Town of Faro Water Wells Investigation
Project #25

Prepared for

Deloitte & Touche Inc.
(Acting as court-appointed Interim Receiver of Anvil Range Mining Corporation)

Submitted by
Gartner Lee Limited

February 2006

Gartner Lee

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Reference: **GLL 50-564**

Distribution:
2 Deloitte & Touche Inc.
2 Faro Mine Closure Planning Office
1 Town of Faro
1 Gartner Lee Limited

Gartner Lee

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February 7, 2006

Mr. Doug Sedgwick
Environmental Services
Deloitte & Touche Inc.
79 Wellington Street West, Suite 1900
Toronto, Ontario M5K 1B9

Dear Mr. Sedgwick:

Re: 50-564 – Town of Faro Water Wells Investigation
Final Report (Project #25)

We are pleased to submit this final report of the Town of Faro Water Wells Investigation. This report incorporates all study results, including preliminary results of the investigation previously submitted in January 2005. The study was initiated to address a condition of water licence QZ03-059.

This report will be attached to the 2005 Annual Environmental Report to the Yukon Water Board. Don't hesitate to call me if you have any questions regarding the contents of this report.

Yours very truly,
GARTNER LEE LIMITED

Don McCallum, MASc., P.Eng.
Senior Environmental Engineer / Principal

.cc	Wesley Treleaven	Deloitte & Touche
	Roger Payne	Faro Mine Closure Planning Office
	Herman Minderlein	Town of Faro
	Eric Denholm	Gartner Lee Ltd

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1. Introduction

1.1 Study Objectives

The Town of Faro, Yukon, obtains its municipal water supply from three groundwater wells located south of the community, near Vangorda Creek and the Pelly River. Concerns have been raised regarding the potential for mine-related activities, including failures or upsets, to impact Vangorda Creek and that Vangorda Creek could influence the quality of groundwater drawn for municipal uses (see Figure 1 for a general illustration of the area). This potential issue was raised at the October 2003 Yukon Water Board public hearing in Faro, held to review a water licence renewal application for the Anvil Range mine site. As a result of the concerns raised at the hearing, the renewed water licence (QZ03-059) includes a requirement to conduct a study examining the relationship between water flowing in Vangorda Creek and water obtained from the Town of Faro water supply wells. It was noted by the Water Board, in their "reasons for decision", that no substantive information had yet been presented to suggest that there is an impact to the municipal supply wells resulting from the Anvil Range mine site. This report contains the results of a study undertaken for the purpose of addressing this specific water licence requirement.

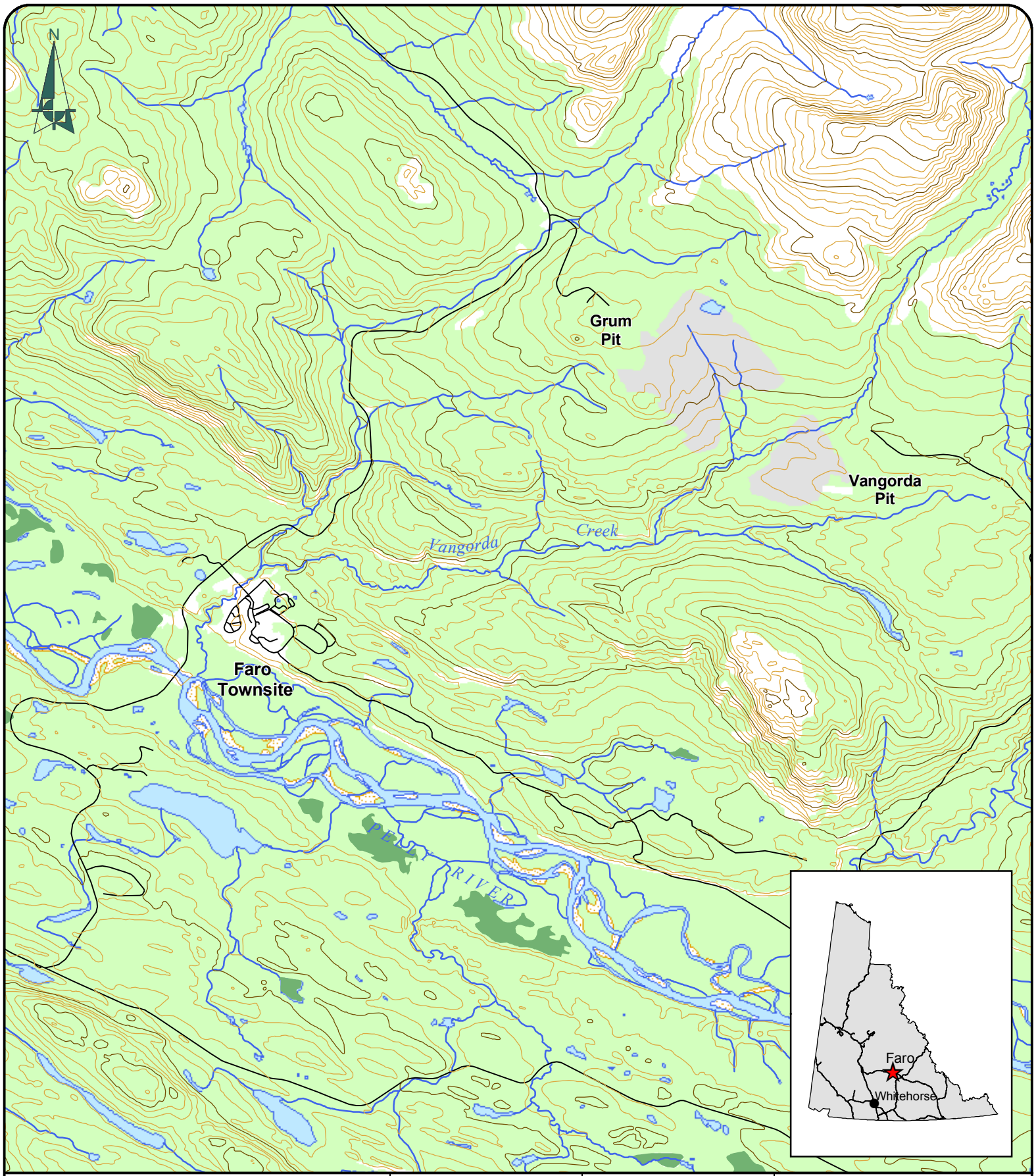
The specific objective of this study is to examine the potential relationship between Vangorda Creek and Town of Faro water supply wells. Previously reported preliminary study information in January 2005 (Gartner Lee, 2005) is incorporated within this report.

1.2 Site History

The Town of Faro water supply wells #1 and #2 were drilled and completed as part of a 1968 test drilling program. An additional well was drilled and tested in 1980, and was put into production the following year, as water supply well #3 (see Figure 2). The following key water supply reports have been reviewed for this study:

- Hydrogeological Consultants (1980);
- Hydrogeological Consultants (1988); and
- Jacobsen (2003).

The 1980 Hydrogeological Consultant report includes the driller's log, pumping test results, expected yield, and estimated aquifer properties associated with water supply well #3. Additionally, the report provides a background summary of the 1968 test drilling program. A total of eleven test wells were drilled in 1968 in the Vangorda Creek valley. Two of these test wells became water supply wells #1 and #2. According to this report, four of the test wells were completed as observation wells (well



LEGEND:

- Index Contours
- Intermediate Contours
- Roads
- Watercourses
- Pits
- Sand
- Waterbodies
- Wetlands
- Vegetation

0 0.5 1 2 kms

Scale 1: 75 000
Contour Interval: 100 feet

DATA SOURCES AND DISCLAIMERS:

National Topographic Data Base (NTDB) data compiled by Government of Canada, Natural Resources Canada (NRCan), at 1:50 000 scale.

Updated Road Network compiled by Government of Canada, Natural Resources Canada (NRCan) at 5m accuracy.

Deloitte.

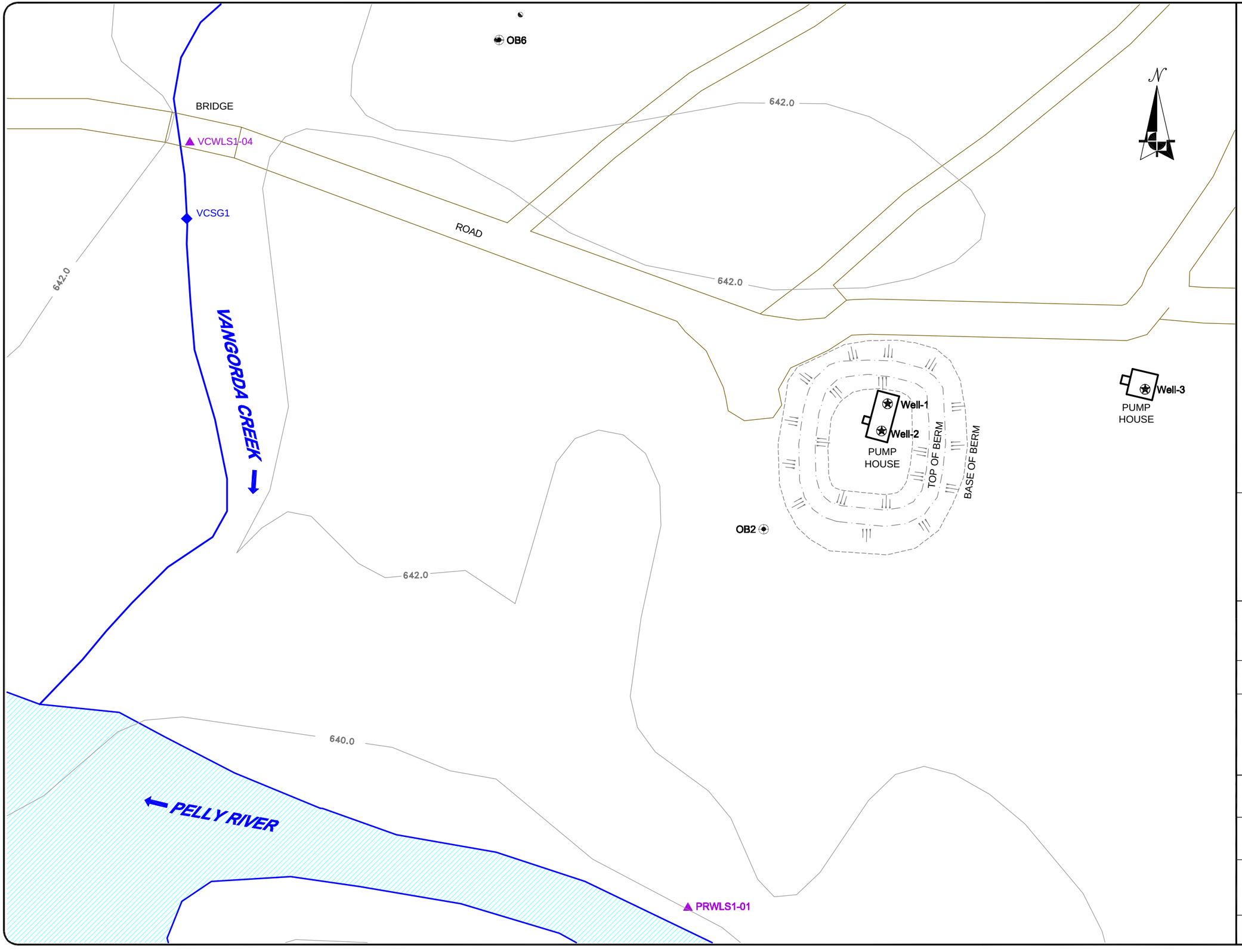
Projection: UTM Zone 8 NAD83
Created By: AS
Reviewed By: JK
Date Issued: October 29, 2004
Project Number: 40419
File Name: 40419_figure_1_01Nov04.mxd
Revision: 1

Project: Town of Faro Water Wells Investigation
Preliminary Results Project Number 20a
Location: Faro, Yukon
Client: Deloitte & Touche Inc.

Site Location Map

Gartner Lee

Figure No.
1



Legend:

- Building
- Stream, River
- Road
- VCSG1 — Location of Stream Gauge
- PRWLS1-04 — Water Level Sensor
- OB6 — Observation Well 2" or 6" diameter
- Well-2 — Town of Faro Water Supply Well
- Abandoned Well

Data Sources:

1. Digital copy of 1:50,000 topographic map and orthophoto supplied by SRK Consulting.
2. Survey conducted in summer 2004 by Yukon Engineering Services

0 5 10 20 Metres

SCALE 1:500

Projection : UTM NAD 27 Zone 8
Contour Interval : 2 m (ASL)

Reviewed By : DMcC/JK
Prepared By : PW
Date Issued : February 3, 2006
Project No. : 50-564
File Name : 50564_B2_06bFeb03_Fig2.DWG
Revision : 0

Deloitte & Touche

Project: Faro Townsite Water Supply
Location: Faro, Yukon Territory
Client: Deloitte & Touche

SITE PLAN

Gartner Lee

Figure No. 2

identifications: 8/68, 9/68, 10/68 and 11/68). A range of aquifer property (transmissivity, storativity) observations from the 1968 testing program is reported. No driller's logs from the 1968 program are included in the 1980 report. A report specific to the 1968 drilling program was not located during the research conducted for this study.

