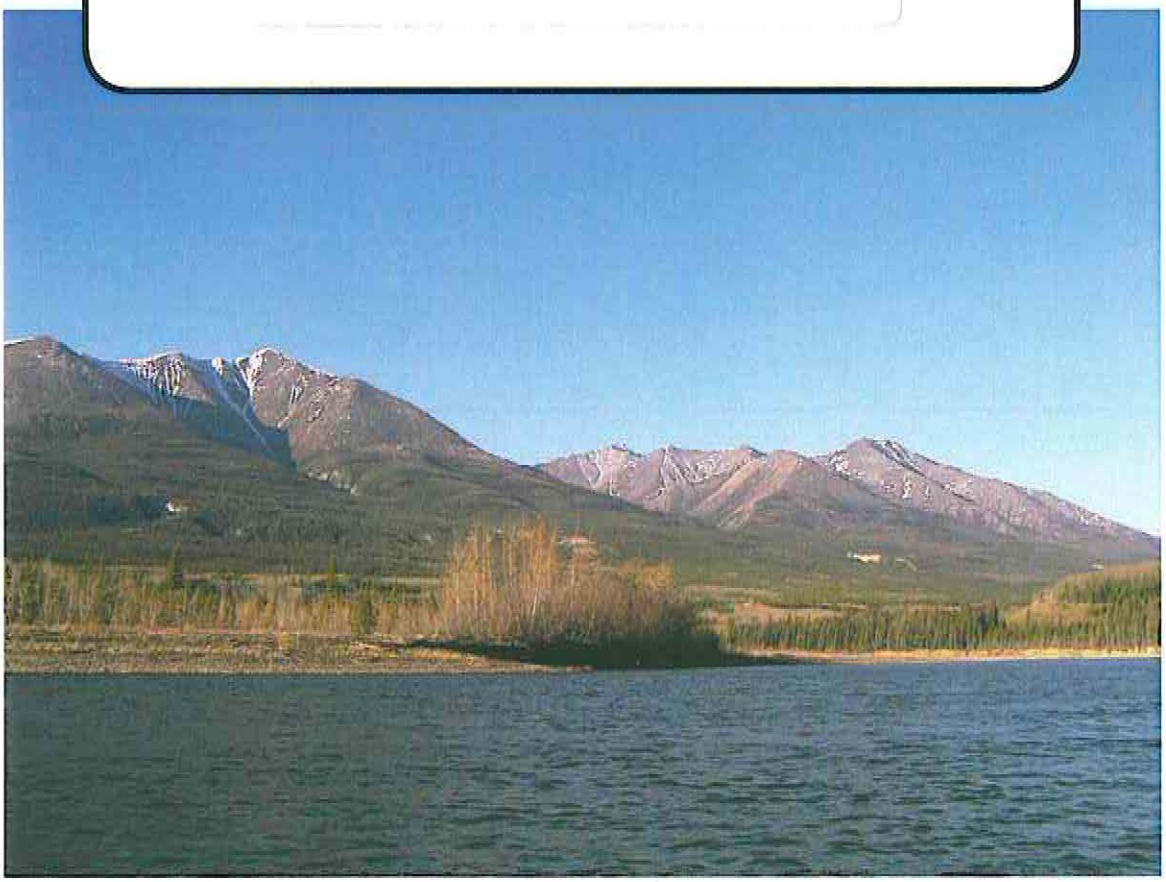
Pelly River WQ 2003 Final Report



For

Selkirk First Nation Lands & Resources Department

By

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TABLE OF CONTENTS

LIST OF APPENDICES

LIST OF TABLES

1.0 BACKGROUND AND INTRODUCTION

The Pelly River watershed drains 50,000 km^2 that encompasses the traditional territory of the Selkirk First Nation (SFN) as well as parts of the Little Salmon Carmacks First Nation and the Kaska Dena First Nation. The Pelly drains the eastern part of the Yukon River basin. From its headwaters in the Selwyn Mountains, it traverses the Pelly Plateau and over 250 km of the Tintina Trench before crossing the Lewes Plateau to its mouth at Fort Selkirk.

