Water Quality Objective Monitoring, White River Basin, 2013

Hydrologic and Geomorphic Characteristics of the White River Drainage Basin

The White River, with a drainage area of about 50,504 square kilometres, adds vast amounts of silt and sediment from glacier and mountain runoff to Yukon River. Many large tributary rivers and streams flow into the catchment area of the White River basin. The confluence of the White River with the Yukon River creates the point that delineates the Yukon River North from the Yukon River South.

In 2010, water samples were collected 11 sites in the White River basin. Sampling commenced on June 2nd, 2010 and a total of 117 samples were collected up until the end of the season on September 16th, 2010. A combination of automatic composite sampling and grab sampling methods were used in the basin.

Atmospheric data was collected using two portable weather stations; one located below all mining on Burwash creek the other below all mining on Gladstone Creek.

Blitz sampling events took place in the basin on June 2nd, June 30th, July 9th, July 21st, July 23rd, August 18th and September 1st 2010. Samples were taken at 11 WQO sites along the main stem of the White River as well as at the mouth of its major tributaries.

Basin total flow data was provided to us from the Water Survey of Canada station that is monitoring flow in the White River watershed, located just below the glacier field on the White, at Kilometre 1881.6, of the Alaska Highway. Flow data for the individual tributaries to the White 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.

White River Watershed Placer Authorization

On April 11, 2008, pursuant to Section 35(2) of the Federal *Fisheries Act*; The Minister of Fisheries and Oceans Canada revoked the conditions of the Yukon Placer Authorization (issued June 1993) and all subsequent amendments pertaining to placer mining works or undertakings and sediment discharge standards in the Yukon River North watershed.

The Minister then authorized the "*harmful alteration, disruption or destruction of fish habitat*" resulting from placer mining works or undertakings and the discharge of sediment at concentrations specified in the new authorization, which are uncontaminated by deleterious substances, within certain streams or portions of streams in the White River watershed. The areas of allowable discharge are identified on the *Yukon Placer Fish Habitat Suitability Map for the White River watershed* (Schedule 1) and the sediment discharge standards for mine discharge (allowable sediment discharge concentrations) detailed in the *Sediment Discharge Standards for Placer Mine Effluent – White River watershed* (Schedule 2).

Under these new authorizations, it was decided to incorporate a 3 year phase-in schedule for the sediment discharge standards that would apply to each Placer mining operation in the Yukon. This phase-in period would allow both the government mining inspectors and the Yukon Placer

Secretariat enough time to ensure that each operator fully understood their requirements to comply with the new authorizations and to operate within the framework of the new management system for Placer mining in the Yukon. The 3 year phase-in schedule contains the following requirements:

> In 2008 – Licensed placer miners would be informed about the operating practices required to comply with the new system for managing placer mining activity under the *Fisheries Act*. Inspectors and the Yukon Placer Secretariat would ensure that each operator is aware of the specific changes required at his or her site.
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> In 2009 – All licensed placer miners must be oriented to the Design Target and Action Level detailed within the authorization pertaining to the watershed they are operating in and, must comply with a Sediment Discharge Standard for Mine discharge of no greater than 2.5 ml/L, or the standard stipulated in their existing water use license, whichever is more stringent.
> And in 2010 – All operations must be oriented to operate within the Design Target and Action Level, and must not exceed the Compliance Level stipulated in the table of ***Sediment Discharge Standards for Placer Mine Effluent*** (Schedule 2) for the habitat suitability classification and the watershed in which the mine is located.

It should be noted, that with the exception of a few water use licenses issued after April 11, 2008 for the White River Watershed, the new fish habitat management system did not result in reduced sediment discharge standards or stricter site management practices for 2010 in this basin. In most cases, the existing water use licenses for operations in the White River Watershed were already set at or below the maximum allowable standard of 2.5 ml/l consequently, the water quality objectives monitoring results for 2010 are an assessment of the *status quo*, as opposed to the beneficial influence of the new rules for Yukon placer mining.

Highly sensitive habitat received a high degree of protection under the YPA, and that is maintained in the new system. The degree of disturbance of all mined tributaries in each watershed is recognized under the new rules by the Previous Development designation. The Water Quality Objectives and related discharge standards that are set are designed to mitigate the potentially negative downstream effects of placer mining.

High suitability habitats (Areas of Special Consideration) are defined as watercourses that contain ecologically or culturally important fisheries or aquatic resources. Watercourses assigned this designation may include habitats for rare or locally significant species or areas which directly support subsistence, traditional, commercial or sport fisheries. Areas of Special Consideration (ASC) may be established for either anadromous or nonanadromous species of fish.