Curragh Resources, a previous owner of the Anvil Range mine, commissioned a 1988 study to assess the possibility of a direct hydraulic connection between Vangorda Creek and the aquifer in which the Town of Faro water supply wells were completed. The assessment was completed by Hydrogeological Consultants (1988) using data from the 1968 and 1980 groundwater programs. No additional field programs were conducted as part of the investigation. The findings of the study were qualitative in nature and concluded that under normal conditions, a direct hydraulic connection between Vangorda Creek and the aquifer in which the Town of Faro water wells are completed is unlikely. The study report did note the possibility of Vangorda Creek water entering the aquifer during a high-water stage. The report recommended that the following additional information be collected if more definitive conclusions were required:

- seasonal water quality data for Vangorda Creek and the town wells; and
- continuous water level readings from one observation well for a minimum of one year.

A review of the Faro water system was recently completed by the Health and Social Services Department of the Government of Yukon (Jacobsen 2003). This review indicated that each of the three wellheads are suitably protected within pumphouses and elevated above the surrounding ground. It was also noted that the two buildings housing the wellheads appear to be adequately protected from flooding as a result of berms surrounding the facilities. No source water issues were identified in this report.

1.3 Study Components

Recognizing the challenges in adequately characterizing the hydrogeological characteristics within the study area, a broad range of study components and techniques have been employed. These study components have been carefully selected and employed to ensure the study objectives were met in a timely and cost-effective manner. Field studies were initiated in Summer 2004 and were completed in Fall 2005. The specific study components completed and associated rationale are described below.

- **Review of previous studies and historical water quality data**

  Previous hydrogeological studies completed in the area have been reviewed for the purpose of determining known aquifer characteristics and groundwater flow information. Water quality data collected in lower Vangorda Creek since 1992 has been compared to Town of Faro municipal water supply quality data collected over a similar time period.

- **Site reconnaissance**

  A site visit was undertaken during the Summer 2004 for the purposes of completing a conceptual geological setting of the study area and locating previously abandoned test wells in the area. Two abandoned test wells located during the reconnaissance survey were selected for use as groundwater monitors for the purpose of the study.

- **Site survey and instrumentation**

  A site survey was completed by Yukon Engineering during Summer 2004 for the purpose of obtaining ground and water elevations in the vicinity of the following features: town pumping wells, two observation wells (discovered during an earlier site visit), lower Vangorda Creek, and the Pelly River (directly south of town wells). Level Loggers, recording temperature and water depth, were also installed during October 2004 in two observation wells, Vangorda Creek and the Pelly River. These level loggers have recorded water depth and temperature information continuously for a 12-month period between October 2004 and October 2005. Interpretation of this data is provided in Section 4 of this report.

- **Water quality data collection**

  Water quality samples of the town water supply, Vangorda Creek, Pelly River, and two observation wells have been collected (concurrently) on one occasion during Fall 2004 and on four separate dates in 2005. This data provides "snapshots" of water quality at each sampling location during the following river flow conditions: winter pre-freshet, freshet, lower flow summer, and lower flow fall conditions. Preliminary water quality sampling of the town water supply, Pelly River and Vangorda Creek was undertaken by Anvil Range staff during Spring 2004. Interpretation of this data is provided in Section 3 of this report.

- **Vangorda Creek flow data collection**

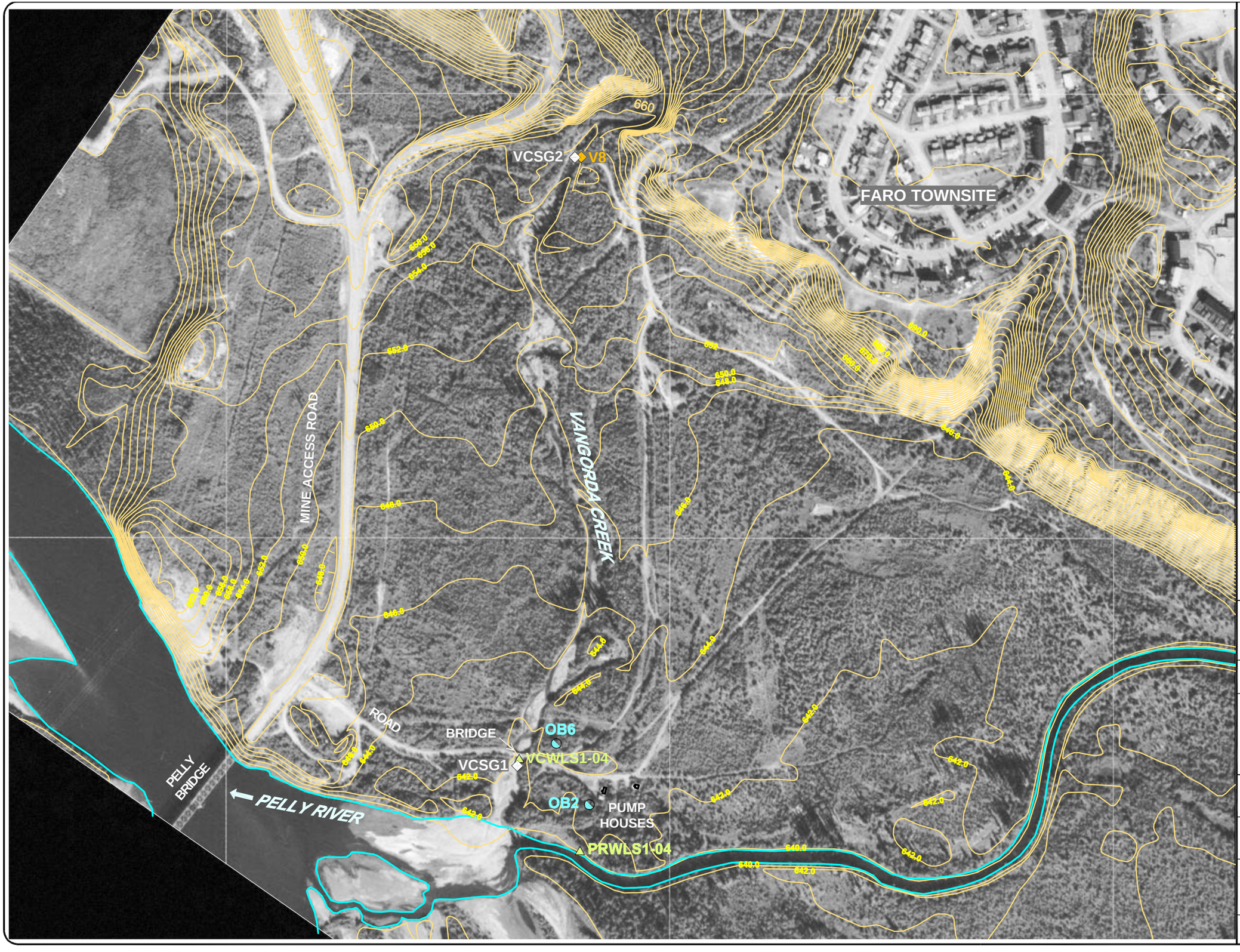
  Stream flow measurements were obtained at two locations in Vangorda Creek during each of the concurrent water quality sampling visits in 2004 and 2005. Interpretation of this data is provided in Section 4 of this report.

2. Project Setting

The location of the three Town of Faro water supply wells are illustrated in Figure 2 in relation to other prominent site features. Water supply wells #1 and #2 are located approximately 100 m from Vangorda Creek and 70 m from the Pelly River. Four abandoned wells, which were discovered during one of the site visits, are indicated on the figure. Two of these abandoned wells (OB2 and OB6) have been used as observation wells for the purpose of this study. Water level and temperature sensors have been installed in both Vangorda Creek and the Pelly River at relevant locations and are identified on Figure 2 as VCWLS01-04 and PRWLS01-04, respectively. Photographs taken throughout the study area, including the specific monitoring locations, are provided in Appendix E.

Vangorda Creek is a relatively small stream, two to three metres in width during normal conditions. Approximately 800 m from its confluence with the Pelly River, it exits a relatively narrow, high gradient canyon (Figure 3) and spills onto a moderate gradient (3%) alluvial fan for a distance of approximately 250 m. Downstream of this location, the creek gradient is reduced somewhat to approximately 1%. It is apparent from aerial photography (Figure 3) and previously published reports that the lower one-third of this 800 m reach has likely occupied different channels in the recent past. As reported in the Hydrogeological Consultants (1988) report, prior to 1968 Vangorda Creek flowed in a channel east of water supply wells #1 and #2 (approximately mid-way between these wells and the current location of water well #3). In later 1968 or early 1969, the lower Vangorda Creek watercourse changed to its current location approximately 100 m west of water wells #1 and #2.

Upon review of a site air photo, available drilling logs, site elevation data, and a preliminary terrain analysis that included brief ground-truthing exercises (i.e., hand dug test pits), a conceptual geological setting of the study area was completed. As would be expected, coarse grain, alluvial fan deposits were identified across the upper portion of the study area where Vangorda Creek exits the canyon. The presence of these deposits is reflected in the fan-like topography (Figure 3). These coarse-grained, high-energy-type deposits are believed to extend down to approximately 100 to 200 meters north of the Pump Houses. Beyond this location, a transitional zone is believed to exist which incorporates the low energy, finer-grained deposits of the Pelly River flood plain. These deposits are often silty and fine-sand rich, and have been identified in the upper portion of the drilling logs associated with wells 1, 2 and 3. The interaction of groundwaters between the Vangorda Creek alluvial fan and the Pelly River flood plain deposits is the focus of this study.



Legend:

- VCSG1 — Location of Stream Gauge
- PRWLS1-04 — Water Level Sensor
- OB2 — Observation Well 2" or 6" diameter
- V8 — Anvil Range Monitoring Location

N

Data Sources:

1. Digital copy of 1:50,000 topographic map and orthophoto supplied by SRK Consulting.
2. Survey conducted in summer 2004 by Yukon Engineering Services

0 100 200 Metres

SCALE 1:4000

Projection : UTM NAD 27 Zone 8
Contour Interval : 2 m (ASL)

Reviewed By : DMcC/JK
Prepared By : PW
Date Issued : November 1, 2004
Project No. : 40-419
File Name : X40419-1D-01-R1.DWG
Revision : 1

Deloitte & Touche

Project: Faro Townsite Water Supply
Location: Faro, Yukon Territory
Client: Deloitte & Touche

2004 SITE INSTRUMENTATION AND SURVEY

Gartner Lee

Figure No. 3

3. Water Quality Analysis

3.1 Historical Water Quality Analysis

Historical water quality records exist for both the Town of Faro water supply wells and lower Vangorda Creek. Monitoring of the Town water supply wells has been conducted by the Town in compliance with water licence conditions (current licence#: MN00-030). Lower Vangorda Creek (site #V8, located near pedestrian footbridge below town; see Figure 3) has been monitored by the Anvil Range Mining Corporation and the previous mine owner, Curragh Resources. No water quality or flow information is available for the Pelly River at Vangorda Creek.

The Town of Faro water supply monitoring results reported in annual reports for the years 1990 through 2003 have been reviewed for this study. This timeframe approximately matches the monitoring record for Vangorda Creek. Samples for trace metal analyses have generally been collected twice per year, while bacteriological samples are collected more frequently. A summary of this data is provided in Table 1. The data generally indicate a good quality water supply. There has never been a detection of fecal coliforms in the raw water supply, as reported in annual water use reports. All chemical parameters analyzed have been within Canadian Drinking Water Quality guidelines (Health Canada 2004) with a few rare exceptions. One sample slightly exceeded the guideline for cadmium. However, 14 of 16 samples collected during the review period recorded undetectable cadmium concentrations (detection limit was consistently below the guideline). Iron concentrations in the raw water supply have generally been lower than the associated guideline with only a few exceptions. The iron guideline is defined for aesthetic purposes and is not related to human health.

A graphical illustration of historical well water quality is provided in Figure 4 for the purpose of exploring potential seasonal trends. Based on 13 years of monitoring data it appears that a seasonal water quality trend may exist for some parameters including conductivity. As illustrated in Figure 4, conductivity values tended to be higher in the early spring period and lower in summer and fall. It is difficult to determine cause and effect relationships from this observation as no more than two data points have been reported in any one year. The same seasonal trend is not apparent for all water quality parameters, including zinc (Figure 4).

Seasonal trends in Vangorda Creek quality are also apparent as illustrated in Figure 5. This figure incorporates 12 years of monitoring data collected at the Anvil Range monitoring location site V8. An inverse relationship between stream flow rate and conductivity is apparent. This relationship is expected to be the result of the relatively higher contribution of (high conductivity) groundwater to total stream flows during low-flow conditions.

