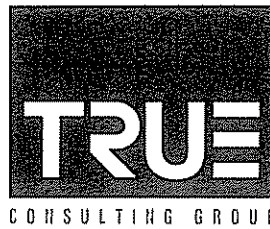


CITY OF WILLIAMS LAKE

Review of 2007 Receiving Environment Monitoring



*April 2008
Ref: 602-021*



April 24, 2008

Our File: 602-021

City of Williams Lake
450 Mart Street
Williams Lake, B.C. V2G 1N3

Attention: Mr. Joe Engelberts

Dear Sir:

RE: Review of 2007 Receiving Environment Monitoring Data


Attached herewith is the writer's review report of the monitoring data from the Fraser River above and below the City's wastewater treatment plant on October 25, 2007. On this date, the Fraser River flow was about 1700 cms which is more than four times the 7 day 2 year return low flow on which the MSR registration and Initial Dilution Zone (IDZ) calculations were based. With the river flow being significantly greater than 375 cms on which the IDZ was based, it would be anticipated that the impact of the City's outfall in terms of increased concentrations of the various monitoring parameters would be negligible. The monitoring data for turbidity, nitrites, total phosphorus, orthophosphorus and fecal coliform are consistent with the calculated dilution ratios for a river flow of 1700 cms. There was however an increase in ammonia concentrations from 0.107 mg/L above the outfall to 0.395 mg/L. below the outfall which is inconsistent with the calculated dilution ratio and "above and below" concentrations for all other monitoring parameters. I am not able to offer any explanation for the IDZ ammonia concentration of 0.395 mg/L.

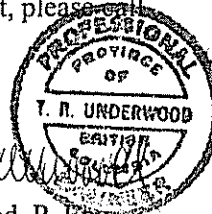
Ideally, sampling of the Fraser River would be undertaken when river flow is significantly less than the case in October 2007, i.e. 1700 cms. At this river flow, I suspect that locating the sampling sites and taking samples is not straightforward. For the 2008 river sampling, I suggest the following:

- assess opportunities for sampling in the early spring before freshet when river flows are typically at or near seasonal lows.
- ensure that total suspended solids at Sites 1 and 2 are included as test parameters consistent with the approved monitoring program.

Should questions arise related to any aspect of this review report, please call

Yours truly,


T.R. Underwood, P. Eng.



Enclosure

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City of Williams Lake

Review of Receiving Environment Monitoring

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SECTION 1.0 – INTRODUCTION

In December 2001, TRUE Consulting Group (TRUE) prepared a report for the City of Williams Lake titled “Outfall Assessment and Environmental Impact Report”. This report described upgrading requirements to the City’s wastewater treatment plant outfall into the Fraser River to comply with the Municipal Sewage Regulation (MSR) and provided an environmental impact assessment to confirm compliance with receiving environment sections of the MSR. The report was reviewed with staff of the Ministry of Environment and formed the basis for an application for registration under the MSR by the City of Williams Lake in January 2002. The MSR registration application was accepted by the Ministry of Environment and the effective date established as January 31, 2002.

In the spring of 2002, the City of Williams Lake completed construction of an extension of the treatment plant outfall to achieve compliance with the outfall design provisions of the MSR. The outfall was extended about 40m “further” into the Fraser River to insure that the east edge of the initial dilution zone as defined in the MSR did not extend beyond the calculated river edge at the 7 day low flow having a return frequency of 2 years.

In July 2004, the City of Williams Lake entered into discussions with the Ministry of Environment to develop a receiving environment monitoring program consistent with the requirements of the MSR. From these discussions an appropriate receiving environment monitoring program was agreed to by both the City and Ministry staff as described in a TRUE letter dated August 23, 2004 (copy enclosed Appendix A). The City of Williams Lake proceeded with the implementation of the receiving environment monitoring program in September 2004. This report presents a review of the receiving environment monitoring data for 2007 with comparisons provided with data for the period 2004 to 2007 inclusive.

SECTION 2.0 – RECEIVING ENVIRONMENT MONITORING PROGRAM & REVIEW REQUIREMENTS

The Receiving Environment Monitoring program is described in a TRUE letter dated August 23, 2004 (please refer to Appendix A) and comprises annual sampling of the Fraser River and Williams Lake River summarized as follows.

- Fraser River approximately 100m upstream of Outfall (Station No. 1)
- Fraser River at the midpoint of the Calculated Edge of the Initial Dilution Zone (Station No. 2)
- Williams Lake River upstream of Confluence with the Fraser River (Station No. 3)

The sampling of the Fraser River represents monitoring necessary to comply with the MSR. The sampling of the Williams Lake River is included only for general information purposes. The Williams Lake River quality testing is intended to provide the City with a background database for future planning and infrastructure assessment purposes, for example stormwater infrastructure.

Monitoring parameters are summarized following.

Turbidity	Sites 1, 2
Total Suspended Solids	Sites 1, 2
Total Phosphorus (as P)	Sites 1, 2 and 3
Ortho Phosphorus (as P)	Sites 1, 2 and 3
Ammonia Nitrogen (as N)	Sites 1, 2 and 3
Nitrate – Nitrite Nitrogen (as N)	Sites 1, 2 and 3
Fecal Coliforms (3 samples each site)	Sites 1, 2 and 3

Sampling of the Williams Lake River for fecal coliform was suggested recognizing that it is a potential source of fecal coliform in the Fraser River adjacent to the recreation area. Three fecal coliform samples were suggested at each of the three sites recognizing that fecal coliform results can be variable.

