<0.5	4