Receiving water quality is very important to the SFN. Their primary concerns centre on the community of Pelly Crossing, Fort Selkirk, and surrounding settlement lands in the lower main stem of the Pelly River and the lower portion of the Macmillan River. However, as a downstream user of water draining from the Faro Mine and other development areas in the upper watershed, the SFN is also concerned with quality of water that enters their traditional territory from upstream. The SFN Final Agreement 14.8.1 states that *"...a Yukon First Nation has the right to have water which is on or flowing through or adjacent to its Settlement Land remain substantially unaltered as to quantity, quality, and rate of flow, including seasonal rate of flow."* It is intended that the data generated by these surveys be compared from time to time to see if the Selkirk First Nation is indeed receiving water that is substantially unaltered as to quality.

The SFN Lands and Resources Branch initiated aquatic environmental studies in their traditional territory in 2000. One of these was a water quality characterization of the Pelly River (*Pelly River Water Quality Investigations 2001*, Laberge Environmental Services). Follow up water quality surveillance sampling took place in 2002, and again in 2003. This report presents the findings of the most recent survey and also serves as a data compilation of previous surveys. It is anticipated that at some future date all of these data will be integrated into a GIS platform.

1.1 Scope of Work 2003

The SFN directed that water quality surveillance be conducted in the fall of 2003. Other projects initiated by the SFN Lands and Resources Department (L&R), particularly the fisheries

investigations in the Earn River, Kalsas River and Upper Kalsas watersheds resulted in additional water sampling in the Pelly River Drainage in August, 2003. This report contains the results of all water sampling conducted in the Pelly River and its tributaries in the year 2003. In depth interpretation of these data are beyond the scope of this report, however, some comparisons to the previous years data and to established criteria are offered. Recommendations as to the scope of future water data collection and interpretation projects are offered.

1.2 Methods 2003

Water samples were collected following standard protocols in clean new plastic bottles, kept cool, and shipped to Norwest Labs for analysis of a suite of parameters comparable to that used in previous work. Parameters were selected to enable both a "snapshot" of the water quality of the Pelly River and its major tributaries, as well as a low detection limit background data set. In situ measurements were made of pH, conductivity, temperature, turbidity, total dissolved solids, and dissolved oxygen using either LES or SFN L&R scientific equipment.

2.0 BACKGROUND WATER QUALITY SAMPLING

A search of historic water quality data is beyond the scope of this report. It is important to note, however, that background water quality sampling has been conducted in selected tributaries of the Pelly River by the SFN over the past few years in conjunction with other work. In 2003, the tributaries sampled by the SFN were: Earn River, Anvil Creek, Kalsas (Little Kalsas and Big Kalsas drainages), Needlerock Creek, Diamain Creek, and Mica Creek. Water quality analytical reports from 2001, 2002, and 2003 are included in this report as Appendix A – Analytical Reports.

2.1 Historical Data Sets

Historical water quality data on the Pelly River and its tributaries exists in several data sets. The Pelly River main stem had two sites monitored during the 1980 – 1983 Yukon River Basin Study – the Pelly River at Pelly Crossing and the Pelly River at Faro. A complete set of Yukon River

Basin Study reports is available in the DIAND Library. Water Quality Work Group Report #1 contains the results of samples collected routinely for 13 months in 1982/83. The results of a mercury study in the Faro area are also presented. Environment Canada (Water Survey) collected water quality data at Pelly Crossing from 1992 to 1996, and during the late winters of 1992 and 1993, water quality data was collected at Water Survey of Canada gauging stations all over the Yukon, including stations in the Pelly watershed. DIAND Water Resources (transferred to Government of Yukon in 2003) has paper and computer records of water quality data of Pelly River tributaries collected from the late 1960's to the present. Computer records are limited to licensed sites such as the Faro or Ketza mine from the 1990s to present. This information is limited to those parameters and sampling sites required by the water license.

There have been detailed water quality monitoring efforts on certain tributaries to the Pelly River. These have been mainly related to mineral development. Records exist for a number of sites that were inspected by Water Resources at reconnaissance level. For example, the Tom and Jason claims in Macmillan Pass and the Clear Lake Property near Pelly Crossing have data sets resulting from reconnaissance sampling.