From the Municipal Sewage Regulation and correspondence from the Ministry of Environment, monitoring program, review and reporting requirements are:

- discharger (City) must document any effect of the discharge on the receiving environment using appropriate statistical and graphic analysis.
- discharger (City) must document any trends in environmental quality in the receiving environment affected by the discharge using background or pre-discharge data and by using all the years of record in which the discharge has taken place.
- the report must be written by a qualified professional and provide interpretation of the monitoring data.
- the report should explain the sampling results in relation to the key issues outlined in the registration. The key issues are the effectiveness of the mixing of the effluent with receiving waters, ammonia levels at the edge of the initial dilution zone and fecal coliform impacts on the beach area from May to September inclusive.

SECTION 3.0 – WASTEWATER TREATMENT PLANT EFFLUENT QUALITY DATA

Data from monthly sampling of the wastewater treatment plant effluent by the City of Williams Lake for the period January 01, 2004 to December 31, 2007 are summarized in Table 3.1. Comparisons of the effluent quality data presented in Table 3.1 with assumptions presented in the “Outfall Assessment and Environmental Impact Report” dated December 2001 are as follows:

➤ Ammonia (as N)

Assumed Concentration December 2001 – 30 mg/L

2004/2005 Data (Table 3.1) – Fall, Winter, Spring – Average 18.3 mg/L

2004/2005 Data (Table 3.1) – Summer, July, Aug., Sept. – Average 0.3 mg/L

2006 Data (Table 3.1) – Fall, Winter, Spring – Average – 20.0 mg/L

2006 Data (Table 3.1) – Summer, Aug. Sept. Oct. – Average – 2.9 mg/L

2007 Data (Table 3.1) – Fall, Winter, Spring – Average – 17.60 mg/L

2007 Data (Table 3.1) – Summer, July, Aug., Sept., Oct. – Average – 5.21 mg/L

Summer (delete August) – Average – 1.68

Historically, effluent ammonia concentrations are in the range of 15.0 to 25.0 mg/L in the fall, winter and spring periods and decrease to consistently less than 5.0 mg/L during the months, typically July to October. The effluent ammonia concentration of 15.8 mg/L for a sample on August 15, 2007 is inconsistent with historical data. The fall, winter and spring of 2007, the average ammonia concentration of 17.60 mg/L is consistent with historical data and significantly less than the assumed effluent ammonia concentration of 30 mg/L used in the December 2001 “Outfall Assessment and Environmental Impact” report.

**TABLE 3.1: WILLIAMS LAKE WASTEWATER TREATMENT PLANT
EFFLUENT QUALITY**

<i>Date</i>	<i>BOD₅</i>	<i>TSS</i>	<i>NH₃ (as N)</i>	<i>Tot P</i>	<i>Total Ortho P</i>
Jan-04	24	15	19.60	3.85	3.24
Feb-04	26	20	19.70	3.87	2.77
Mar-04	10	4	19.50	3.58	3.07
Apr-04	<10	13	11.60	3.83	3.2
May-04	21	22	17.10	4.1	2.94
Jun-04	77	42	0.15	5.22	2.96
Jul-04	16	27	0.06	3.3	2.71
Aug-04	14	11	0.02	3.33	2.85
Sep-04	16	12	1.21	4.69	2.39
Oct-04	<10	14	16.40	3.76	2.71
Nov-04	13	27	17.10	3.65	3.1
Dec-04	27	32	16.50	3.44	2.89
Jan-05	32	24	18.00	3.71	2.86
Feb-05	28	10	18.50	3.69	3.69
Mar-05	21	26	18.20	3.84	3.14
Apr-05	16	10	22.80	4.17	3.87
May-05	15	17	20.80	3.66	3.25
Jun-05	18	16	18.90	3.52	2.97
Jul-05	18	27	0.24	3.48	3.01
Aug-05	<10	18	<0.01	3.27	3.06
Sep-05	11	10	0.27	3.22	3.12
Oct-05	<10	13	2.40	3.29	2.85
Nov-05	<10	9	19.10	3.61	3.37
Dec-05	19	18	19.70	3.43	2.95
Average 2004 and 2005				3.73	3.04
Jan. 19/06	22	28	18.5	3.23	2.91
Feb. 16/06	26	21	20.5	3.31	2.68
Mar. 15/06	20	14	18.3	3.37	2.94
Apr. 19/06	13	14	17.6	3.48	3.01
May 17/06	11	5	19	3.24	2.94
June 20/06	16	30	24.3	3.38	2.99
July 18/06	<10	19	23.1	3.66	3.21
Aug. 16/06	28	36	<0.005	3.72	2.99
Sept. 18/06	17	25	2.45	3.41	2.83
Oct 17/06	<10	20	3.38	3.49	2.69
Nov. 16/06	<10	20	18.6	3.2	2.86
Dec. 14/06	23	12	20.8	3.24	3.01
Average 2006				3.39	2.92

TABLE 3.1: WILLIAMS LAKE WASTEWATER TREATMENT PLANT
EFFLUENT QUALITY

(continued)