Table 1. Town of Faro Water Quality Summary (1990 - 2003)[a]

Parameter	Canadian Drinking Water Quality Guidelines[b] (mg/L)	Number of Samples (#)	Detection Limit (mg/L)	Number of samples > Detection Limit (#)	Median (mg/L)	Maximum (mg/L)
Bacteriological						
Fecal coliforms (org/100 mL)	0	86	1	0	<1	<1
Total Metals						
Arsenic	0.025	16	0.0004 - 0.04	0	<0.02	<0.04
Cadmium	0.005	16	0.0001 - 0.001	2	<0.0005	**0.0078**
Calcium	-	25		25	63	84
Iron	0.3	25	? - 0.2	24	0.045	**0.660**
Lead	0.01	16	0.0001 - 0.01	2	<0.005	0.007
Manganese	0.05	25	0.001 - 0.01	20	0.003	0.030
Zinc	5	16	0.005	15	0.010	0.029

Notes:

a *Data source: Annual Water Use Reports for Town of Faro, 1990 - 2003; data for raw untreated water supply, sampling location FA-1.*

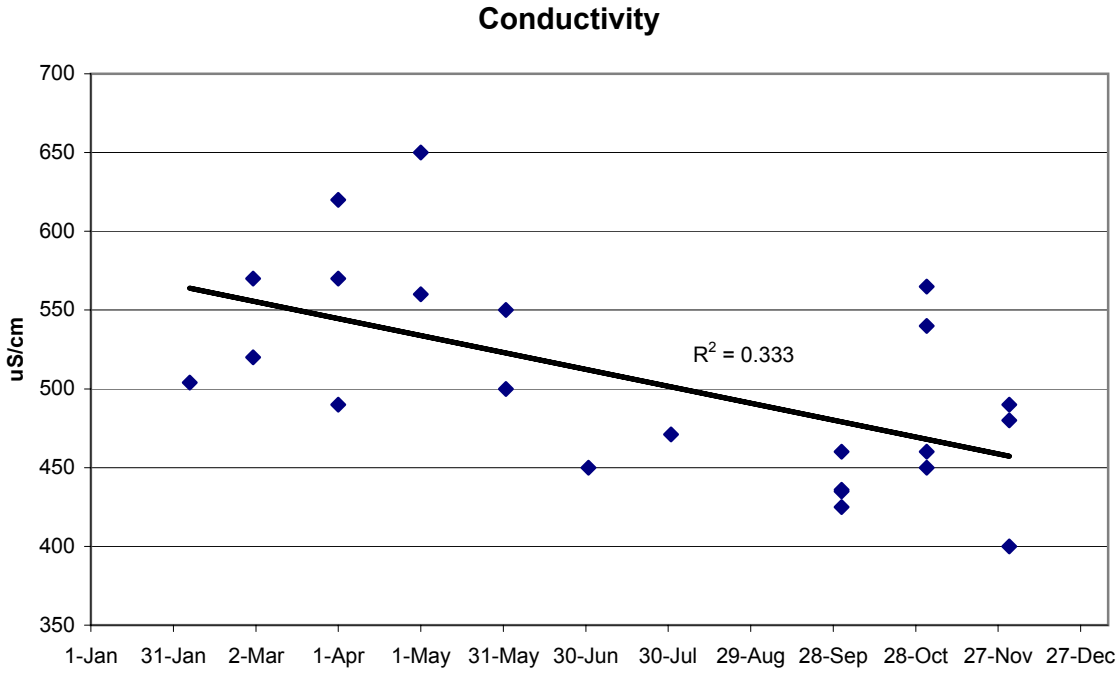
b *Health Canada. Guidelines for Canadian Drinking Water quality. Sixth Ed., 1996.*

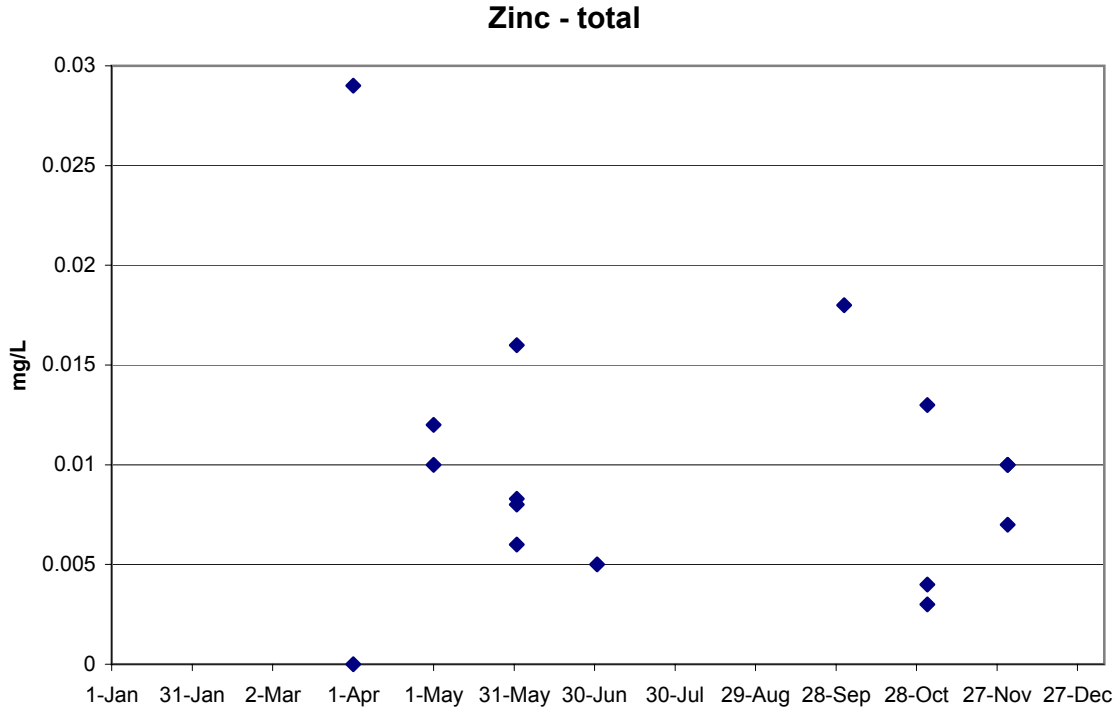
< *indicates less than the detection limit.*

- *indicates no guideline or analysis for this parameter.*

bold *indicates parameter exceeded guideline.*

Figure 4: Town of Faro Water Supply Monitoring Results (1990 - 2003)

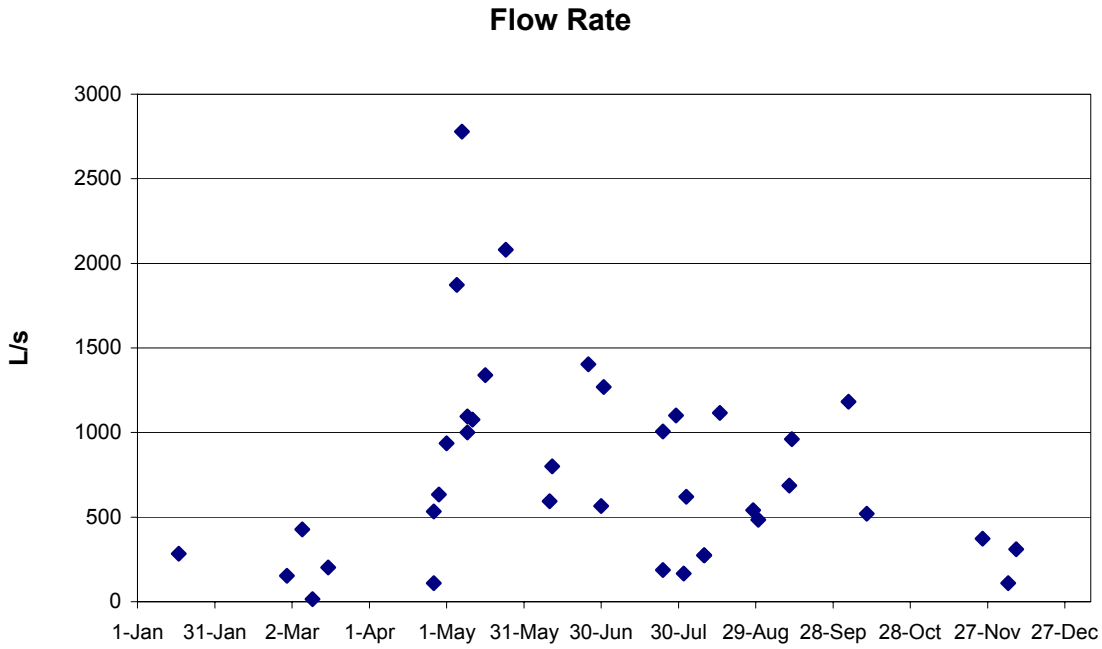


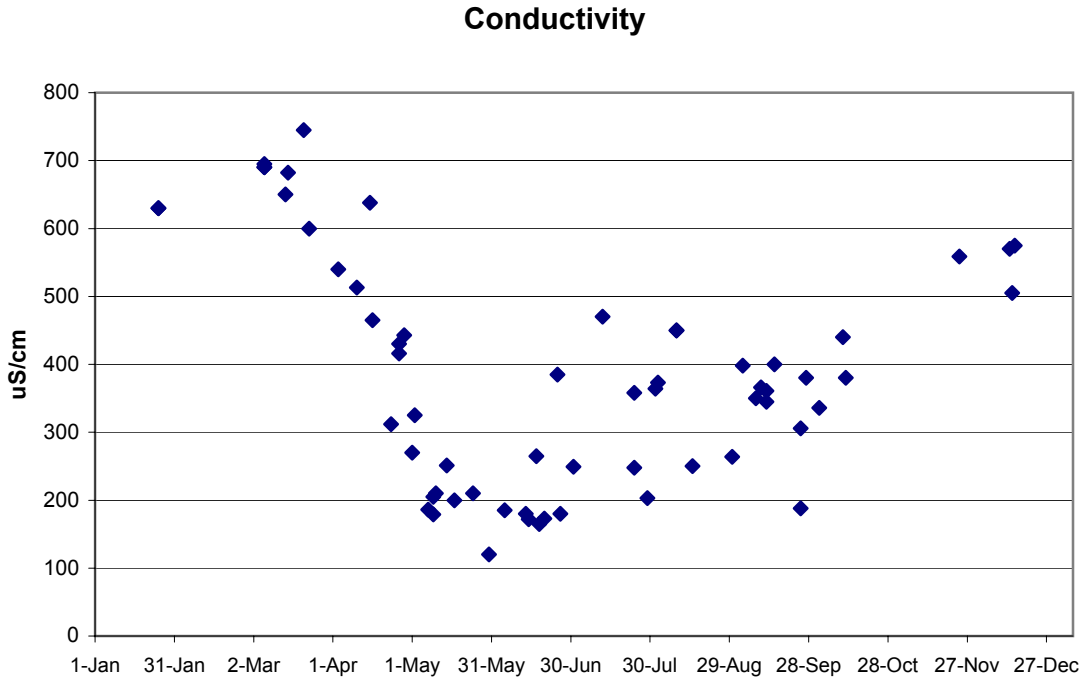


Notes

1. Data source: Annual Water Use Reports for Town of Faro, 1990 - 2003; data for raw untreated water supply, sampling location FA-1

Figure 5: Vangorda Creek Selected Monitoring Results (1992 - 2004)





3.2 Water Quality during Study Period

Anvil Range staff conducted preliminary water quality sampling on May 20, 2004. Samples were obtained from the Town of Faro wells, Pelly River and Vangorda Creek. Triplicates samples were obtained from Vangorda Creek and the Town of Faro wells. These samples were analyzed by Cavendish Analytical Laboratory (Vancouver) for a range of physical parameters, dissolved anions, nutrients, total and dissolved trace metals. A tabulated summary of water quality results from this preliminary sampling event is provided in Appendix A.

Samples for water quality analysis were obtained by Gartner Lee staff concurrently from the Town of Faro wells, Pelly River, Vangorda Creek, and two of the discovered abandoned wells (OB2 and OB6) on the following dates:

- October 7, 2004;
- April 5, 2005;
- June 17, 2005;
- July 20, 2005; and
- October 6, 2005.

Each of the samples collected on the above referenced dates were analyzed by ALS Environmental (Vancouver) for a range of physical parameters, dissolved anions, nutrients, and trace metals. Dissolved metals analyses were conducted on all samples, except for the October 7, 2004 sampling event. Total metals analyses were conducted on all samples collected during the October 7, 2004 sampling event and for all Town water supply samples. Field measurements of pH, temperature and conductivity were recorded at each sampling location during each sampling event (included in Appendix B). A tabulated summary of water quality results for each of the concurrent sampling events is provided in Appendix A. Original laboratory reports are provided in Appendix C.

Grab samples were also obtained during the site reconnaissance trip on September 10th, 2004 from the Town of Faro water wells, Vangorda Creek and Pelly River. These samples were submitted to the Department of Earth Sciences, University of Waterloo for environmental isotope analysis. Results of the analyses to determine the relative concentrations of heavy stable isotopes of oxygen (O-18) and hydrogen (H-2) are incorporated in Appendix D.

3.2.1 Town of Faro Water Supply Quality

A summary of all Town of Faro water supply quality results obtained during the study period is provided in Table 2. As illustrated in this table, all water quality results were well below Canadian Drinking Water Quality guidelines (Health Canada 2004) with the exception of lead and total dissolved solids (TDS) during two separate sampling events.