A large database is available through long term monitoring of the streams that drain the Faro Mine. The streams that report to the Pelly River from the Faro Mine are the Rose Creek/Anvil Creek system, and Vangorda Creek. Water quality data from these streams has been collected over the years as part of routine monitoring required by water licenses, and project oriented monitoring resulting from environmental screening of proposed projects. More recently, the Interim Receiver of the Faro Mine, Deloitte and Touche, has commissioned environmental surveys and assessments in all three of these watersheds in support of water licence applications. As a result, extensive water quality data will be available for review from the Yukon Territory Water Board.

2.1.1 Vangorda Creek

Vangorda Creek drains the Vangorda Plateau and flows into the Pelly River at Faro. It has been sampled by the mining company or by the receivers on a regular basis since 1988. The data

shows that there are natural temporal fluctuations in concentrations of various parameters. The contaminants of concern from the Vangorda Project are the metals cadmium, copper, lead and zinc. Levels of cadmium were low when cadmium was rarely detected. Copper levels were generally low where detected. An abnormally high concentration of 0.235 mg/L total copper occurred during the spring freshet in 1991, coinciding with very turbid waters. (The concentration of total suspended solids was 590 mg/L at the time). Lead values were generally low with higher values recorded during the annual spring freshet. The highest recorded concentration.0.46 mg/L total lead also occurred in 1991. Zinc levels were also typically low and followed the same seasonal trend. Again the highest concentration recorded out of 142 samples collected over this time period, was 0.364 mg/L, also occurring in the spring of 1991. All other recorded zinc values were well below this concentration. These higher than normal values recorded in 1991 were a result of high water and associated runoff. It is doubtful that they would have had any impact on the Pelly River, which also would have had high, turbid waters at this time. In general, the contaminants of concern were well below concentrations considered safe to protect aquatic life, and have not exceeded levels unsafe for humans.

From this preliminary review of company data, it would not appear that drainage from the Vangorda Project impacts the Pelly River via Vangorda Creek.

2.1.2 Anvil Creek

Anvil Creek drains the Faro Mine and Down Valley Tailings Treatment System. This stream has been sampled just below the confluence with Rose Creek much less frequently than Vangorda Creek. The Water Licence site is located approximately 35 km upstream of the confluence with the Pelly River, and represents the closest site to the Pelly River that is monitored. Company data has been collected here a few times annually, since 1990. Although the treated discharge from the tailings ponds empties into Rose Creek at the sample station "X – 5", there is little evidence of metals showing up in the samples collected approximately 15 km downstream at the Anvil Creek site. The only anomaly was a total zinc concentration of 0.453 mg/L documented on December 19, 1991.

In the past, however, there has been at least one episode of the temporary pollution of Anvil Creek. In 1975, a tailings dam failed at the tailings treatment facility. The result was a distribution of tailings and partly treated mill effluent all the way down the stream. (pers. comm. Gerry Whitley)

2.1.3 Other Areas of Interest

In the recommendations of this report, it is again suggested that a watershed study and assessment be pursued for the Pelly River basin. It is also suggested that a long-term water quality monitoring program be established. Data from areas such as those listed above, would be compiled into a suitable database under such initiatives. Management of water quality data is in itself a significant component of water quality monitoring.

The Pelly River watershed has other significant areas of interest in water quality monitoring. The following is a listing of areas known to have at least partial historical water quality records:

1. The Macmillan Pass area mineral deposits have been monitored sporadically over the years as part of efforts to document the acid drainage phenomenon there.

2. Howards Pass: Occasional samples collected at the exploration site. This large lead zinc deposit in Pelly River headwaters on the Yukon/ NWT is one of many potential mines in the upper Pelly.

3. Iona Silver and Ketza River Mine have extensive water quality data collected before and after mining.

4. Ross River at Ross River: Data collected between 1969 and 1973.

5. Macmillan Pass: Miscellaneous data.

6. Blind Creek: Miscellaneous data from the 1970s. Paul Harder and Associates 1990, baseline study. Laberge Environmental Services baseline survey 1996.

7. Mica Creek, Needlerock, and Willow Creeks: Samples from Mica in 1994. 1999/2000 study by SFN "*Salmonid Habitat Restoration and Monitoring Three Drainages of the Pelly River, Y.T. 2000*" for DFO, YTG Renewable Resources, and Yukon Fish and Wildlife Management Board, January, 2001. study done in 1999.