<i>Date</i>	<i>BOD₅</i>	<i>TSS</i>	<i>NH₃ (as N)</i>	<i>Tot P</i>	<i>Total Ortho P</i>	<i>Total Coliform</i>	<i>Fecal Coliform</i>
Jan. 16/07	67	25	21.85	3.16	2.63		
Feb. 15/07	24	17	25.4	4.06	2.61		
Mar. 15/07	16	29	11.8	3.44	3.23		
Apr. 16/07	16	11	24.7	3.3	2.97		
May 15/07	12	13	13.1	3.95	3.31	10,600	685
June 14/07	<10	17	24.9	4.11	3.82		
July 12/07	25	32	0.059	3.58	3.12		2,400
Aug. 16/07	26	28	15.8	4.71	2.32	4,700	1,035
Sept. 17/07	36	30	0.332	3.56	3.06	6,400	1,130
Oct. 23/07	26	107	4.66	3.73	3		33,000
Nov. 14/07	15	14	15.3	3.98	2.85	27,000	1,600
Dec. 18/07	21	20	23.3	4.74	3.06		119,000
Average 2007				3.86	3.00		

➤ Phosphorus

	<i>Assumed Concentration December 2001</i>	<i>2004/2005 Averages</i>	<i>2006 Average</i>	<i>2007 Average</i>
Total Phosphorus	6.0 mg/L	3.73 mg/L	3.39 mg/L	3.86 mg/L
Total Ortho Phosphorus	5.5 mg/L	3.04 mg/L	2.92 mg/L	3.00 mg/L

In the period to December 2001, the City of Williams Lake did not monitor the effluent quality for either total phosphorus or total ortho phosphate. In the absence of any actual data, effluent concentrations for total phosphorus of 6.0 mg/L and total ortho phosphorus of 5.5 mg/L were assumed based on data for other lagoon systems treating primarily municipal wastewater. Monitoring data for phosphorus in 2007 is consistent with historical data. Average concentrations for total and orthophosphorus through 2007 are approximately 60% of the assumed concentration used to support the MSR Registration.

In 2007, the City of Williams Lake initiated sampling of the wastewater treatment plant effluent for fecal and total coliform. As presented in Table 3.1, effluent fecal coliform concentrations in 2007 ranged between 685 (May) to 119,000 (Dec.). As would be expected, effluent fecal coliform concentrations were lower in the summer months.

SECTION 4.0 – RECEIVING ENVIRONMENT MONITORING

Monitoring data of the receiving environment by the City of Williams Lake in accordance with the monitoring program as described in TRUE letter dated August 23, 2004 is presented in Table 4.1. The analytical report from EcoTech Laboratory Ltd. for samples taken in October 2007 is contained in Appendix B.

A component of the approved monitoring program is total suspended solids for the Fraser River upstream (Site 1) and downstream at the IDZ (Site No. 2) of the outfall. In 2006, analyses for total suspended solids at these sites were not undertaken. In 2007, analysis of the upstream and downstream sites included total dissolved solids instead of total suspended solids (please refer to EcoTech Analytical Report in Appendix B). The TDS results for all three sites for sampling on October 25, 2007 were:

	<i>Total Dissolved Solids</i>
Site 1 (Upstream)	142 mg/L
Site 2 (at IDZ)	137 mg/L
Site 3 (Williams Lake River)	653 mg/L

Historical data illustrates, as would be expected, a direct correlation between turbidity and total suspended solids. Associated with turbidity concentrations in the Fraser River of 17 and 19 NTU, the total suspended solids would have been about 15 mg/L.

River flow data for the period when the sampling was undertaken on October 25, 2007 has been obtained from the Water Survey of Canada website for the Fraser River at Marguerite (Station 08 MC 018). On October 25, 2007, the Fraser River flow was about 1700 cms with an increasing trend (please refer to Appendix C). As compared to the calculated 2 year return low flow of 375 cms as presented in the MSR registration supporting document, the October 2007 river flow was about 4 times higher. Associated with a river flow of 1700 cms, the theoretical dilution ratio in the initial dilution zone is derived as follows.

- cross sectional area of IDZ at 7 day 2 year return low flow of 375 cms = 40.9m²*
(*from December 2001 TRUE report)
- estimated cross sectional area of IDZ at 1700 cms = 78.4m²
- estimated velocity – 2.8 m/sec
- flow in IDZ cross section – 78.4m² x 2.8 m/sec = +220 cms

From the above, the estimated dilution ratio at the IDZ on October 25, 2007 is presented as follows:

	<i>December 2001 IDZ Dilution Ratio Calculation</i>	<i>October 2007 IDZ Dilution Ratio Calculation</i>
Fraser River Flow	375 cms*	1700 cms
Flow in IDZ Cross Section	75.9 cms	±220 cms
Effluent Discharge Volume	8000m ³ /day	6680m ³ /day (actual)**
Theoretical Dilution Ratio at IDZ	820:1	2840:1

* 7 day 2 year return low flow

** Average daily discharge rate for the period October 24 to 26, 2007 from City of Williams Lake Annual Report

Using the theoretical dilution ratio of 2840:1 as calculated for October 25, 2007, the increase in total phosphorus, orthophosphorus, ammonia and fecal coliform concentrations measured at the IDZ compared to background are:

Total Phosphorus – $3.73 \text{ mg/L} \div 2840 = 0.001 \text{ mg/L}$ increase

Total Orthophosphorus – $3.00 \text{ mg/L} \div 2840 = 0.001 \text{ mg/L}$ increase

Ammonia – $4.66 \text{ mg/L} \div 2840 = 0.002 \text{ mg/L}$ increase

Fecal Coliform – $33000/100 \text{ ml} \div 2840 = 12/100 \text{ ml}$ increase

The above theoretical calculations would suggest that the City of Williams Lake effluent should not be “identifiable” by significant concentration increases of the monitoring parameters upstream and downstream of the outfall.

