Water Quality Objective Monitoring, Indian River Watershed, 2009

Hydrologic and Geomorphic Characteristics of the Indian River Drainage Basin

The Indian River, a major tributary to the Yukon River, drains an area of approximately 2220 square kilometers and has an overall channel length of approximately 120 km. The drainage basin is located 60 km south of Dawson.

Indian River, a gravel bed stream, is a tributary of Yukon River. The Indian River basin lies within the Klondike Plateau, a gently sloping upland south of Tintina Trench consisting of accordant summits (e.g., King Solomon Dome, Australia Mountain). The present flood plain descends about 53 m over a distance of 33 km with an overall gradient of about 1.6 m/km between the confluences of Dominion Creek and Ruby Creek.

The Water Survey of Canada (WSC) gauging station (09EB003) is located 1.5 km from the confluence of the Indian River with the Yukon River.

Topographical drainage Basin	2220 Sq. Kilometers
Area of Lakes	0%
Area of Forest	85%
Channel Length	120 Kilometers
Terrain	non-glaciated

In 2009, water samples were collected at 13 different sites in the Indian River basin. Sampling commenced on June 9th, 2009 and a total of 422 samples were collected up until the end of the season on September 15th, 2009. A combination of automatic composite sampling and grab sampling methods were used in the basin. An additional 99 samples were collected by E.M.R staff during routine mine inspections.

Atmospheric data was collected using three portable weather stations; one located near the mouth of the Indian River, the second downstream of Quartz Creek on the Indian River and the last at a background site on the Indian River.

Blitz sampling events took place in the Indian River basin on June 9th, August 4th and September 15th, 2009. Samples were taken every two kilometres along the main stem of the Indian River as well as on Sulphur Creek, Dominion Creek and Australia Creek, which form the headwaters of the Indian River.

Basin total flow data was provided to us by the Water Survey of Canada station located near the mouth of the Indian River. Flow data for the individual tributaries to the Indian River was collected at the time of sampling by the staff of E.M.R CS&I using the methodology outlined in the Yukon Placer Secretariats, Water Quality Monitoring Protocol.

Site Codes and Global Position of Water Quality Sampling Locations in the Indian River Watershed

SITE CODE	LOCATION	LAT_Y	LONG_X
IND 01	Indian River at mouth	63.77794	-139.70927
IND 02	Indian River u/s of Nine Mile Ck, d/s of Ophir Ck	63.77337	-139.34888
IND 03	Indian River d/s of Ruby Creek	63.76852	-139.31589
IND 04	Indian River d/s of Quartz Creek	63.74484	-139.15034
IND 05	Indian River d/s of Gimlex bridge	63.73735	-139.07439
IND 05A	Indian River d/s Montana Creek	63.69810	-138.97296
IND 06	Indian River d/s of Tamarack drain	63.69385	-138.93163
IND 07	Indian River u/s of Tamarack drain	63.64296	-138.87100
IND 08	Indian River at bridge over to Eureka (background)	63.61241	-138.72108
IND AUS 01	Australian Creek mouth	63.62037	-138.68327
IND DOM 01	Dominion Creek mouth u/s of Sulphur Creek	63.62565	-138.69148
IND DOM 02	Gold Run Creek mouth	63.69152	-138.59724
IND DOM 03	Grant Pup Creek mouth	63.70445	-138.57770
IND DOM 04	Dominion Creek u/s Gold Run Ck, d/s Burnham Ck	63.71686	-138.54523
IND DOM 05	Burnham Creek mouth	63.72881	-138.52914
IND DOM 06	Dominion Creek u/s of Burnham, d/s Arkansas Ck	63.73349	-138.52496
IND DOM 07	Arkansas Creek mouth	63.74499	-138.51467
IND DOM 08	Kentucky Creek mouth	63.75940	-138.51349
IND DOM 09	Jensen Creek mouth	63.77149	-138.53495
IND DOM 10	Nevada Creek mouth	63.80472	-138.60658
IND DOM 11	Champion Pup Creek mouth	63.82743	-138.68361
IND DOM 12	Chapman Pup Creek mouth	63.83091	-138.69487
IND DOM 13	8 below Pup Creek mouth	63.83350	-138.71324
IND DOM 14	Troublesome Pup Creek mouth	63.83500	-138.74991
IND DOM 15	Almeda Pup Creek mouth	63.83905	-138.78414
IND DOM 16	Caribou Creek mouth	63.84294	-138.80054
IND DOM 17	Mummie Pup Creek mouth	63.85705	-138.85352
IND DOM 18	Lombard Pup Creek mouth	63.85677	-138.85347
IND EUR 01	Eureka Creek Below All Mining (BAM)	63.60483	-138.83099
IND MON 01	Montana Creek mouth	63.69810	-138.97296
IND NIN 01	Nine Mile Creek mouth	63.79533	-139.40988
IND QUA 01	Quartz Creek mouth	63.74271	-139.13976
IND QUA 02	Quartz Creek at dredge	63.75333	-139.12445
IND RUB 01	Ruby Creek mouth	63.76226	-139.29227
IND SUL 01	Sulphur Creek mouth u/s of Dominion Ck	63.63774	-138.68327
IND SUL 02	Sulphur Creek u/s of large culverts	63.65632	-138.67613
IND SUL 03	Sulphur Creek at Brimstone Gulch	63.74023	-138.84891
IND SUL 04	Sulphur Creek right fork headwaters	63.82285	-138.92863
IND TAM 01	Tamarack drain	63.64308	-138.87200