Table 2. Town of Faro Water Supply Quality 2004/2005 – Comparison to Guidelines

Parameter		Canadian Drinking Water Quality Guidelines[a]		Town of Faro Water Supply n=6		
				Median	Minimum	Maximum
Physical Tests						
Colour	CU	15	AO	<5	<5	<5
Conductivity	uS/cm	-		509	449	584
Hardness	CaCO3	-		274	223	290
pH		6.5-8.5	AO	7.38	7.23	7.92
Total Dissolved Solids	mg/L	500	AO	358	300	**700**
Turbidity	NTU	5	AO[1]	0.15	<0.1	0.49
Dissolved Anions (mg/L)						
Alkalinity-Total	CaCO3	-		166	147	208
Chloride	Cl	250	AO	0.95	<1	1.44
Fluoride	F	1.5	MAC	0.121	0.109	0.133
Sulphate	SO4	500	AO	112	86	149
Nutrients (mg/L)						
Nitrate Nitrogen	N	10	MAC	0.295	0.223	1.11
Nitrite Nitrogen	N	1	MAC	<0.1	<0.001	0.01
Total Metals (mg/L)						
Aluminum	T-Al	-		<0.01	<0.01	0.022
Antimony	T-Sb	0.006	IMAC	<0.0005	<0.0005	0.004
Arsenic	T-As	0.025	IMAC	0.00015	<.0001	0.00018
Barium	T-Ba	1	MAC	0.075	0.063	0.096
Beryllium	T-Be	-		<0.005	<0.0002	<0.01
Boron	T-B	5	IMAC	<0.1	<0.1	0.07
Cadmium	T-Cd	0.005	MAC	<0.0002	<0.00005	<0.0002
Calcium	T-Ca	-		66.1	52.9	71.3
Chromium	T-Cr	0.05	MAC	<0.002	<0.0006	0.005
Cobalt	T-Co	-		<0.001	<0.0005	<0.001
Copper	T-Cu	1	AO	0.002	<0.001	0.048
Iron	T-Fe	0.3	AO	<0.03	<0.03	0.051
Lead	T-Pb	0.010	MAC	<0.001	<0.001	**0.015**
Magnesium	T-Mg	-		24.2	19.8	26.2
Manganese	T-Mn	0.05	AO	<0.002	<0.002	0.011
Mercury	T-Hg	0.001	MAC	<0.0002	<0.0002	<0.0002
Molybdenum	T-Mo	-		0.0015	<0.001	0.002
Nickel	T-Ni	-		<0.003	<0.001	<0.005
Potassium	T-K	-		1.09	0.9	1.2
Selenium	T-Se	0.01	MAC	<0.003	<0.001	0.0011
Sodium	T-Na	200	AO	3.2	2.6	3.8
Titanium	T-Ti	-		<0.001	<0.001	<0.05
Uranium	T-U	0.02	IMAC	0.00373	0.00363	0.0056
Vanadium	T-V	-		<0.001	<0.001	<0.03
Zinc	T-Zn	5	AO	<0.05	<0.05	0.040

Notes:

[a] Summary of Guidelines for Canadian Drinking Water Quality, April 2004

AO aesthetic objective (taste, odour, appearance, etc.)

IMAC Interim Maximum Acceptable Concentration

MAC Maximum Acceptable Concentration

[1] 1 NTU maximum allowed for water entering distribution systems

< indicates less than the detection limit

- indicates no guideline or analysis for this parameter

bold indicates parameter exceeded guideline

Of the six time periods where samples of town water supply were obtained, four results recorded total lead concentrations below the laboratory detection limit of 0.001 mg/L. Total lead concentrations measured during the May 20, 2004 sampling event slightly exceeded the drinking water guideline (0.015 mg/L measured vs. 0.01 mg/L guideline). However, the *dissolved* concentration of lead during the same May 20, 2004 sampling event was less than the laboratory detection limit of 0.002 mg/L. The dissolved lead result, combined with the low concentrations observed in all other sampling events suggest that the higher total lead concentration measured during the May 20, 2004 period may have resulted from inadvertent contamination of the sample during the sample collection and handling process.

Measurements of Total Dissolved Solids (TDS) provide an indication of the palatability of the water supply (and is not health-related). TDS measurements of the Town water supply were below the Canadian Drinking Water Quality guideline of 500 mg/L during each sampling period with the exception of the June 17, 2005 sampling event where a concentration of 700 mg/L was recorded.

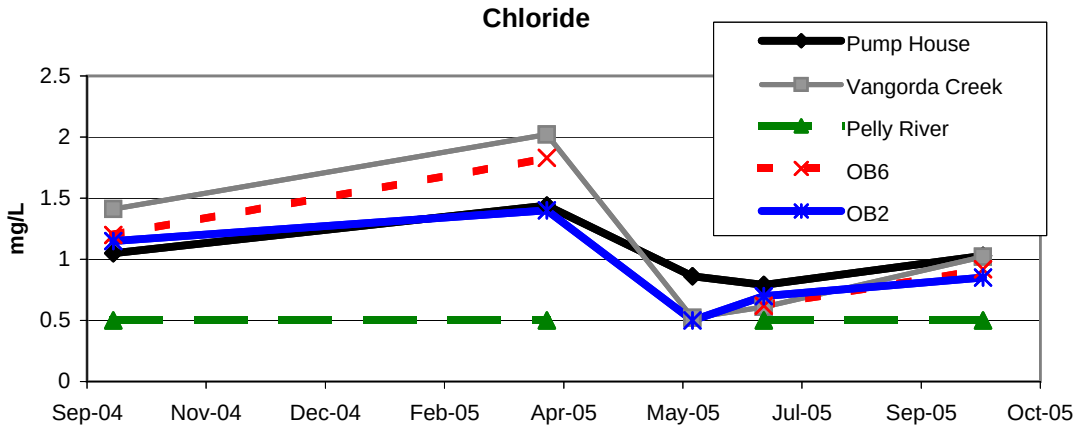
3.2.2 Water Quality Trends

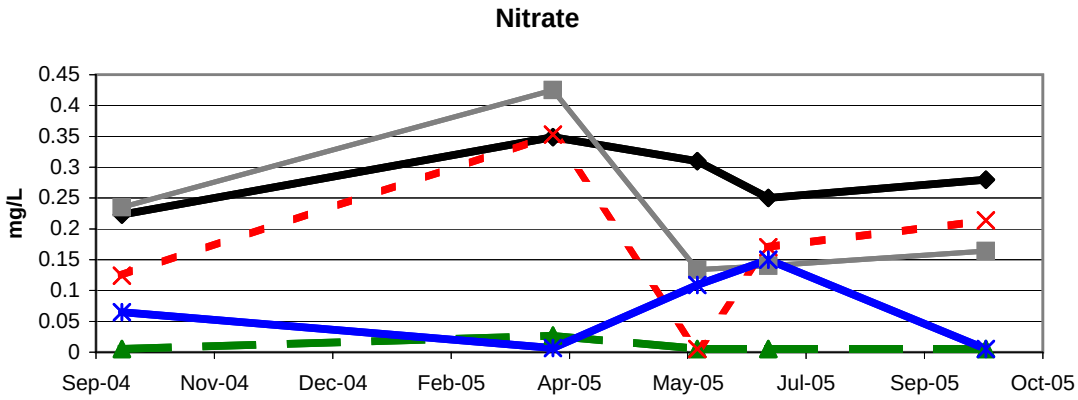
Water quality data were obtained from the water supply wells, Vangorda Creek, Pelly River and both observation wells (OB2 and OB6) during five sampling events between October 2004 and October 2005. This data provides both an indication of seasonal variability at each sampling location and chemical similarities and differences between each sampling location. Three anions – chloride, nitrate and sulphate – have been selected to illustrate these trends within and among the sampling stations. Each of these compounds are highly soluble and are not readily attenuated or retarded, thus providing useful information regarding source water characteristics. Chemical transformations of these compounds are also generally not expected to occur (within the study area) owing to their relatively inert nature. However, sulphate is a less reliable water quality indicator in the two observation wells owing to the possibility of sulphate-reducing bacterial growth in the stagnant (non-pumping) wells.

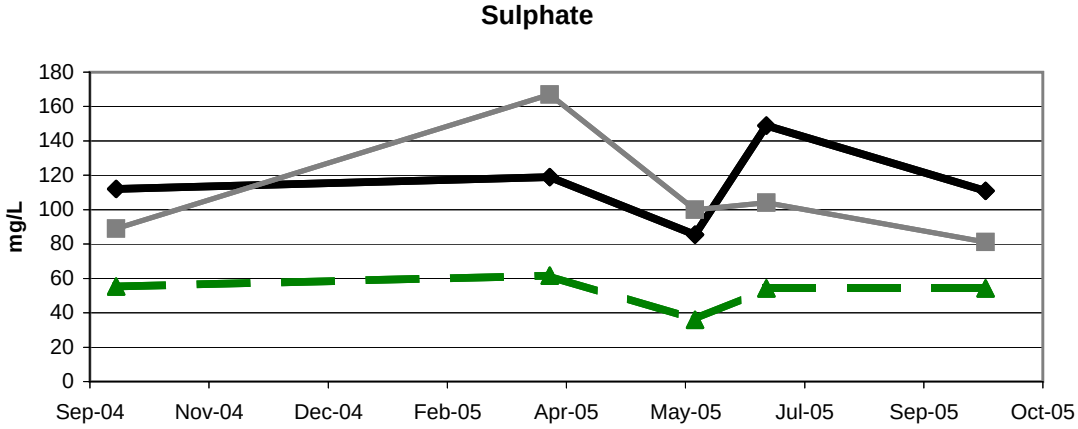
Clear distinctions in water quality are apparent between Pelly River and Vangorda Creek, as illustrated in Figure 6. Pelly River water quality consistently recorded concentrations of chloride and nitrate at less than (or near) the laboratory detection limits while corresponding concentrations in Vangorda Creek ranged as high as 4 times the detection limit for chloride to 80 times the detection limit for nitrate. The source of elevated nitrate concentrations in Vangorda Creek (relative to Pelly River) has not been determined. Sulphate concentrations were also consistently higher in Vangorda Creek relative to the Pelly River.

Concentrations of nitrate, chloride and sulphate were consistently higher in the town water supply samples relative to the Pelly River. The highest concentrations of each of these compounds were measured in samples from Vangorda Creek. All measurements were well below the respective Canadian Drinking Water Quality Guidelines (Health Canada 2004).

Figure 6. Selected Water Quality Results (October 2004 - October 2005)







Notes:

Chlorides:

1. Less than detection limit values are shown at the d.l. (0.5 mg/L)
2. Pelly River and OB6 values not shown for June 1 event because of high d.l (< 10 mg/L)

Nitrates:

1. Less than detection limit values are shown at the d.l. (0.005 mg/L)

Seasonal water quality variability in Vangorda Creek, Town wells, and the observation wells is readily apparent from Figure 6. With few exceptions, the highest concentrations of indicator parameters (illustrated in Figure 6) were measured just prior to spring freshet, while the lowest concentrations were observed during or immediately following freshet conditions. This seasonal water quality pattern is consistent with the observation of historical town water supply results discussed in Section 3.1. Less variability is apparent in the Pelly River water quality results. However, the highest concentrations of the indicator parameters in Pelly River water samples occurred just prior to spring freshet (during low river flow conditions).

Contaminants of Potential Interest

Lead and zinc are two contaminants of potential interest as a result of historical mining activities in the Vangorda Creek watershed, upstream of the study area. Lead concentrations were not detected (<0.001 mg/L) in any of the Vangorda Creek or Pelly River samples collected between October 2004 and October 2005. The highest detected zinc concentration observed in Vangorda Creek during this time (0.0118 mg/L) was far below the aesthetic Canadian Drinking Water Quality Guideline value of 5 mg/L.

3.2.3 Significance of Water Quality Results Related to Study Objectives

Based on the preceding discussion of water quality results, a number of key observations and findings are apparent:

- Pelly River water is chemically distinguished from Vangorda Creek water (within the study area) based on the water quality indicators: chloride, nitrate, and sulphate.
  - Vangorda Creek was consistently higher in each of the indicators.
- The Town of Faro water supply was consistently higher in concentrations of chloride, nitrate and sulphate than the Pelly River.
- The Town of Faro water quality varies throughout the year indicating potential influence of surface water recharge sources. Based on this, and the previous observations, the following conclusions can be drawn:
  - It is unlikely that the Pelly River provides the sole (or dominant) source of recharge water to the Town of Faro water supply aquifer.
  - Vangorda Creek may be providing a significant source of recharge water to the Town of Faro water supply aquifer.
- The Town of Faro water supply is of good quality compared to Canadian Drinking Water Quality Guidelines, as indicated by historical monitoring (bacteriological, trace metals, nutrients, aesthetic parameters) and monitoring undertaken during this study period (trace metals, nutrients, aesthetic parameters).
- Metal concentrations measured in Vangorda Creek throughout the study period were well below Canadian Drinking Water Quality Guidelines; consequently,
  - Metal concentrations in Vangorda Creek pose minimal risks to the Town of Faro water supply.

4. Hydrogeological Analysis

4.1 Existing Monitoring / Production Wells

The locations of the three Town of Faro water supply wells are illustrated in Figure 2 in relation to other prominent site features. Water supply wells #1 and #2 are located approximately 100 metres from Vangorda Creek and 70 metres from the Pelly River. A summary of pertinent well construction details is provided in Table 3.

Table 3. Summary of Well Construction Details

Location	Elevation of Top of Casing (masl)	Depth to Bottom of Well (mbgs)	Well Bottom Elevation (masl)	Depth to Top of Screen (mbgs)	Elevation of Top of Screen (masl)
Well No. 1	642.44	12.8	629.64	8.2	634.24
Well No. 2	642.41	12.5	629.91	9.4	633.01
Well No. 3	643.33	11.6	631.73	7.9	635.43
OB2	641.55	5.81	635.74	n/a	n/a
OB6	641.73	8.5	633.23	5.8	635.93
PRWLS1-04	639.43	2.457	636.973	0	639.43

Notes:
Source of Well Completion Info (Wells 1, 2 and 3): Curragh Resourse Inc. Water Well Record.
Source of Well Completion Info (Wells OB2 and OB6): GLL filed visit activities Sept and Oct. 2004..
n/a = no information avalaible.

Given the historical groundwater drilling and testing activities that have been documented in and around the Faro Well field, a site visit was conducted in an attempt to locate abandoned wells that potentially could be used as monitoring wells. In total, four abandoned wells were discovered (Figure 3). Attempts were made to inspect and identify the well screen interval of all the abandoned wells using a down-hole camera. However, due to limitations in well diameter size, only one (OB6) of the four abandoned wells could be inspected. Additionally, only three of the four abandoned wells could accommodate the water level probe and or a water level / temperature sensor (i.e., a Level Logger). Based on these limitations, and the relative proximity of three of the located abandoned wells, only two of the four abandoned wells (OB2 and OB6) have been instrumented as part of this study. A discussion regarding the instrumentation details is provided in section 4.2. A summary of pertinent well construction details is provided in Table 3.