On the basis of the preceding theoretical dilution ratio calculations, interpretive comments related to receiving environment monitoring data in Table 4.1 are presented as follows:

- the turbidity concentrations above and below the outfall (19 and 17 NTU respectively) are considered to be the same concentration. As would be expected, the effluent discharge is not reflected in an increase in turbidity of the Fraser River.

- On October 23, 2007 the ammonia concentration of the City's effluent was 4.66 mg/L therefore reflecting significant nitrification in the system. Assuming the nitrate concentration in the effluent was about 10 mg/L, an increase in nitrate concentration of about 0.003 mg/L is calculated based on a dilution ratio of 2840:1. The sampling data shows an increase in nitrate concentration from Site 1 to 2 of 0.007 mg/L which is consistent with the assumption that a substantial component of the nitrogen in the effluent on October 25, 2007 was in the form of nitrates.
- the sampling data shows an increase of ammonia concentration from Site 1 to 2 in the Fraser River of 0.288 mg/L. This increase is more than 100 times the theoretical calculated increase of 0.002 mg/L based on an effluent ammonia concentration of 4.66 mg/L. There is no explanation for the ammonia concentration of 0.395 mg/L at Site 2 recognizing that nitrate-nitrite, phosphorus and fecal coliform data for Sites 1 and 2 are consistent with the calculated dilution ratio of 2840 in the IDZ. The reported ammonia concentration of 0.395 mg/L is significantly less than concentrations where toxicity to fish would be a concern.
- the total phosphorus concentration above the outfall on October 25, 2007 was greater than the concentration at the IDZ. The sampling results are consistent with the dilution calculations, i.e. there should be a minimal or no increase in total phosphorus at the IDZ.
- ortho phosphorus concentrations above and below the outfall were the same concentration (<0.003 mg/L) on October 25, 2007 indicating no impact (as calculated) by the City's outfall. The 2007 data is the same as data for 2004, 2005, and 2006 when orthophosphorus for both sites was <0.003 mg/L.
- fecal coliform concentrations (average of three samples) were 76 per 100 ml upstream of the outfall and 61 per 100 ml downstream of the outfall. Theoretical calculations based on the estimated dilution ratio of 2840:1 suggest that the Site 2 concentrations should be about 10 CFU/100 ml higher than Site 1. All coliform results are less than 200 CFU/100 ml, the standard for recreational contact.

Monitoring data presented in Table 4.1 for the Williams Lake River is intended for background information purposes.

**Table 4.1: Receiving Environment Monitoring Data
Fraser River**

Date	Sept. 21, 2004		Sept. 29, 2005		Dec. 07, 2006		Oct. 25, 2007	
	Upstream Site 1	At IDZ** Site 2	Upstream Site 1	At IDZ** Site 2	Upstream Site 1	At IDZ** Site 2	Upstream Site 1	At IDZ** Site 2
River Flow	1750 cms		1120 cms		600 cms		1700 cms	
River Flow Trend	decreasing		increasing		stable		increasing	
Turbidity (NTU)	21	22	9.2	9.1	4.5	4.7	19	17
Total Suspended Solids	22	24	8	10	not done		not done	
Nitrate+Nitrate (as N)	0.050	<0.003	<0.003	0.053	0.089	0.095	0.021	0.028
Total Phosphate (as P)	0.023	0.107	0.003	0.045	0.0197	0.063	0.122	0.098
Ortho Phosphate (as P)	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Ammonia (N)	0.067	0.031	0.032	0.142	0.099	0.131	0.107	0.395
Fecal Coliform (CFU/100ml)***	99	55	62	93	67	160± (Note 4)	76	61

Williams Lake River

Date	Sept. 21, 2004	Sept. 29, 2005	Dec. 07, 2006	Oct. 25, 2007
Turbidity (NTU)	1.4	2.8	0.35	<1
Total Suspended Solids	2	1	not done	not done
Nitrate+Nitrate (as N)	<0.003	<0.003	0.024	<0.003
Total Phosphate (as P)	0.015	0.058	0.011	0.016
Ortho Phosphate (as P)	<0.003	0.010	<0.003	<0.003
Ammonia (N)	0.007	0.131	0.073	<0.005
Fecal Coliform (CFU/100ml)***	11	82	5	6

** refer to Appendix A for sampling site location plan

*** average of 3 samples

(4) Fecal coliform concentrations at IDZ >200, >200 and 81

SECTION 5.0 – SUMMARY

This review of receiving environment (Fraser River) monitoring data for sampling by the City of Williams Lake in October 2007 may be summarized as follows.

- at the time of sampling in October 2007 the Fraser River flow was 1700 cms. This flow is about 400% greater than the 7 day low flow having a 2 year return period of 375 cms used for the MSR dilution zone calculations.
- the MSR registration supporting documents calculated a dilution rate of 820:1 at the edge of the initial dilution zone corresponding to a river flow of 375 cms. With river flow of 1700 cms in October 2007, the dilution ratio achieved at the IDZ is estimated to be 2840:1.
- monitoring data for the Fraser River upstream of the City outfall (Site 1) and at the IDZ (Site 2) for October 25, 2007 indicates:
 - no increase in turbidity consistent with the calculated dilution ratio.
 - an increase of Nitrate of 0.007 mg/L which is generally consistent with the assumption that nitrogen in the wastewater treatment plant effluent in October 2007 was principally in the nitrate form and the calculated dilution ratio.
 - no increase in total or dissolved orthophosphorus which is consistent with the calculated dilution ratio.
 - no increase in fecal coliform concentrations which is consistent with the calculated dilution ratio.
 - an increase in ammonia (as N) concentration of 0.288 mg/L which is inconsistent with the calculated dilution ratio and the above/below concentrations of all other monitoring parameters. The ammonia concentrations of 0.395 mg/L is less than concentrations where toxicity to fish may be a concern.