8. Needle Rock area: Samples collected by the Canadian Wildlife Service from wetlands; study done in 1999/2000.

9. Upper MacMillan River recent and historical landslide phenomena. No water quality data.

3.0 2003 SURVEILLANCE SURVEY RESULTS AND DISCUSSION

In August 2001, a fixed-wing, low altitude over-flight of the Pelly River between Faro and Pelly Crossing was done to examine the major land uses and natural processes that might affect water quality, and thus focus attention on areas or sites where sampling stations could be established. The fixed-wing survey was completed using a Cessna 172B on August 20, 2001. In September 2001, a boat reconnaissance survey was carried out. In October 2002 a helicopter survey revisited those sites, with the addition of the tributaries Tay River, Harvey Creek, Earn River, and Tummel River. In August and October 2003, surveillance samples were collected by boat from the Pelly River main stem, Little Kalsas River, and the Big Kalsas River, and by helicopter from the Earn River.

All lab analysis reports from 2001 to 2003 are included in Appendix A – Analytical Reports Pelly River. A summary of selected parameters is presented in Table One. A discussion of the water quality results with relevant comparisons to previous data follows:

3.1 Criteria:

There are several criteria to use when examining the quality of water:

- Is the water palatable and safe to drink? (drinking water guidelines)

- Is the water clean enough to swim in and is it pleasing to the eye? (recreational and aesthetic guidelines)
- Does the water have constituents that are harmful to aquatic life? (freshwater aquatic life guidelines)

Since the SFN values water for traditional and contemporary uses, a useful criteria for comparison to the results from these surveys are the Canadian Council of Resource and Environment Ministers (CCME) Guidelines for Aquatic Life and Guidelines for Drinking Water Quality, 1999.

Also, the SFN has "the right to have Water which is on or flowing through or adjacent to its Settlement Land remain substantially unaltered as to quantity, quality and rate of flow, including seasonal rate of flow". To determine if water quality is "unaltered", one criterion is whether or not statistically significant change has occurred as observed through routine monitoring.

In the data attached to this report, virtually all samples met the CCME guidelines for aquatic life. The Pelly River and its tributaries sometime exceed national drinking water guidelines for colour, turbidity, and suspended solids. Keep in mind that the national guidelines are meant for ***treated water***, and that all health agencies recommend boiling surface waters before consumption because of potential microbial contamination.

3.2 Pelly River Water Quality

The rivers of the Pelly River basin are largely snow fed and experience high water in June with a slow decline into the fall. There have been occasional high water events due to prolonged rainfall in the summer and fall. After freeze up the rivers continue to decline with shallow aquifers supplying the bulk of base flow. Lake storage contributes to base flow as well. Lowest flow is usually seen in March when water quality reflects the groundwater quality. Water chemistry has been very similar from year to year at comparable seasons.

The water quality of the Pelly River is driven by the surficial geology of its watershed. The headwaters of the Pelly River flow through sulphide mineralization, reflected in high sulphate

values in the Ketza and South Macmillan Rivers. Some of the sulphide deposits are rich in metals such as zinc, copper, and nickel. Groundwater is high in magnesium bicarbonates, alkalinity, and dissolved solids.

3.2.1 Physical Properties

During the 2001 reconnaissance survey, the water of the Pelly was at a typical autumn stage, perhaps slightly higher than normal due to recent rainfall. In 2002 the survey was conducted at a slightly lower stage. In 2001 the water was moderately turbid and had moderately high colour, even though the total suspended solids were low (12 to 15 mg/L). The suspended solids were composed entirely of fixed solids, as there were no detectable volatile suspended solids. In 2002 the Pelly River water was again very clear and colourless, with very low suspended solids. The 2003 samples follow a similar pattern, with the exception of the MacMillan River, which was turbid, high in colour, and contained about 20 mg/L suspended solids.

Suspended and dissolved solids drive the water chemistry in a basin such as the Pelly River. The surficial geology – the soil that the river is flowing through – is continuously adding both solid and dissolved solids to the system according to the characteristics of the parent material and the forces of erosion. Lately, the potential and real effects of climate change such as permafrost degradation, may be affecting the solids flux into the Pelly River.