Details regarding operation of the production wells were obtained during the September 2004 site visit through conversations with Pat McCracken (Town of Faro - Water Operator). It was noted that the pumping levels in the productions wells are relatively shallow (<5 to 7 m), and that the wells have never run dry. Additionally, the wells have never required cleaning or well rehabilitation, which suggests that typical bio-fouling and associated decreases in well efficiency have yet to be an issue. Groundwater

temperature and flow data from the production wells are recorded daily. Groundwater temperatures are typically approximately 6°C during summer months and can drop to less than 1°C by late January or early February. Pumping rates increase during the cold winter months to supply extra water for household water bleeders. Boilers are available to heat the water source if necessary but have not been required in the last eight years (approximately).

4.2 Site Elevation Survey and Instrumentation

Yukon Engineering Services completed a site elevation survey on October 7, 2004 for the purpose of accurately determining groundwater and surface water elevations. Pertinent land features and water elevation monitoring locations were identified and surveyed in order to create hydrogeological cross sections through the study area. Additionally, permanent reference points such as the top of monitoring wells and gauging stations were surveyed for future reference.

As discussed earlier, two of the four abandoned wells (OB2 and OB6) have been used as observation points for the purpose of this study. In addition to static water level measurements, Solinst Level Loggers were installed at these locations collecting groundwater elevation data every two to six hours. The Level Logger installed at OB6 also collects groundwater temperature data.

Although access has been provided to production wells #1, #2, #3, in order to collect groundwater quality samples, it was not possible to collect static groundwater elevations or to install water level / temperature monitoring devices at these locations. The production wells are equipped with a line shaft pump, which is mounted to a concrete wellhead within the well house. Consequently, access into the well bore was not possible.

In addition to collecting groundwater levels at OB2 and OB6, surface water elevations were also obtained during the October 7, 2004 survey. Solinst Level Loggers were also installed in Vangorda Creek and the Pelly River; the locations are identified on Figure 2 as VCWLS01-04 and PRWLS01-04, respectively. These Level Loggers collected water elevation and water temperature data at a frequency of once every eight to 12 hours.

The installed level loggers recorded data for the period spanning October 7, 2004 to October 30, 2005. The following list summarizes activities conducted associated with logger installation, maintenance, and removal:

October 7, 2004

- Installation of dataloggers into VCWLS1-04, PRWLS1-04, OB2, and OB6 commencing yearlong monitoring period.

April 5, 2005 (pre-freshet).

- Downloading of dataloggers.

June 17, 2005 (freshet)

- Vangorda Creek levelogger found to have been washed away sometime during snowmelt; and
- Levelogger installed as a barologger in OB6; downloading of leveloggers.

July 20, 2005 (post freshet)

- Removed transducer acting as a barologger from OB6 and reinstalled in Vangorda Creek at VCWLS1-04 location;
- Installed new barologger in OB6;
- Installed new levelogger in OB2 capturing two channels including level and temperature; and
- Downloaded all transducers;

October 30, 2005

- Downloaded all transducers; and
- Removed all dataloggers from monitoring wells (OB2 and OB6), Vangorda Creek and Pelly River

4.3 Stream Gauging

Stream gauging was conducted at two locations (VCSG1 and VCSG2; Figure 3) along the 800 m reach of Vangorda Creek, between the canyon and just upstream of the confluence with the Pelly River, on the following dates:

- October 7, 2004;
- June 17, 2005;
- July 20, 2005;
- October 6, 2005; and
- October 30, 2005.

This information was collected to assess potential surface water recharge of Vangorda Creek to the underlying alluvial sediments and aquifer. The stream gauging results are provided in Table 4.

Table 4. Vangorda Creek Stream Gauging Results

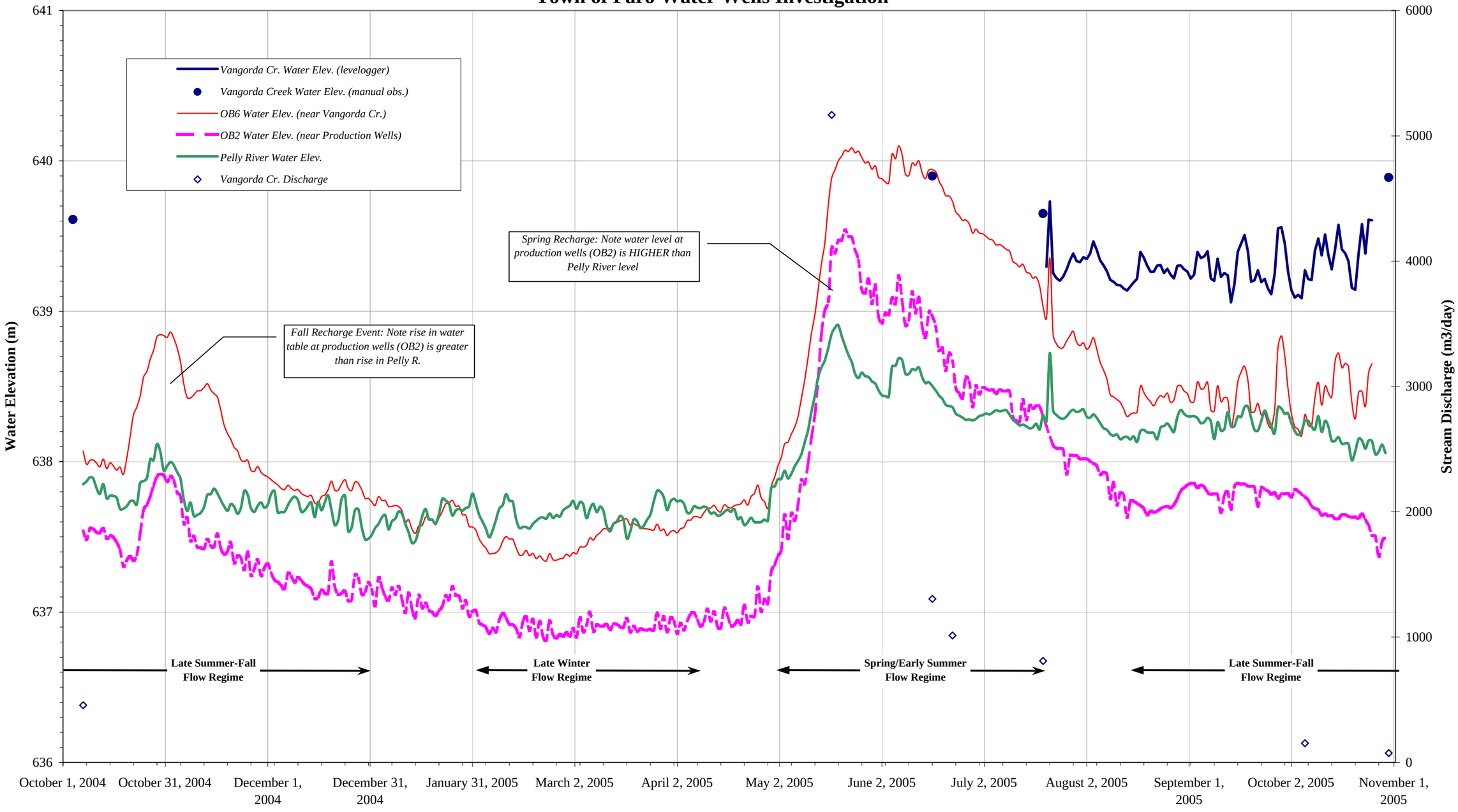
Date	Station Location	Flow (L/s)		
		Trial #1	Trial #2	Average
October 7, 2004	VCSG2 (upstream)	513	491	502
	VCSG1 (downstream)	445	466	456
			Downstream flow as % of upstream flow:	**91%**
June 17, 2005	VCSG2 (upstream)	1660	1727	1693
	VCSG1 (downstream)	1406	1202	1304
			Downstream flow as % of upstream flow:	**77%**
July 20, 2005	VCSG2 (upstream)	750	767	759
	VCSG1 (downstream)	806	813	810
			Downstream flow as % of upstream flow:	**107%**
October 6, 2005	VCSG2 (upstream)	164	178	171
	VCSG1 (downstream)	154	152	153
			Downstream flow as % of upstream flow:	**90%**
October 30, 2005	VCSG2 (upstream)	-	-	-
	VCSG1 (downstream)	71	83	77
			Downstream flow as % of upstream flow:	**-**

While there is some variability between individual stream gauge trials (~ 5 %), as expected, some broad conclusions can be drawn from the data. During three of the four monitored periods, the downstream flow measurements were lower than the upstream measurements. The largest flow difference was observed during the highest flow period (June 17, 2005) whereby measured downstream flows were only 77% of the flows recorded 800 metres upstream. The data indicate that for a significant portion of the ice-free season (when measurements were taken), a fraction of Vangorda Creek flow between VCSG2 and VCSG1 is lost as recharge to the underlying sediments. The most significant Vangorda Creek source of recharge to the aquifer occurs during the periods of high creek flows in late spring and early summer.

4.4 Groundwater and Surface Water Elevation Monitoring

A hydrograph portraying water levels in the aquifer (observation wells OB2 and OB6), Vangorda Creek and Pelly River for the period of one year (October 7, 2004 to October 30, 2005) is shown on Figure 7. The location of the monitoring points is shown on Figure 3. As noted earlier, the Vangorda Creek level

Figure 7. Surface Water and Groundwater Hydrograph
Town of Faro Water Wells Investigation



logger was destroyed, and therefore continuous water level data in Vangorda Creek is only available from July 21st, 2005 onward. However, a few manual spot level measures are shown on the hydrograph to give an indication of the relative water elevation in the creek.

4.4.1 Detailed Transient Water Elevation Data

Figure 8 illustrates the water level behavior in observations wells OB2 and OB6 over a relatively short period of time (two-day period). The water levels in both wells rapidly fluctuate, with several peaks observed during each day. The Town of Faro has three water supply wells: two of which are continually pumping while a third turns on and off based on demand requirements. This on/off pumping scenario is the cause for the short-term water level changes observed in the two observation wells. The magnitude of the change is greatest at observation well OB2, which is adjacent to and closest to the production wells.

The small inset plot on Figure 8 illustrates that there is a positive correlation between the water well fluctuations in the observation wells: the water level changes observed at OB6 (adjacent to Vangorda Creek) are related to the water level changes observed at OB2 (adjacent to the production wells. This observation indicates the cone of depression, or zone of influence, induced by the production wells extends to Vangorda Creek.

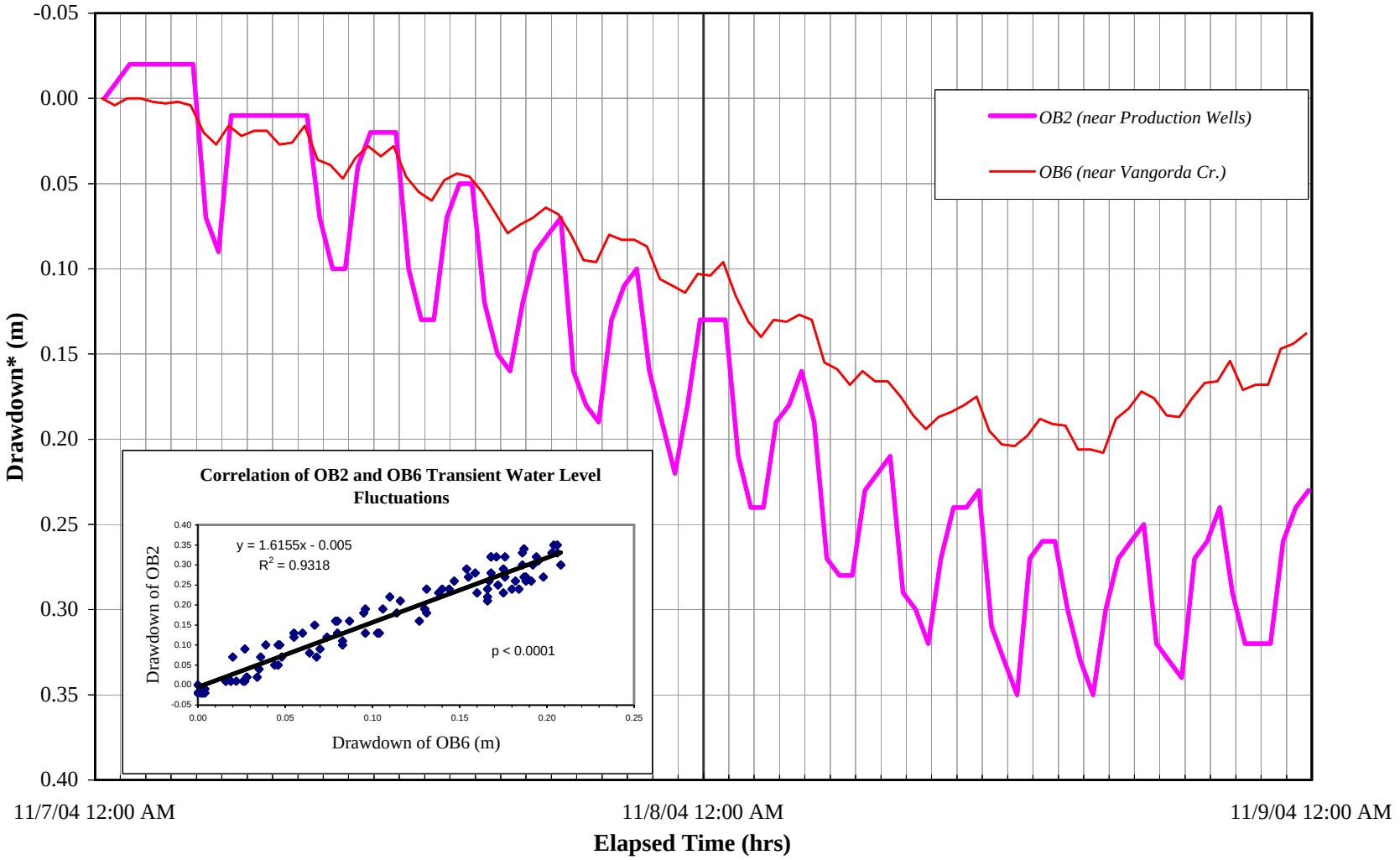
4.5 Conceptual Hydrogeological Regime

As discussed earlier, the Town of Faro water supply wells are completed in an unconfined sand and gravel aquifer. The aquifer is an alluvial fan deposited by Vangorda Creek as it discharges to the Pelly River flood plain. Although a detailed aquifer delineation has not been completed, based on an assessment of depositional environment and topographic expression, it is assumed that the Vangorda Creek fan aquifer is generally limited to the area between the mouth of the creek's canyon to the north and the Pelly River to the south. The east-west extent is likely 600 m, bounded by the organic sediments of the Pelly River flood plain to the east and the glaciolacustrine outcrops underlying the Faro access road to the west. The surface of the flood plain is at an elevation of between 640 and 642 m ASL. The top of the Vangorda Creek fan (e.g. where the creek exits the canyon) is at elevation of 655 m ASL. The gravelly sediments of the fan, over which the creek flows, allows the creek to lose water to the subsurface, or in other words, recharge the groundwater under the fan. This interpretation is supported by stream gauging results discussed earlier in Section 4.3. Therefore, groundwater flow will generally be parallel with and away from, the flow direction of Vangorda Creek.