APPENDIX 'A'

Receiving Monitoring Program – TRUE letter dated August 23, 2004



August 23, 2004

Our File: 602-021

Ministry of Water, Land and Air Protection
400 – 640 Borland Street
Williams Lake, B.C.
V2G 4T1

Attention: Mr. Doug Hill

Dear Sir:

RE: *Receiving Environment Monitoring Program*
Your File: RE 255 – City of Williams Lake

The City of Williams Lake has requested the writer present a proposal to you for the Receiving Environment Monitoring Program associated with the registration of the City's wastewater treatment plant and outfall to the Fraser River under the Municipal Sewage Regulation. A "draft" receiving environment monitoring program proposal was presented in a letter dated July 15, 2004. This proposal formed the basis for discussion with representatives of the City of Williams Lake at City Hall on July 20, 2004. On the basis of this meeting, the receiving environment monitoring program has been finalized and is presented herein.

1.0 Description of Works and Monitoring Programme Constraints

Associated with the registration of the City's sewerage works under the Municipal Sewage Regulation (MSR), the City's outfall was extended in 2002 "further" into the Fraser River to fully comply with the Initial Dilution requirements of the MSR. Referring to TRUE drawing 602-021-05 R2, as constructed drawing of the outfall extension, the outfall location and calculated initial dilution zone as referenced in documentation supporting the MSR regulation are illustrated. The drawing also illustrates the calculated Fraser River width at 2 year low flow (375 cms) and the, as surveyed, edge of river on May 01, 2001 at which time the river flow was 2310 cms. In relation to the as surveyed stream boundary on May 01, 2001, the outfall is approximately 65m from the east riverbank.

Winter weather conditions make access to the Fraser River for sampling purposes impractical in the period from November to April annually. Outside of this period, the monthly mean flows for Fraser River as measured at Marguerite are tabulated as follows:

May	2902 cms
June	3300 cms
July	2825 cms
August	1909 cms
September	1320 cms
October	1100 cms

.../2

On the basis of these mean flow data, it is our opinion that undertaking sampling for the purpose of receiving environment monitoring in the period from May to August when the Fraser River flow is greater than 2000 cms would provide no meaningful data. This suggestion is based on:

- (1) the centre point of the initial dilution zone will be approximately 65m from the edge of the river and very difficult to "locate" for sampling purposes.
- (2) in relation to the 2 year low flow of 375 cms, the calculated dilution ratio for a discharge volume of 8000 m³/day is 820:1. When the river flow is 2000 cms, the average depth of water in the initial dilution zone is 6m and the calculated dilution ratio is about 4200:1.
- (3) assuming that ammonia is the parameter of particular concern, and that the ammonia concentration in the discharge is 30 mg/L (conservatively high), the calculated increase in concentration at the edge of the initial dilution zone is 0.006 mg/L which is approaching the minimum detection limit of the ammonia test.

Correspondence from the Ministry of Water, Land and Air Protection dated February 04, 2002 requests that the receiving environment monitoring programme address possible "fecal coliform impacts on the beach area from May to September inclusive". Referring to drawing 602-021-05 the following should be noted relative to the recreation area.

- (1) in the period May to September when the Fraser River flows are of the order of 2000 cms, the outfall is a minimum of 50 m into the river at the recreation area.
- (2) while the recreation area is only approximately shown on drawing 602-021-05, the majority of the area is upstream of the outfall. The southern extent of the recreation area is about 15 m downstream of the outfall.

In the period May to August when mean river flows are 2000 cms or greater it would appear impossible for fecal coliforms from the outfall to impact the river edge fronting the recreational area. It is the writer's opinion that the Williams Lake River is however a potential source of fecal coliforms in the Fraser River adjacent to the recreation area.

2.0 Receiving Environment – Proposed Monitoring Programme

On the basis of the discussion of the outfall and Fraser River flows, it is proposed that receiving environment monitoring be undertaken sometime in the period after September 15th annually when Fraser River flows, based on historical data, will be in the range of 1100 to 1300 cms. At this time natural turbidity concentrations in the river will be approaching seasonal minimums therefore water quality parameters will not be as subject to anomalies attributable to suspended solids as compared to sampling in May, June or July. At periods of lower flow in the Fraser River, it is anticipated that it will be more straightforward for the City to determine the location of the initial dilution zone for sampling purposes.

Effluent and receiving environment parameters referenced in the MSR would form the basis for the proposed monitoring programme. The proposed monitoring program is presented as follows:

Sample Locations:

- Site 1 – 100m upstream of outfall – Fraser River
- Site 2 – midpoint of calculated edge of initial dilution zone – Fraser River
- Site 3 – Williams Lake River – upstream of confluence with Fraser River

Monitoring Parameters

Turbidity	Sites 1, 2
Total Suspended Solids	Sites 1, 2
Total Phosphorus (as P)	Sites 1, 2 and 3
Ortho Phosphorus (as P)	Sites 1, 2 and 3
Ammonia Nitrogen (as N)	Sites 1, 2 and 3
Nitrate – Nitrite Nitrogen (as N)	Sites 1, 2 and 3
Fecal Coliforms (3 samples each site)	Sites 1, 2 and 3

Sampling of the Williams Lake River for fecal coliform is suggested recognizing that it is a potential source of fecal coliform in the Fraser River adjacent to the recreation area. Three fecal coliform samples are suggested at each of the three sites recognizing that fecal coliform results can be variable.