Water Quality Objective monitoring, Indian River Watershed – Summary

This basin has been extensively monitored for the past 5 years by many different organisations providing us with an immense amount of information regarding the state of the water quality in a historically mined watershed. The Indian River basin is a heavily diverse watershed, with vast areas of active mining as well as inactive, reclaimed and partially reclaimed, sections. Placer activities in this watershed have remained consistent over the last decade. Due to the great interest in the area, and recent changes in mining locations and levels of activity, the Indian River Watershed was once again designated a '*major'* watershed for monitoring in 2009. This meant that a major proportion of our monitoring efforts were spent in the basin, and that our monitoring schedule included many repeat visits throughout the season.

Four automatic water sampling station and three weather stations were set up and maintained from June 16th, 2009 until shutdown on September 15th, 2009. From the data obtained by these instruments and through on site visits and sampling conducted by CS&I staff, the following observations regarding the water quality in the basin can be made:

> The overall water quality in the basin, met the minimum objectives set under the *Fish Habitat Management System* throughout the monitoring season. On average, the Total Suspended Solids concentrations, from water samples collected at our water quality monitoring sites were below 25 mg/L TSS all season.

Low stream flows resulting in less suspension / resuspension of sediment in the water combined with below average seasonal rainfall which led to a decrease in the amount of additional sediment entering the watercourse through runoff, helped to reduce the Total Suspended solids concentration in the basins waters. This in conjunction with already reduced effluent discharge volumes and effluent sediment concentrations improved the overall water quality in the Indian River watershed for 2009.

The Fish Habitat Management System - Indian River Watershed (Category B)
Sample Results that Exceed Water Quality Objectives for 2009

Sampling Station	IND 01	IND 02	IND 04	IND 08	Other	Other	Other	Other	Other
Location Description	Mouth	u/s IND NIN 01	d/s IND QUA 01	IND backgrd					
Sample Type	Auto/Grab	Auto/Grab	Auto/Grab	Auto/Grab					
Lat Y	63.77794	63.77337	63.74484	63.61241					
Long X	-139.70927	-139.34888	-139.15034	-138.72108					
Habitat Classification	Moderate-M	Low	Low	Low					
Water Quality Objective (mg/L)	100	300	300	300					
Date of Sampling									
	No samples exceeded the Water Quality Objectives								
Total Seasonal Average TSS (mg/L) by site	7.7	10.2	13.5	23.3					
Number of days sampled	90	90	72	88					

Legend Not continuously monitored

Water Samples that are: Above / Below the Water Quality Objective