A detailed review of the hydrograph illustrating the elevation relationships between the surface water bodies (Vangorda Creek and the Pelly River) and the water supply aquifer provides insight to the

Figure 8. Short-Term Water Level Drawdown in Wells OB2 and OB6

Town of Faro Water Wells Investigation



*Note: * Drawdown means water level decline from start of time period.*

groundwater flow regime at the site, and its relationship to surface water. This relationship changes throughout the season as water levels in surface water bodies and the aquifer change. When reviewing the annual hydrograph (Figure 7), it is apparent that there are three seasonal flow regimes with "transition" periods between:

- Late Summer-Fall (August to December);
- Late Winter (February to mid-March); and
- Spring/Early Summer (May to July).

These three seasonal flow regimes are described as follows and illustrated in the plan and cross section views contained in Figures 9, 10 and 11, respectively.

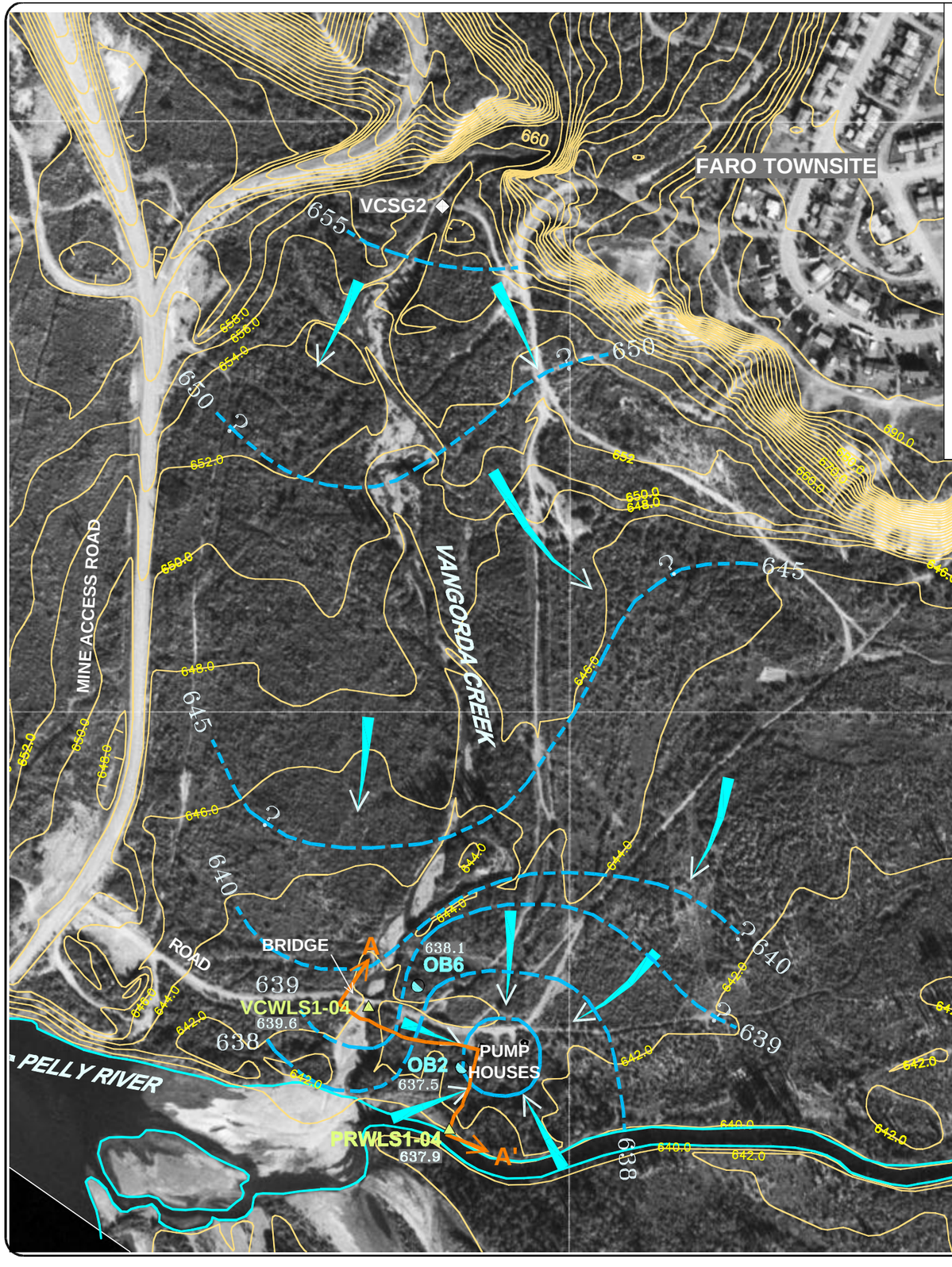
It should be noted that due to the relatively low precipitation and infiltration rates typically found in the Yukon, direct infiltration and recharge by precipitation is not likely to constitute a major source of groundwater recharge to the Town of Faro wells' water supply aquifer. This aquifer is relatively small in extent, and therefore most of the groundwater recharge is expected to come from surface water.

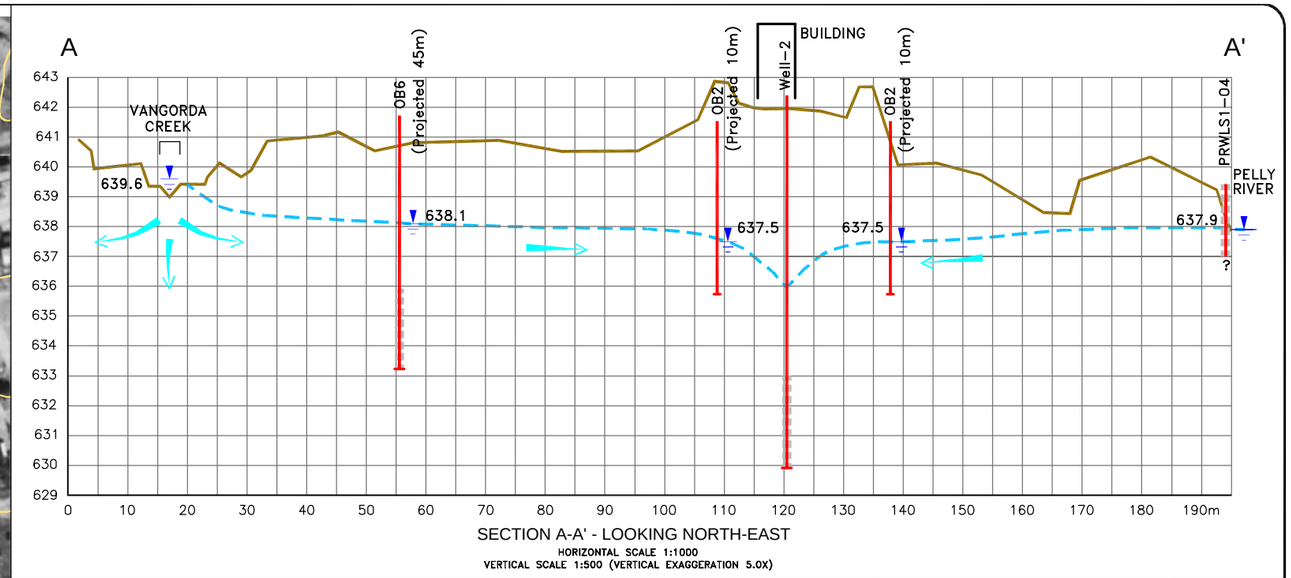
4.5.1 Late Summer-Fall Flow Regime

The late Summer/Fall flow regime begins in August, following Spring high flow, and continues through January. Based on the measured water elevations illustrated in Figure 7, a conceptual groundwater flow path is illustrated in Figure 9. Key observations include:

- Vangorda Creek elevation is higher than the aquifer elevation and therefore a downward vertical gradient exists from the creek to the aquifer;
- Aquifer water elevations near Vangorda Creek (OB6), are *higher* than Pelly River, indicating groundwater flow towards the river; and
- Aquifer water elevations near the production wells (OB2) are lower than both the aquifer near the creek (OB6) and the Pelly River; therefore it is likely that the well field is receiving recharge water not only from Vangorda Creek, but also from the Pelly River during this period.

By examining the hydrograph (Figure 7), an interesting observation can be drawn during the Fall 2004 recharge event. During the period starting October 19 and continuing through mid-November, water levels at OB6 (near Vangorda Creek) rose 0.9 m over a period of seven days. During this time, the Pelly River also rose, but only rose 0.4 m. The rise in OB6 is likely due to increased recharge from Vangorda Creek as a high water event occurred during this period. The interesting observation is that OB2, adjacent to the production wells, rose 0.6 m, which is *greater* than the water level change in the





Legend:

- VCSG1 LOCATION OF STREAM GAUGE
- PRWLS1-04 WATER LEVEL SENSOR
- OB2 OBSERVATION WELL 2" OR 6" DIA.
- CROSS SECTION A–A'
- INFERRED DIRECTION OF GROUNDWATER FLOW
- INTERPRETED GROUNDWATER ELEVATION CONTOURS
- 637.5 OBSERVED WATER ELEVATION (m ASL)
- GROUND SURFACE CONTOUR
- WATER LEVEL MEASURED IN FALL 2004
- WELL
- SCREENED INTERVAL

Data Sources:
1. Digital copy of 1:50,000 topographic map and orthophoto supplied by SRK Consulting.
2. Survey conducted in summer 2004 by Yukon Engineering Services

Contour Int: 2 m (ASL) | Projection: UTM NAD 27 Zone 8

Reviewed By: DMcC/JK | Project No.: 50-564
Prepared By: PW/NT | Revision: 0
Date Issued: JANUARY, 2006
File Name: 50564_B1_06aJan06_01.DWG