In the course of the meeting on July 20, 2004, it was requested that the Williams Lake River also be sampled for nutrient parameters. While this sampling is not specifically required to comply with the requirements of the MSR, concurrent sampling for nutrients of the Williams Lake River would provide data that, in the future, may assist the City in addressing water quality concerns related to stormwater discharges, the effectiveness of the proposed Stormwater Management Plan intended to be implemented on a phased basis and background data to support a possible future application for an increase in the wastewater discharge quantity.

Other requirements and suggestions relative to the sampling and monitoring program discussed on July 20, 2004 are summarized as follows:

- sampling should be scheduled for a period of relatively stable weather conditions. For example, sampling would not be appropriate immediately following a period of significant rainfall which may have resulted in short term increases in turbidity and suspended solids in the Fraser River.
- the flow in the Fraser River at the Marguerite Station on the date of sampling should be reported with the sampling data. Flow data for the Fraser River of Marguerite can be obtained from the Environment Canada website as follows:
 - web address: www.msc.ec.gc.ca/wscf
 - follow links to "Real Time Hydrometric Data"
 - Fraser River at Marguerite is Station 08 MC 018.
- sampling site No. 2, centre of the edge of the initial dilution zone, may be located by using GPS equipment. Local datum coordinates for Site 2 are provided on drawing 602-021-05. The GPS coordinates for Site 2 can be calculated from measured GPS coordinates of on shore reference points.

➤ suggested sample depths at the three sample sites are:

- Site 1 – 0.6m depth
- Site 2 – 2.0m depth if practical
- Site 3 – midstream and mid depth

Depth suggestions at Sites 1 and 3 have the objective of ensuring that floatable materials do not influence the sample analytical results. In late September, it is anticipated that the water depth at the outfall will be about 4m. A sample depth of 2m is suggested to ensure that the sample is as representative as possible.

I trust this letter satisfactorily responds to the requirements for a receiving Environment Monitoring programme for the City of Williams Lake's sanitary sewer outfall to the Fraser River. Should questions arise, please contact the undersigned.

Yours truly,

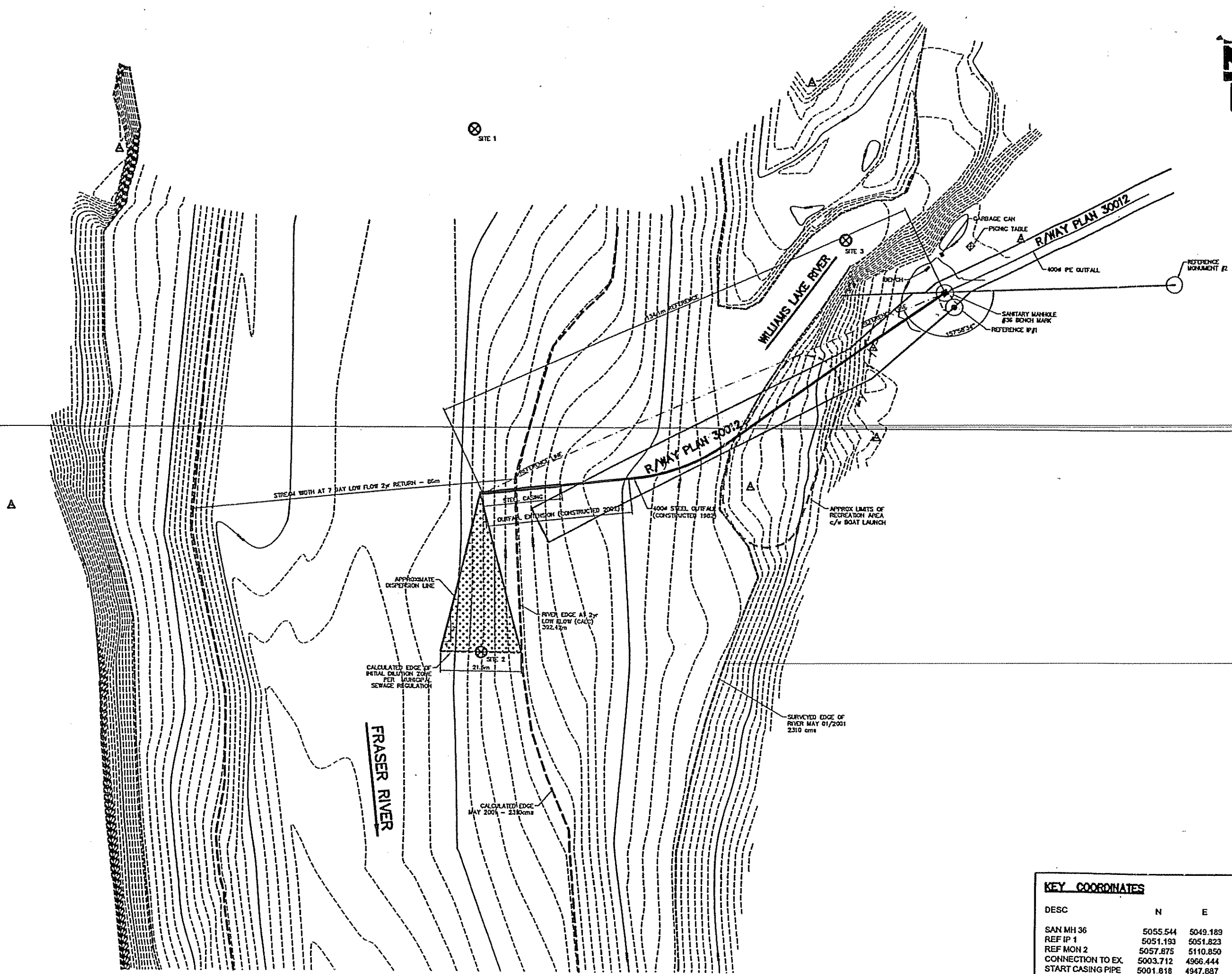


T.R. Underwood, P. Eng.