The Pelly River flows through the Tintina Trench, which transects the heavily glaciated Yukon interior. The surficial soils are of glacio-fluvial origin and contain significant discontinuous permafrost in fine-grained sediments and granular material. The river morphology and erosive forces cause the fine sediment to wash into the water during rainfall and freshet floods. Significant contributors of sediment to the system are the frequent mudslides that occur along the banks.

In discussions with elders and other people who frequently travel the Pelly River and lower Macmillan River, it was noted that the water in late summer and fall is sometimes milky, where as in past years it would be clear (personal communication, Peter Isaac). In 2003, the MacMillan

River above its confluence with the Pelly was turbid and high in colour, contrasting with the Pelly which was clear and colourless. A brief aerial survey was done with Wayne Curry as part of the Kalsas River fisheries study, to look for any obvious sources of turbidity in the lower MacMillan River. A major mudslide was documented near the Big Kalsas River (below), but the turbidity was originating somewhere upstream. The river was notably turbid with a grey green colour as far upstream as Lone Mountain.

Landslide on MacMillan River at UTM NAD 27, 08V 0486734mE 6971227mN

Another typical active landslide is located on the Pelly River downstream of Ragged Creek. While conducting a fish habitat survey with the SFN in August 2002, Paul Sparling noted that within a few hours, the slide had doubled in size, and introduced massive pieces of mud into the river. The slide was noted to be approximately the same size in 2003.

This is the mudslide downstream of Ragged Creek in August 2001.

This is the same slide a year later. It has increased in size by about 1/3 in that time.

The obvious physical changes in water quality resulting from landslides are an increase in colour, turbidity, and suspended solids. The colour and turbidity were a result of dissolved constituents such as dissolved minerals and natural plant acids, as well as very fine soil particles in suspension. In 2003, the Pelly River samples had colour ranging from 5 to 14 colour units, while the MacMillan had 35 colour units. Turbidity in the Pelly ranged from 2.2 NTU at P.3 to

5.1 NTU at P.7. The MacMillan River had 21 NTU turbidity and 18 mg/L suspended solids. Coulter counter analysis of particle size distribution showed that the MacMillan River suspended particles were smaller in mean diameter than the Pelly River suspended solids.

In future, a focussed effort should be made to characterize the physical properties of the Pelly River and the MacMillan River below major landslide disturbances.

3.2.2 Routine Chemistry

The water of the Pelly remained alkaline with a consistent pH around 8. Total Alkalinity, the ability of the water to resist changes in pH, was also moderately high, with values ranging from 104 to 108 mg/L in 2001; 113 to 178 mg/L in 2002; and 104 mg/L to 111 mg/L in 2003 . Pelly River water was hard, and was moderately high in total dissolved solids, which reflect the metal ions present in the water. Other ions such as Fluoride, Chloride and Sulphate were within recommended criteria for drinking and for aquatic life.

3.2.3 Metals

Metals in water have a wide range of effects on aquatic life. Often, the criteria for a metal in water is a great deal higher for drinking water than for aquatic life. This is due to the fact that metals in water can be much more toxic to aquatic organisms than to humans. For example, the criteria for zinc in drinking water is 5.0 mg/L whereas for the protection of aquatic life, the criteria is 0.03 mg/L. The sources of metals in the Pelly River are the parent soil composition and the contribution of metals burden from tributaries that drain highly mineralized areas. The samples collected in September 2001 were analysed for trace extractable metals. Guidelines for aquatic life criteria are usually expressed as dissolved metals. The difference between the two analyses is that in the dissolved metals test, the sample is filtered through a 0.45 micron filter to remove all of the fine suspended solids before analysis. Extractable metals closely reflect dissolved metals when the suspended solids are very low or not detectable. In the 2002 surveillance survey, total and dissolved metals were added to the suite to serve as background data.

The most significant potential metal contaminant of concern in the basin is zinc. Zinc can be highly toxic to aquatic organisms under certain conditions. Zinc can be dissolved from particles in the tailings ponds of mine concentrators through a process of acid drainage. Since there is a potential for this to occur at the Faro Mine, zinc is an important parameter to watch in the receiving waters of the Rose Creek/ Anvil Creek system. Anvil Creek water quality was well within guidelines in both 2001 and 2002. Zinc and other metals concentrations were low. There was no detectable increase in zinc in the Pelly River from the Faro Mine drainage at the time of the 2001 or 2002 surveys.