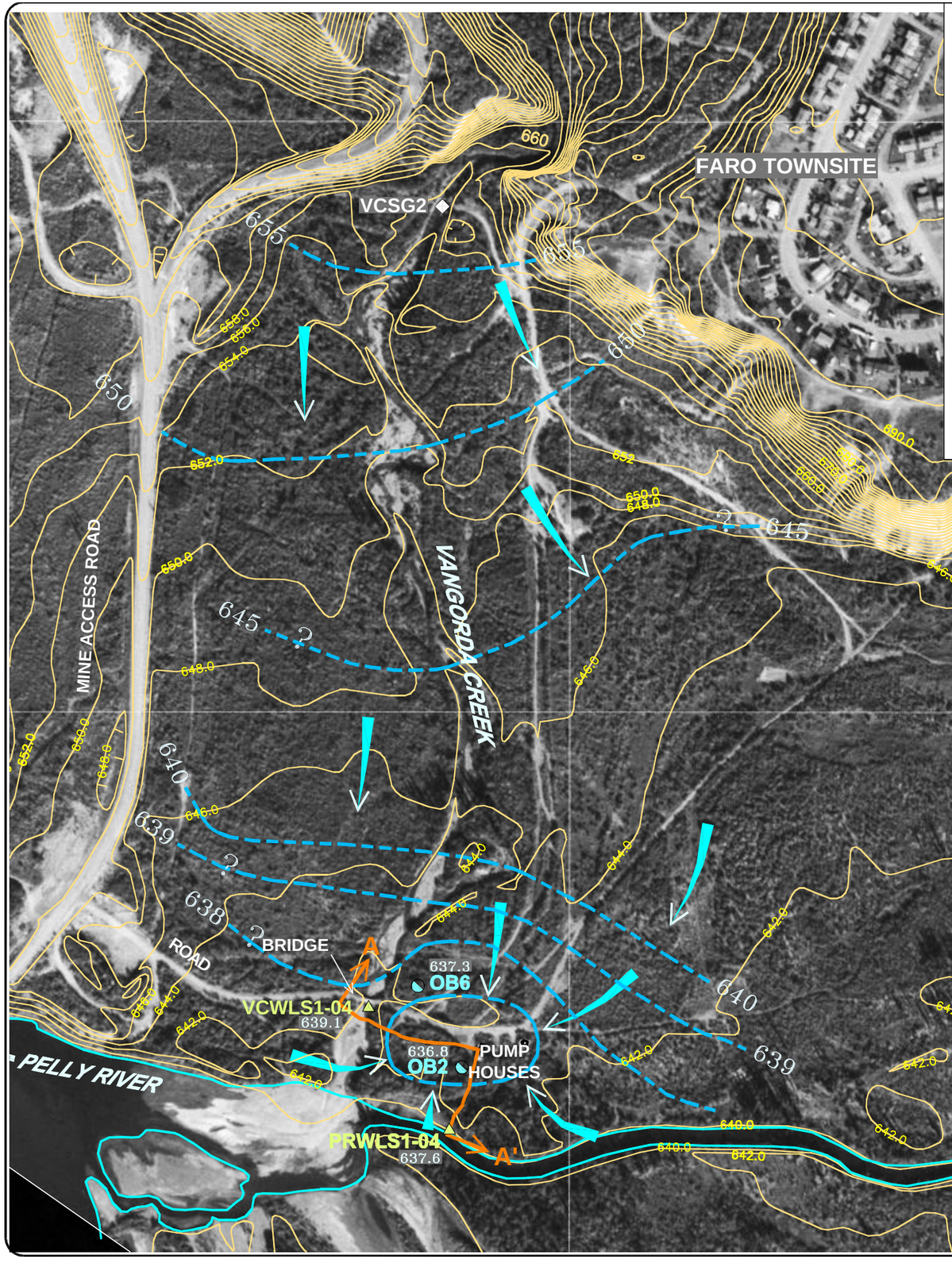
Deloitte & Touche

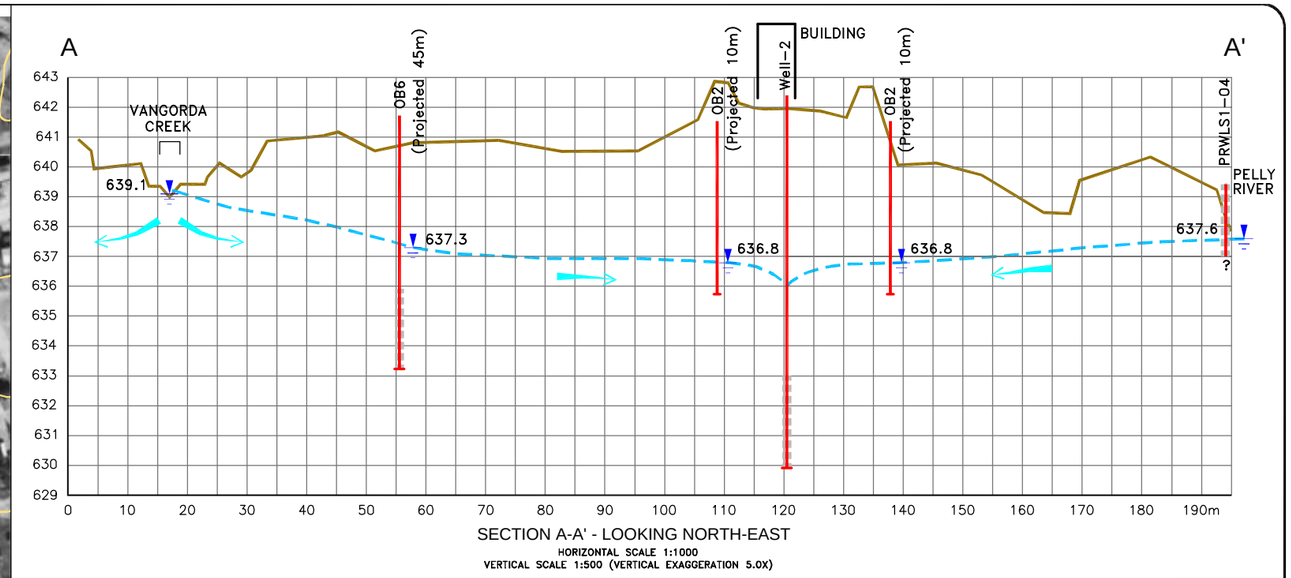
Project: Faro Townsite Water Supply
Location: Faro, Yukon Territory
Client: Deloitte & Touche

CONCEPTUAL GROUNDWATER FLOW SYSTEM - FALL 2004

Gartner Lee

Figure No. 9





SECTION A-A' - LOOKING NORTH-EAST
HORIZONTAL SCALE 1:1000
VERTICAL SCALE 1:500 (VERTICAL EXAGGERATION 5.0X)

Legend:

- VCSG1 LOCATION OF STREAM GAUGE
- PRWLS1-04 WATER LEVEL SENSOR
- OB2 OBSERVATION WELL 2" OR 6" DIA.
- CROSS SECTION A–A'
- INFERRED DIRECTION OF GROUNDWATER FLOW
- INTERPRETED GROUNDWATER ELEVATION CONTOURS
- 637.5 OBSERVED WATER ELEVATION (m ASL)
- GROUND SURFACE CONTOUR
- WATER LEVEL MEASURED IN FEBRUARY 2005
- WELL
- SCREENED INTERVAL

Data Sources:
1. Digital copy of 1:50,000 topographic map and orthophoto supplied by SRK Consulting.
2. Survey conducted in summer 2004 by Yukon Engineering Services

Contour Int: 2 m (ASL) | Projection: UTM NAD 27 Zone 8

Reviewed By: DMcC/JK | Project No.: 50-564
Prepared By: PW/NT | Revision: 0
Date Issued: JANUARY, 2006
File Name: 50564_B1_06aJan06_02.DWG

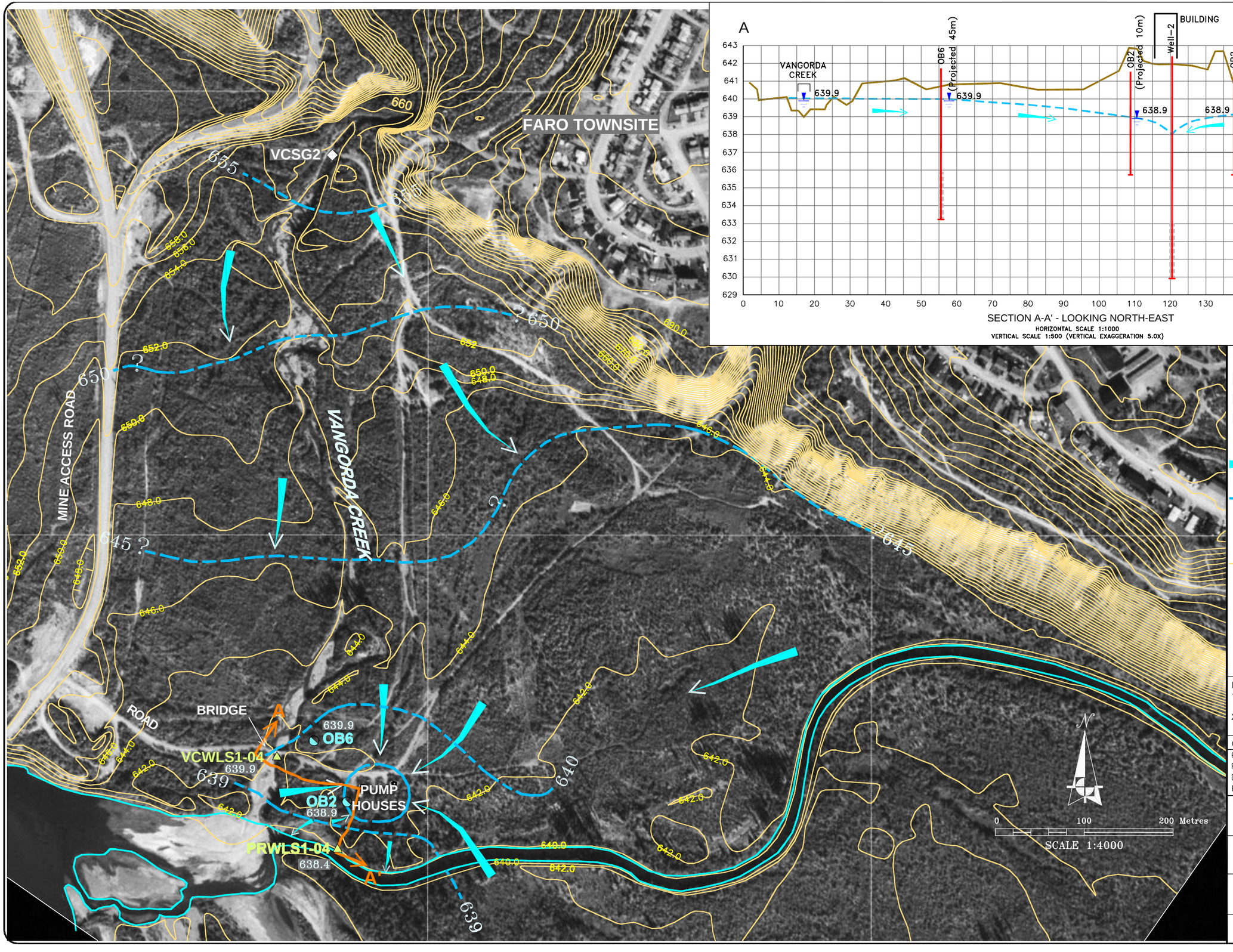
Deloitte & Touche

Project: Faro Townsite Water Supply
Location: Faro, Yukon Territory
Client: Deloitte & Touche

CONCEPTUAL GROUNDWATER FLOW SYSTEM - FEBRUARY 2005

Gartner Lee

Figure No. 10



Legend:

- VCSG1 LOCATION OF STREAM GAUGE
- PRWLS1-04 WATER LEVEL SENSOR
- OB2 OBSERVATION WELL 2" OR 6" DIA.
- CROSS SECTION A–A'
- INFERRED DIRECTION OF GROUNDWATER FLOW
- INTERPRETED GROUNDWATER ELEVATION CONTOURS
- 637.5 OBSERVED WATER ELEVATION (m ASL)
- GROUND SURFACE CONTOUR
- WATER LEVEL MEASURED IN SPRING/EARLY SUMMER 2005
- WELL
- SCREENED INTERVAL

Data Sources:

1. Digital copy of 1:50,000 topographic map and orthophoto supplied by SRK Consulting.
2. Survey conducted in summer 2004 by Yukon Engineering Services

Contour Int: 2 m (ASL) | Projection: UTM NAD 27 Zone 8

Reviewed By: DMcC/JK | Project No.: 50-564
Prepared By: PW/NT | Revision: 0
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File Name: 50564_B1_06aJan06_03.DWG

Deloitte & Touche

Project: Faro Townsite Water Supply
Location: Faro, Yukon Territory
Client: Deloitte & Touche

CONCEPTUAL GROUNDWATER FLOW SYSTEM - SUMMER 2005

Gartner Lee

Figure No. 11

Pelly River. Therefore, the change in water level at the production wells (OB2 area) was created primarily by the increased recharge from Vangorda Creek. This suggests that a significant portion of the water being extracted by the town wells during this period is due to recharge from Vangorda Creek.

4.5.2 Late Winter Flow Regime

The late Winter flow regime occurs primarily in February and March. During this period, flow is characterized by water levels throughout the aquifer being below both Vangorda Creek and the Pelly River. During this time, the aquifer is receiving reduced recharge and the pumping of the production wells draws the groundwater table down. In February and March, the water elevations in OB6 and OB2 are below the Pelly River level (see Figure 10). Therefore, the production wells during this period are likely receiving a mix of Pelly River water and Vangorda Creek water. Recharge from Vangorda Creek during this period may be reduced due to:

1) Reduced flow in the creek; and
2) Freezing of the creek bottom, preventing infiltration.

Freezing of the creek bottom is a known phenomenon in the lower reaches of Vangorda Creek, causing Spring-time flooding as the creek channel becomes filled with ice.

4.5.3 Spring/Early Summer Flow Regime

The Spring/early Summer flow regime begins with a rapid rise in water levels in the aquifer and streams due to Spring freshet. During the study period, this occurred starting in April 30, 2005. This flow regime is characterized by water levels throughout the aquifer being *higher* than the Pelly River. In 2005, this condition persisted until mid to late July at which point pumping by the production wells drew the aquifer level at OB2 below the Pelly River elevation. It is interesting to note that at the onset of this flow regime, the aquifer in the vicinity of the production wells rose 2.5 m over a period of 20 days. Following this period, water levels in the aquifer (in the vicinity of the production wells) declined steadily in response to sustained pumping until a new equilibrium was reached some ten months later. The Spring event represents the only major annual rise in aquifer water levels and therefore represents the most significant aquifer recharge event.

During the Spring/early Summer flow regime, groundwater flows from Vangorda Creek and discharges to the Pelly River. As the water level at OB2 (near the production wells) is higher than the Pelly River (see Figure 11), this suggest that during this period, water provided to the production wells is *not* coming from the Pelly River and is likely primarily fed by recharge from Vangorda Creek.

4.5.4 Travel Times

Although a detailed flow assessment is not possible at this time, a simplistic calculation of travel times can be completed using the Darcy equation to provide an order-of-magnitude estimate of travel times between the surface water bodies and the creek. Historical pumping test analyses have reported aquifer transmissivities ranging between 2,500 and 10,000 m^2/day (Hydrogeological Consultants Ltd. 1980). Using an effective aquifer thickness of 7.5 m (average distance between bottom of well screen and water table surface), this results in a calculated hydraulic conductivity on the order of 7×10^{-3} m/s. This is a relatively high value; however, it is consistent with very permeable gravel observed at the site. Using this hydraulic conductivity, hydraulic gradients ranging from 0.01 to 0.006, and a standard porosity of 30%, the ground water flow velocities are calculated to range between 13 and 30 m/day. The distance between the production wells, and Vangorda Creek and Pelly River is approximately 100 m and 80 m, respectively. Based on these distances and the assumptions noted above, travel times between the surface waterbodies and the pumping wells are calculated to range between one week and as little as three days. It should be recognized that these travel time calculations are very sensitive to the hydraulic conductivity value used, and considerable uncertainty exists regarding the actual hydraulic conductivity in the study area. Calculated groundwater travel times of 50 days or less is often used as a screening indicator that groundwater may be under the direct influence of surface water (GUDI).