TRU/cab

attach.

cc: City of Williams Lake, Attn: Brian Lawrence
TRUE Consulting Group, Attn: Dave Underwood



NO.	DATE	DESCRIPTION	BY
9			
8			
7			
6			
5			
4			
3	JULY 2001	2000 PROPOSED SANITARY SEWER	ML/ML
2	MAY 2001	AS CONSTRUCTED	ML/ML
1	JULY 2000	ISSUED FOR CONCEPTUAL APPROVAL	ML/ML
0		DESCRIPTION	BY

ISSUES / REVISIONS

SCALE	1:500
DESIGN BY	ML
DRAWN BY	ML
DATE	07/2001
CHK. BY	
DATE	



SANITARY SEWER OUTFALL EXTENSION

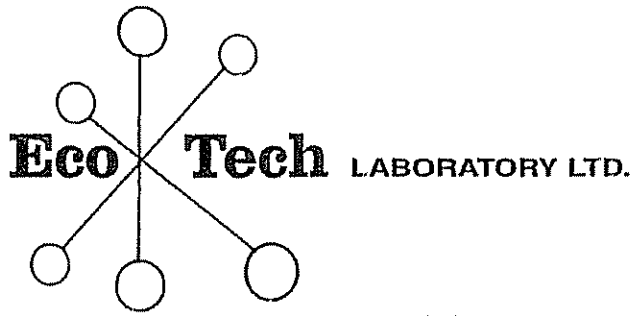
OVERALL LOCATION PLAN

KEY COORDINATES	N	E	ELEV
SAN MH 36	5055.544	5049.189	405.56
REF IP 1	5051.193	5051.823	405.60
REF MON 2	5057.875	5110.850	411.51
CONNECTION TO EX.	5003.712	4966.444	393.24
START CASING PIPE	5001.818	4947.887	391.46
END OUTFALL	4999.928	4926.518	391.725

50% REDUCED DWG

APPENDIX 'B'

**Analytical Reports – EcoTech Laboratory Ltd. dated
November 15, 2007**



ASSAYING, GEOCHEMISTRY
ANALYTICAL CHEMISTRY
ENVIRONMENTAL TESTING
ISO 9001 Accredited Co.

10041 Dallas Drive, Kamloops, BC V2C 6T4
Phone (250) 573-5700 Fax (250) 573-4557
E-mail: info@ecotechlab.com
www.ecotechlab.com

ANALYTICAL RESULTS - #:E07-2369

CITY OF WILLIAMS LAKE
450 Mart Street
WILLIAMS LAKE, BC
V2G 1K3

RECEIVED

15-Nov-07

NOV 20 2007

CITY OF WILLIAMS LAKE

ATTENTION: Joe Engelberts

SAMPLE IDENTIFICATION:

Sample Received: October 26, 2007
Sample Dated: October 25, 2007
Labelled: #1: Fraser River Site #1
 #2: Fraser River Site #2
 #3: Williams Lake Creek Site #3

PARAMETERS	YOUR SAMPLES		
	1	2	3
Turbidity (NTU)	19	17	<1
Total Dissolved Solids	142	137	653
Nitrate & Nitrite	0.021	0.028	<0.003
Total Phosphate	0.122	0.098	0.016
Ortho Phosphate	<0.003	<0.003	<0.003
Ammonia	0.107	0.395	<0.005
Fecal Coliform (CFU/100mL)	70	57	8
Fecal Coliform (CFU/100mL)	80	68	4
Fecal Coliform (CFU/100mL)	78	58	5

NOTE: Results expressed in mg/L unless otherwise indicated.

ECO-TECH LABORATORIES LTD.
John Andrew, BSc
Environmental Lab Manager

JA/Im

APPENDIX 'C'

**Water Survey of Canada Historical Streamflow Data.
Fraser River at Marguerite for October 22 to 28, 2007**



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FRASER RIVER NEAR MARGUERITE (08MC018)

Data Category: Real Time

Parameter Type: Primary water level

Note - if primary water level is not current, try Redundant Water Level in parameter drop-down list