The metals Aluminium and Selenium were detected in the Pelly River. In 2001 Aluminium increased from 0.111 mg/L at P.1 near Faro to 0.207 mg/L at P. 7 at Pelly Crossing. In 2003 results for aluminium ranged from 0.039 at P.1 to 0.133 at P.6. These metals are likely derived from the fine-grained suspended soils, which have come from the parent soil being eroded into the river by natural processes such as the mudslides discussed above.

Because metals appeared in the samples does not mean that the water is "polluted". The concentrations of metals in the Pelly River are not outside the range of values observed in other streams. The fate and transport of metals in the Pelly River is closely related to soils. The geological characteristics of the sub basins, type and concentration of suspended solids, and buffering capacity of the river all contribute to the metals burden. There is a risk that pollution by metals could affect the Pelly River under certain conditions such as a failure of the environmental protection systems at Faro, or a massive influx of soil into the river resulting from landslides.

Table One: Summary of Selected Parameters 2001 / 2002 / 2003

Site #	P.1 25Km D/S Faro	P.1	P.1	P.2 D/S Tay	P.2	P.3 SFN Sign	P.3	Guideline Drinking Water	Aquatic Life Guideline
Date	09.25.01	10.11.02	01.10.03	09.26.01	10.11.02	09.28.01	02.10.03		
UTM Coordinates NAD 27 08V	561250 6914500			592917 6940374		506292 6956976			
Water Temperature °C	5.9	0.2	2.3	5.7	0.2	4.9	10.8	15	
Dissolved Oxygen mg/L	10.5			10.7		10.8	nr		
Conductivity umhos/cm	274	309	312	270	309	277			
pH	8.1	8.4	8.2	8.1	8.3	8.2		6.5-8.5	6.5 to 9.0
Total Alkalinity as CaCO3 mg/L	104	113	106	105	115	105	111		
Sulphate mg/L	49.1	47.7	57.7	45.9	45.2	47.6	58.6		
Calcium	41.1	40.2	42.2	40.1	42	40.8	41.8		
Magnesium	13.4	14	14.5	12.7	13.1	12.9	14.5		
Sodium	1.4	1.6	1.7	1.5	1.9	1.6	2.0		
Potassium	0.5	0.5	0.7	0.6	0.5	0.6	0.9		
Iron	0.085	0.06	0.04	0.101	0.07	0.111	0.04		0.3
Manganese	0.0059	0.006	<.005	0.0072	0.007	0.008	<.005		
Chloride	0.5	2.2	<0.5	0.8	0.6	<.5	<.5		
Flouride	0.12	0.13	0.14	0.12	0.12	0.12	0.14	1.5	
Total Suspended Solids mg/L	15	8	<5	12	10	14	6		
Total Dissolved Solids mg/L	168	172	181	164	169	166	186	500	
Hardness as CaCO3 mg/L	158	152	166	153	150	155	168		
Colour Colour Units	22	9	14	18	11	22	13	15	
Tubidity NTU	11	1.5	2.3	11	1.6	12	2.2	5	
Extractable Metals mg/L									
Aluminum	0.111	0.039	0.039	0.12	0.035	0.125	0.037		0.1
Copper	0.008	<0.001	<.001	0.001	<0.001	0.001	<.001	1	0.003
Selenium	0.008	0.0014	0.0014	0.01	0.0013	0.01	0.0014	0.01	0.001
Zinc	0.006	0.008	0.006	0.0042	0.005	0.0045	0.004	5	0.03