In **all cases**, any placer mining activities that are likely to result in the harmful alteration, disruption or destruction of High (ASC) suitability habitats require a site-specific review, and if the activity is deemed to be acceptable, a site-specific authorization issued by Fisheries and Oceans Canada. In order to further protect these ASCs, a full compensation and fish habitat restoration plan must be submitted to Fisheries and Oceans Canada with any proposal to conduct works in or around High (ASC) suitability habitats.

In moderately sensitive habitat where mining has occurred for decades, the *Previous Development* designation results in application of a less stringent discharge standard, recognizing that the habitat features predicted by the classification model likely don't exist.

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

Site Code	Alias	Location	Latitude	Longitude
WH01	W 01	White River mouth	63.188920	-139.588850
WH04	W 04	White River at the Alaska Highway	61.988010	-140.555980
WH__DO_AR01	W ARC 01	Arch Creek near mouth	61.494120	-139.718550
WH__DO_KL_BU01	W BUR 01	Burwash Creek below all mining	61.442650	-139.215480
WH_DO_NI_NA_DI01	W DISC 01	Discovery Creek mouth	62.073840	-137.228520
WH_DO_NI_NA_DI02	W DISC 03	Discovery Creek above all mining	62.079540	-137.189320
WH_DO_NI_NA_DO01	W DOLL 02	Dolly Creek below all mining	62.062330	-137.221210
WH_DO_NI_NA_DO02	W DOLL 03	Dolly Creek above all mining	62.064990	-137.213200
WH_DO01	W DON 01	Donjek River at Alaska Highway	61.678940	-139.757110
WH_DO_KL_DU01	W DUK 01	Duke River at Alaskas Highway	61.377770	-139.147370
WH_DO_KL_GL01	W GLAD 01	Gladstone Creek mouth	61.318970	-138.655670
WH_DO_KL_GL02	W GLAD 02	Gladstone Lake - Gladstone Creek background	61.323900	-138.173150
WH_DO_NI_NA01	W NAN 01	Nansen Creek mouth	61.980490	-137.199040
WH_DO_NI_NA02	W NAN 02	Nansen Creek below all mining	61.980520	-137.199630
WH_DO_NI_NA03	W NAN 03	Nansen Creek upstream of Discovery Creek	62.073840	-137.228520
WH_DO_NI_NA04	W NAN 04	Nansen Creek East fork above all mining	62.095980	-137.190000
WH_DO_NI02	W NISL 02	Nisling River downstream of Klaza River	62.096410	-138.492360
WH_DO_NI03	W NISL 03	Nisling River downstream of Nansen Creek at class change	61.846160	-137.479520
WH_DO_NI04	W NISL 04	Nisling River upstream of Nansen Creek	61.980490	-137.199040
WH_DO_KL_QU01	W QUIL 01	Quill Creek at Alaska Highway	61.517150	-139.330950
WH_SA01	W SAN 01	Sanpete Creek upstream of Alaska Highway	62.091030	-140.667070
WH_DO_KL_GL_SW01	W SWA 01	Swanson Creek mouth	61.315920	-138.309820
WH_DO_KL_SW01	W SWJ 01	Swede Johnson Creek at Alaska Highway	61.592310	-139.428540
WH_DO_NI_VI02	W VIC 02	Victoria Creek left fork below all mining	62.026190	-137.056300
WH_DO_NI_VI03	W VIC 03	Victoria Creek left fork above all mining	62.097590	-137.146790

Water Quality Objective monitoring, White River Watershed – Summary

There are two major sub-drainages that make up the White River watershed, the Kluane River drainage and the Nisling River drainage. Both the Kluane River and the Nisling River flow into the Donjek River which in turn flows into the White. As Placer mining takes place in both sub-drainages, site specific monitoring and inspection is necessary. The analysis of water and effluent samples collected during these routine inspections were well within the water quality objectives and sediment discharge standards set for the area.

Up until 2009, there has been insufficient data (both in quality and quantity) available in order to draw any conclusions regarding the overall water quality in the White River watershed. There was also a lack of basin specific atmospheric monitoring data available for ether drainage as there is no operating fixed position weather monitoring stations in or around the White River Watershed. The closest operating station is at Carmacks YT. The only Water Survey of Canada station that is monitoring flow in the White River watershed is located just below the glacier field on the White, at Kilometre 1881.6, of the Alaska Highway.