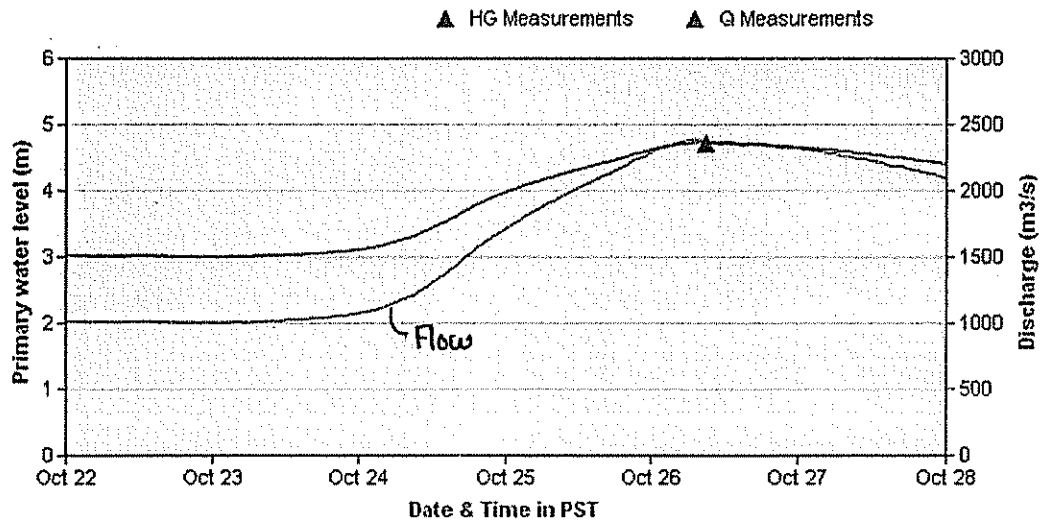
Station Navigation

Customization

In partnership with



British Columbia Ministry of Environment



Y-Axis View: Min Max Start Date: Oct 22 2007 End Date: Oct 28 2007

Statistics for period of record

- Max
- Mean
- Lower quartile
- Min
- Upper quartile
- Median

The current primary water level as of 2008-04-21 17:00:00 is: 2.862 metres. Most recent station visit: 2008-04-17 11:15:00, Measured water level: 2.969metres, Measured discharge: n/a . Deviation: n/a. Curve 31 is currently used to generate the preliminary discharge values on the graph. If the recent measured discharge deviates from the curve by more than 5%, the displayed discharge information may be inaccurate and will be revised for final publication following detailed review of stage and discharge records.

Click the following links for information on [ice conditions at stations](#), and [data spikes and dips](#).

Station Information:

Active or discontinued	Active	Province/Territory	BC
Latitude	52° 31' 48" N	Longitude	122° 26' 32" W
Gross drainage area	114000 km ²		
Record length	57 Years	Period of record	1950 - 2006
Regulation type	Regulated		

Period of record	Type	Operation schedule	Gauge type
1950 - 1955	Flow	Continuous	Recorder
1956 - 1964	Flow	Seasonal	Recorder
1965 - 1968	Flow	Continuous	Recorder



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FRASER RIVER NEAR MARGUERITE (08MC018)

Data Category:

Parameter Type:

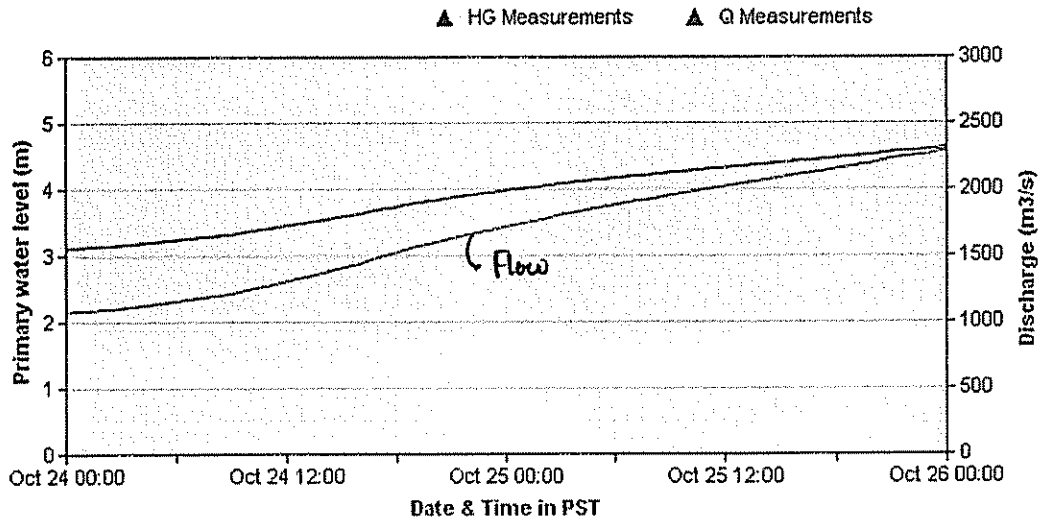
Note - if primary water level is not current, try Redundant Water Level in parameter drop-down list

Station Navigation

Customization

In partnership with

British Columbia Ministry of Environment



Y-Axis View: Min Max

Start Date: Oct 24 2007 End Date: Oct 26 2007

Statistics for period of record

- Max
- Mean
- Lower quartile
- Min
- Upper quartile
- Median

The current primary water level as of 2008-04-21 17:00:00 is: 2.862 metres. Most recent station visit: 2008-04-17 11:15:00, Measured water level: 2.969metres, Measured discharge: n/a . Deviation: n/a. Curve 31 is currently used to generate the preliminary discharge values on the graph. If the recent measured discharge deviates from the curve by more than 5%, the displayed discharge information may be inaccurate and will be revised for final publication following detailed review of stage and discharge records.

Click the following links for information on [ice conditions at stations](#), and [data spikes and dips](#).

Station Information:

Active or discontinued	Active	Province/Territory	BC
Latitude	52° 31' 48" N	Longitude	122° 26' 32" W
Gross drainage area	114000 km ²		
Record length	57 Years	Period of record	1950 - 2006
Regulation type	Regulated		

Period of record	Hydrometric measurement		
	Type	Operation schedule	Gauge type
1950 - 1955	Flow	Continuous	Recorder
1956 - 1964	Flow	Seasonal	Recorder
1965 - 1968	Flow	Continuous	Recorder