Table One: Summary of Selected Parameters 2001 / 2002 / 2003

Site #	P.4 D/S Slide	P.4	P.4	P.6 Needle Rock	P.6	Guideline Drinking Water	Aquatic Life Guideline
Date	09.28.01	10.11.02	10.3.03	09.29.01	10.11.02		
UTM Coordinates NAD 27 08V	476723 6958577			438000 696450			
Water Temperature °C	5.4	0.3	8.5	4.9	0.4	15	
Dissolved Oxygen mg/L	10.4			10.5			
Conductivity umhos/cm	273	313	289	260	313		
pH	8.2	8.7	8.22	8.1	8.3	6.5-8.5	6.5 to 9.0
Total Alkalinity as CaCO3 mg/L	106	178	110	98	120		
Sulphate mg/L	48.2	47.4	57.9	48.2	38.4		
Calcium	41.9	42	44.0	38.7	41.5		
Magnesium	13.2	13.7	14.6	12.4	12.7		
Sodium	1.6	2.1	2.0	1.7	1.7		
Potassium	0.7	0.7	0.8	0.7	0.8		
Iron	0.12	0.09	0.04	0.159	0.28		0.3
Manganese	0.0077	0.008	<0.005	0.0094	0.029		
Chloride	<.5	0.9	<0.5	<.5	1.3		
Flouride	0.12	0.12	0.14	0.12	0.12	1.5	
Total Suspended Solids mg/L	13	7	9	13	24		
Total Dissolved Solids mg/L	169	178	186	160	166	500	
Hardness as CaCO3 mg/L	159	157	170	148	149		
Colour Colour Units	**25**	11	13	**23**	18	15	
Tubidity NTU	**13**	2.1	3.0	**13**	8.2	5	
Extractable Metals mg/L							
Aluminum	**0.135**	0.044	0.046	**0.207**	0.135		0.1
Copper	0.002	<0.001	0.001	0.002	0.001	1	0.003
Selenium	**0.008**	0.0011	0.0013	0.009	0.0013	0.01	0.001
Zinc	0.0037	0.004	0.003	0.0053	0.007	5	0.03

Table One: Summary of Selected Parameters 2001 / 2002 / 2003

Site #	P.7 Pelly Crossing	P.7	P.7	Anvil Creek	Anvil Creek	Anvil Creek	Guideline Drinking Water	Aquatic Life Guideline
Date mm.dd.yy	09.29.01	10.11.02	10.4.03	09.25.01	10.11.02	10.02.03		
UTM Coordinates NAD 27 08V	420000 6967200			454510 6923900				
Water Temperature °C	5	0.6	8.6	4.4	0.1	3.1	15	
Dissolved Oxygen mg/L	10.6			11.5				
Conductivity umhos/cm	261	302		231	271	218		
pH	8.1	8.2	8.18	8.2	8.2	8.19	6.5-8.5	6.5 to 9.0
Total Alkalinity as CaCO3 mg/L	97	110	104	104	117	111		
Sulphate mg/L	47.9	47.3	59.2	27.4	23.8	31.1		
Calcium	38.6	38.3	41.8	36.4	38	41.1		
Magnesium	12.2	12.8	14.0	8.05	9	9.4		
Sodium	1.7	2.8	2.2	2.2	2.3	2.8		
Potassium	0.7	1.9	0.9	1.1	1	1.3		
Iron	0.168	0.12	0.08	0.08	0.09	0.04		0.3
Manganese	0.0092	0.009	0.006	0.284	0.031	0.01		
Chloride	<.5	4.3	2.6	<.5	0.5	0.9		
Flouride	0.12	0.12	0.14	0.1	0.11	0.1	1.5	
Total Suspended Solids mg/L	12	8	5	<1	2	<5		
Total Dissolved Solids mg/L	159	171	153	138	144	153	500	
Hardness as CaCO3 mg/L	147	145	162	124	129	141		
Colour Colour Units	22	14	14	17	12	12	15	
Tubidity NTU	14	3.4	5.1	17	1.4	0.9	5	
Extractable Metals mg/L								
Aluminum	0.224	0.09	0.109	0.049	0.032	0.012		0.1
Copper	0.002	0.001	<.001	<0.001	<0.001	<.001	1	0.003
Selenium	0.004	0.0013	0.0014	0.004	0.0004	0.0007	0.01	0.001
Zinc	0.0048	0.004	0.004	0.0036	0.003	0.002	5	0.03

4.0 CONCLUSIONS AND RECOMMENDATIONS

The water quality results from the 2003 surveillance survey indicate continued excellent water quality within the Pelly River main stem. There was no evidence of negative effects arising from the Faro Mine that can be measured in terms of conventional water quality parameters.