In order to provide additional water quality and atmospheric monitoring data than in the past, EMR CS&I staff deployed automatic sampling equipment and portable weather monitoring stations in the Kluane River drainage in 2013. A total of 50 samples were collected at 8 different sites between June 27th, 2013 and August 9th, 2013.

Unfortunately, in 2013, as in past monitoring seasons, the Kluane drainage area once again proved very difficult to monitor with automated sampling equipment and data loggers. As one example of the problems that kept plaguing our efforts, Burwash Creek experienced extremely high flow variability and major channel migration. This is due in part to the heavy rain events recorded in the region on July 10th, 20th, 25th and 31st , which washed through the area, moved the channel in the creek bed from the left limit of the channel 10 meters to the east, right up against the right limit of the channel. This violent shift in the channel left our monitoring equipment out of the water and unable to automatically collect any sample. At the same time this shift in the channel and the scouring effect and then redeposit of bed material from one side to the other, buried our level monitoring equipment beneath 1-1.5 m of bed material, were it remains to this day.

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:

Insufficient data was obtained throughout the season to draw any conclusions that would be representative to the general state of the water quality in the basin. On average, at the one site located on Burwash Creek, using the limited data obtained through automatic equipment and grab sampling, the water quality of Burwash Creek did not meet the minimum objectives set under the Fish Habitat Management System. On those occasions when the WQO were not met and the Total Suspended Solids levels were greater than the objectives, a direct correlation between environmental conditions and the volume of solids in the water was observed.

In most cases, rainfall, as either localised events or basin wide occurrences, increased the amount of surface run off and subsequent soil erosion from the land, increasing the input of sediment into the receiving waters. These increases occurred simultaneously at the time of the rain event or immediately in a period of one or two days after the rain event, as surface water continued draining from the land and ground water infiltrated the watercourse. Increases in sediment-laden ground and surface water entering the system add to the amount of sediment in the water. The ability of the receiving water to dilute these inputs of sediment is negated by the re-suspension of streambed material and by the further erosion of the streams banks that occurs along with the increased flows that are generated by the aftermath of these rain events.

In the future, a greater effort must be made to collect, on a more frequent base, manual grab samples. It is too difficult to maintain and keep operating automated sampling equipment in this type of dynamic environment. Highly variable flows and meandering streams in wide channels make it impossible to keep stationary sampling instrumentation in the water course.

WH_DO_KL_BU01 JULY 17, 2013

WH_DO_KL_BU01 AUGUST 8, 2013

The Fish Habitat Management System - White River Watershed (Category B)

Sample Results that Exceed Water Quality Objectives for 2013

Sampling Station	WH01	WH_DO_KL_SW01	WH_DO_KL_QU01	WH_DO_KL_BU01	WH_DO_KL_DU01	WH_DO_KL_GL01	WH_DO01	WH_DO_AR01	WH_SA01	WH04
Location Description	Mouth	Mouth	Mouth	Mouth	at hwy	Mouth	Mouth	Mouth	Mouth	at hwy
Sample Type	Grab	Grab	Grab	Auto/Grab			Grab	Grab	Grab	Grab
Lat Y	63.19370	61.59196	61.50624	61.44270	61.37777	61.31897	61.67894	61.49412	62.09103	61.98801
Long X	-139.59580	-139.42787	-139.33156	-139.21507	-139.14737	-138.65567	-139.75711	-139.71855	-140.66707	-140.55598
Habitat Classification	High	Moderate-H	Moderate-H	Moderate-M	Moderate-M	Lake Rule	Moderate-L	Low	Low	Water Quality
Water Quality Objective (mg/L)	<25	<25	<25	<100	<100	<25	<200	<300	<300	n/a
Date of Sampling										
27-Jun-13		18.0	2.0	13.0			4263.0			5003.0
28-Jun-13					1582.0					
12-Jul-13				134.0						
13-Jul-13				141.0						
17-Jul-13		8.0	5.0	6.0	2176.0		2394.0			4756.0
22-Jul-13				7375.0						
23-Jul-13				5115.0						
26-Jul-13				5680.0						
27-Jul-13				1685.0						
28-Jul-13				1416.0						
29-Jul-13				1505.0						
30-Jul-13				782.0						
31-Jul-13				786.0						
1-Aug-13				1534.0						
2-Aug-13				681.0						
8-Aug-13			9.0	8.0	285.0					
20-Sep-13	242.7									
Total Seasonal Average TSS (mg/L) by site	242.7	13.0	5.3	760.8	1347.7		3328.5		7.0	4879.5
Number of days sampled	1	2	3	33	3		2		1	2

Legend: Not continuously monitored

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