Tributary streams, including Anvil Creek and Earn River, showed no significant anomalies and also had excellent water quality. Water sampling and visual observations confirm that significant slope failure activity is present on the Pelly and lower MacMillan rivers.

The following recommendations concerning water monitoring are offered for consideration to the Selkirk First Nation. Many of these recommendations that remain valid are repeated from the 2001 report.

4.1 Water Quality Monitoring Program

Under Chapter 14 of the Selkirk First Nation Final Agreement and the Umbrella Final Agreement, a first nation has *"...a Yukon First Nation has the right to have water which Is on or flowing through or adjacent to its Settlement Land remain substantially unaltered as to quantity, quality, and rate of flow, including seasonal rate of flow."* How does the first nation and the federal government establish whether or not this is the case? A long term water quality monitoring program would help to answer this question.

A water quality monitoring program would have as a cornerstone, a station near the community of Pelly Crossing, which would monitor the water quality there on a permanent basis. Water quality monitoring stations would also be established at strategic locations in Settlement Land and at the periphery of the SFN traditional territory in order to ensure that water quality is "substantially unaltered". An additional element of water quality monitoring would be to build the first nation's technical capacity to investigate water quality phenomena in their regular monitoring of lands and resources. Having people trained to monitor water quality and to properly assess an apparent change would strengthen the stewardship capabilities of the Lands

and Resources Branch of the SFN. Also, the skills and knowledge regarding water data collection, management, and interpretation would help the first nation to assume a meaningful role in the assessment of development projects in the region.

The purpose behind monitoring the waters of the Pelly River and its main tributaries such as the Macmillan River is to measure the effects of any specific discharges and changing land uses on water quality. Natural changes such as permafrost degradation and landslides can also affect water quality. Having a people trained in collecting water data would be useful for the first nation in documenting any natural or water pollution events during the course of other resource monitoring.

There are three main ways to accomplish an ongoing water monitoring program:

- Collect water samples for lab analysis
- Conduct field measurements using scientific equipment
- Record data and build a database that can be observed over time for trends and changes.

All three elements complement each other and can't be done in isolation. Water quality monitoring can be implemented as part of other field programs such as fish habitat monitoring and wildlife management. A water quality monitoring program should be accompanied by observations and measurements of water quantity – or hydrological monitoring. A detailed plan for implementation of a program would need to consider the budget restraints, goals and objectives of monitoring, and capacity of the first nation to maintain the program.

In 1998 a committee called the First Nations Environmental Guidelines Steering Committee commissioned a series of guidelines on safe drinking water, waste disposal, and water monitoring. One of the documents produced was the *Guidelines for Water Data Collection* prepared by Gartner Lee Limited. This document outlines the steps to take in establishing a water-monitoring program in a first nation community. As a follow up to this document, a workshop on water data collection for first nations was presented by Laberge Environmental Services in June 1998. It is recommended that LES prepare and present a water data collection

training program to the SFN based on these guidelines. (A copy of the *Guidelines for Water Data Collection* accompanied the 2001 report for reference).

4.2 Watershed Study

The waters of the Pelly River and its tributaries cannot be fully understood by studying water quality alone – the water samples will not tell the whole story. The land uses in the watershed and the natural erosion process at work in the basin will have the most impact on the quality of the water. A multi-disciplinary study, including a complete inventory of water quality data, land uses, traditional knowledge, and surficial geology processes, would be required to accurately gauge changes in the Pelly River. A water quality monitoring program would be a key component of a watershed study.

A model for carrying out a comprehensive study of watersheds from a first nations perspective is to be found in the Yukon Inter Tribal Watershed Council. The Yukon River Inter Tribal Watershed Council (YRITWC) has embarked on studies of the Yukon River tributaries. A phased watershed study and assessment has been initiated, starting with the Fortymile River. *(The project overview for this study was attached as Appendix C – Yukon River Inter Tribal Watershed Council Documents, to the 2001 report).*

It is recommended that the Selkirk First Nation consult with the YRITWC to determine whether the Committee would be an effective vehicle for initiating a Pelly River watershed assessment and study.

5.0 REFERENCES

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