4.5.5 Discussion of Conceptual Hydrogeological Flow Model

From the data presented above, a number of key observations can be made regarding the Town of Faro production wells in relation to Vangorda Creek:

- Given the response of well OB6 (adjacent Vangorda Creek) to pumping induced water table fluctuations, it is clear that the zone of influence, or cone of drawdown, from the production wells does extend to Vangorda Creek.
- Water is being recharged to the water supply aquifer by Vangorda Creek. Year-round the wells are receiving a varying portion of their water from Vangorda Creek.
  - During winter, the wells are likely receiving a mix of water from Pelly River and Vangorda Creek.
  - During Spring/Early Summer, the wells are likely receiving the majority of their water from Vangorda Creek as the aquifer levels during this period are *higher* than the highest Pelly River stage.
- Calculated groundwater velocities under pumping conditions in the Town of Faro water supply aquifer are relatively fast. The calculated time of travel for water flowing from Vangorda Creek and/or the Pelly River to the production wells may be less than seven days. This suggests that the Town wells are, at least seasonally, potentially under the direct influence of surface water.

5. Summary of Key Findings

Independent areas of investigation, or "lines of evidence", have been used throughout this study to determine the potential relationship between Vangorda Creek and Town of Faro water supply wells. Results of these investigations, incorporating water quality analysis, stream flow analysis, and continuous measurements of water elevations, provide a consistent interpretation of this relationship. Key findings incorporating each of the study components are listed below:

- Water is being recharged to the Town of Faro water supply aquifer by Vangorda Creek. Year-round the wells are receiving a varying portion of their water from Vangorda Creek. This conclusion is supported by the following key observations:
  - Stream gauging results indicate that a fraction of Vangorda Creek flow in the vicinity of the water supply wells is lost as recharge to the underlying sediments. The most significant source of recharge to the aquifer occurs during the periods of high creek flows in late spring and early summer.
  - The zone of influence, or cone of drawdown, from the Town's production wells extends to Vangorda Creek as indicated by the response of monitoring well OB6 (adjacent Vangorda Creek) to pumping-induced water table fluctuations.
  - During Spring/Early Summer, the aquifer levels during this period are *higher* than the highest Pelly River stage.
  - The Town of Faro water supply quality varies throughout the year indicating the potential influence of surface water recharge sources.
  - The Town of Faro water supply quality (as indicated by chlorides, nitrate and sulphate) is similar to Vangorda Creek and consistently higher in concentrations of indicator parameters relative to the Pelly River.
- Calculated groundwater velocities under pumping conditions in the Town of Faro water supply aquifer are relatively fast. The time of travel for water flowing from Vangorda Creek and/or the Pelly River to the production wells may be less than seven days. This suggests that the Town wells are, at least seasonally, potentially under the direct influence of surface water. It is important to note that there have been no detections of fecal coliforms (an indicator of bacteriological contamination) in the Town's historical water supply quality records reviewed for the purpose of this study.
- The Town of Faro water supply is of very good quality compared to Canadian Drinking Water Quality Guidelines, as indicated by historical monitoring (bacteriological, trace metals, nutrients, aesthetic parameters) and monitoring undertaken during this study period (trace metals, nutrients, aesthetic parameters).
- Metal concentrations measured in Vangorda Creek (including lead and zinc) throughout the study period were well below Canadian Drinking Water Quality Guidelines. Consequently, current metal concentrations in Vangorda Creek pose minimal risks to the Town of Faro water supply.

6. Recommendations

The key study findings outlined in the previous section indicate the importance of continued Vangorda Creek monitoring and ensuring appropriate notification protocols with the Town of Faro are in place. Specific recommendations are outlined below:

- Continue monthly water quality monitoring at the lower Vangorda Creek location (site V8); The monitoring parameters should include nitrate in addition to the current parameter list (conductivity, hardness, total suspended solids, total dissolved solids, common anions, total metals, dissolved metals).
- Continue upstream monitoring in Vangorda Plateau area; Incorporate nitrate analysis in samples from strategic locations (V27 and V1) to help determine the source of elevated nitrate concentrations observed in lower Vangorda Creek.
- An Emergency Response Plan has been developed for the Anvil Range site. This plan should be reviewed and modified if necessary to ensure procedures are in place to provide appropriate notification to the Town of Faro in the event of an emergency affecting Vangorda Creek.

The results of this study should be discussed with the Town of Faro staff. All water quality results collected and reviewed for this study indicate that the Town's water supply is consistently of very good quality. The study results also indicate that the Town wells are potentially under the direct influence of Pelly River and Vangorda Creek. This means the Town water supply may be susceptible to surface water contamination (including non-mining related contaminant sources). Future drinking water system management strategies employed by the Town of Faro, including monitoring and treatment, may need to address this issue.

7. References

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Appendices

Appendix A

Water Quality Summary Tables

Table A-1. Surface Water and Groundwater Quality - May 20, 2004

Parameter		Canadian Drinking Water Quality Guidelines[a]		Pump House[b]	Pelly River	Vangorda Creek[b]	OB6	OB2
	Date Sampled			20-May-04	20-May-04	20-May-04	20-May-04	20-May-04
Physical Tests								
Colour	CU	15	AO	<5	10	8	-	-
Conductivity	uS/cm	-		460	167	166	-	-
Hardness	CaCO3	-		261	92	92	-	-
pH		6.5-8.5	AO	-	-	-	-	-
Total Dissolved Solids	mg/L	500	AO	300	200	163	-	-
Total Suspended Solids	mg/L	-		2	3	1	-	-
Turbidity	NTU	5	AO[1]	<5	<5	<5	-	-
Dissolved Anions (mg/L)								
Alkalinity-Total	CaCO3	-		162	65	67	-	-
Chloride	Cl	250	AO	<1	<1	<1	-	-
Fluoride	F	1.5	MAC	-	-	-	-	-
Sulphate	SO4	500	AO	91	26	25	-	-
Nutrients (mg/L)								
Nitrate Nitrogen	N	10	MAC	1.11	0.66	0.74	-	-
Nitrite Nitrogen	N	1	MAC	0.01	<0.01	0.04	-	-
Total Metals (mg/L)								
Aluminum	T-Al	-		0.022	1.553	2.393	-	-
Antimony	T-Sb	0.006	IMAC	0.004	0.003	0.003	-	-
Arsenic	T-As	0.025	IMAC	<0.003	0.003	<0.003	-	-
Barium	T-Ba	1	MAC	0.071	0.193	0.094	-	-
Beryllium	T-Be	-		<0.0002	0.0002	0.0003	-	-
Boron	T-B	5	IMAC	0.07	0.09	0.09	-	-
Cadmium	T-Cd	0.005	MAC	<0.0002	0.0006	0.0002	-	-
Calcium	T-Ca	-		65.9	30.0	28.7	-	-
Chromium	T-Cr	0.05	MAC	0.005	0.003	0.007	-	-
Cobalt	T-Co	-		<0.001	0.003	0.003	-	-
Copper	T-Cu	1	AO	0.048	0.019	0.019	-	-
Iron	T-Fe	0.3	AO	0.051	**4.350**	**3.916**	-	-
Lead	T-Pb	0.010	MAC	**0.0150**	<0.002	0.007	-	-
Magnesium	T-Mg	-		24.4	9.2	10.2	-	-
Manganese	T-Mn	0.05	AO	0.011	**0.253**	**0.122**	-	-
Mercury	T-Hg	0.001	MAC	-	-	-	-	-
Molybdenum	T-Mo	-		0.002	0.002	<0.001	-	-
Nickel	T-Ni	-		<0.001	0.001	0.010	-	-
Potassium	T-K	-		1.2	1.4	1.9	-	-
Selenium	T-Se	0.01	MAC	<0.005	<0.005	<0.005	-	-
Sodium	T-Na	200	AO	2.6	1.2	1.1	-	-
Titanium	T-Ti	-		<0.001	0.034	0.073	-	-
Uranium	T-U	0.02	IMAC	-	-	-	-	-
Vanadium	T-V	-		<0.001	0.008	0.007		
Zinc	T-Zn	5	AO	0.040	0.081	0.047	-	-
Dissolved Metals (mg/L)								
Aluminum	D-Al	-		0.025	0.153	0.300	-	-
Antimony	D-Sb	0.006	IMAC	0.005	<0.002	0.002	-	-
Arsenic	D-As	0.025	IMAC	0.003	<0.003	<0.003	-	-
Barium	D-Ba	1	MAC	0.082	0.091	0.074	-	-
Beryllium	D-Be	-		0.0003	0.0002	0.0003	-	-
Boron	D-B	5	IMAC	0.09	0.08	0.05	-	-
Cadmium	D-Cd	0.005	MAC	<0.0002	<0.0002	0.0002	-	-
Calcium	D-Ca	-		68.9	26.4	25.7	-	-
Chromium	D-Cr	0.05	MAC	0.006	0.001	0.001	-	-
Cobalt	D-Co	-		0.001	<0.001	0.001	-	-
Copper	D-Cu	1	AO	0.026	0.021	0.019	-	-
Iron	D-Fe	0.3	AO	0.040	**0.328**	**0.444**	-	-
Lead	D-Pb	0.010	MAC	<0.002	<0.002	0.002	-	-
Magnesium	D-Mg	-		25.8	7.9	8.7	-	-
Manganese	D-Mn	0.05	AO	0.012	0.029	0.024	-	-
Mercury	D-Hg	0.001	MAC	-	-	-	-	-
Molybdenum	D-Mo	-		0.002	0.003	0.003	-	-
Nickel	D-Ni	-		<0.001	0.002	0.004	-	-
Potassium	D-K	-		1.3	1.1	1.5	-	-
Selenium	D-Se	0.01	MAC	<0.005	<0.005	<0.005	-	-
Sodium	D-Na	200	AO	3.2	0.7	0.9	-	-
Titanium	D-Ti	-		<0.001	0.007	0.015	-	-
Uranium	D-U	0.02	IMAC	-	-	-	-	-
Vanadium	D-V	-		<0.001	0.001	0.002		
Zinc	D-Zn	5	AO	0.019	0.034	0.036	-	-

Notes:

[a]	Summary of Guidelines for Canadian Drinking Water Quality, April 2004
[b]	Where detectable and non-detectable measurements recorded, the average includes the detection limit value (for the non-detects)
AO	aesthetic objective (taste, odour, appearance, etc.)
IMAC	Interim Maximum Acceptable Concentration
MAC	Maximum Acceptable Concentration
[1]	1 NTU maximum allowed for water entering distribution systems
<	indicates less than the detection limit
-	indicates no guideline or analysis for this parameter
bold	indicates parameter exceeded guideline

Table A-2. Surface Water and Groundwater Quality - October 7, 2004

Parameter		Canadian Drinking Water Quality Guidelines[a]		Pump House	Pelly River	Vangorda Creek	OB6	OB2
	Date Sampled			7-Oct-04	7-Oct-04	7-Oct-04	7-Oct-04	7-Oct-04
Physical Tests								
Colour	CU	15	AO	<5.0	<5.0	<5.0	<5.0	**36.6**
Conductivity	uS/cm	-		516	318	459	483	584
Hardness	CaCO3	-		277	164	247	255	298
pH		6.5-8.5	AO	-	-	-	-	-
Total Dissolved Solids	mg/L	500	AO	327	187	283	304	392
Total Suspended Solids	mg/L	-		<3.0	<3.0	5.5	7.0	808
Turbidity	NTU	5	AO[1]	0.19	-	1.95	**10.9**	**1450**
Dissolved Anions (mg/L)								
Alkalinity-Total	CaCO3	-		168	111	156	152	170
Chloride	Cl	250	AO	1.05	<0.50	1.41	1.20	1.15
Fluoride	F	1.5	MAC	-	-	-	-	-
Sulphate	SO4	500	AO	112	55.2	89.0	107	142
Nutrients								
Nitrate Nitrogen	N	10	MAC	0.223	<0.0050	0.235	0.124	0.0650
Nitrite Nitrogen	N	1	MAC	<0.0010	<0.0010	<0.0010	<0.0010	0.0316
Total Metals (mg/L)								
Aluminum	T-Al	-		<0.010	0.031	0.030	0.010	0.350
Antimony	T-Sb	0.006	IMAC	<0.00050	<0.00050	<0.00050	<0.00050	0.0086
Arsenic	T-As	0.025	IMAC	<0.0010	<0.0010	<0.0010	<0.0010	0.0054
Barium	T-Ba	1	MAC	0.096	0.076	0.066	0.090	0.124
Beryllium	T-Be	-		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Boron	T-B	5	IMAC	<0.10	<0.10	<0.10	<0.10	<0.10
Cadmium	T-Cd	0.005	MAC	<0.000050	0.000096	<0.000050	<0.000050	0.00297
Calcium	T-Ca	-		67.9	41.8	59.7	62.9	76.8
Chromium	T-Cr	0.05	MAC	<0.00060	<0.00050	<0.00050	<0.00050	0.0145
Cobalt	T-Co	-		<0.00050	<0.00050	<0.00050	<0.00050	0.0054
Copper	T-Cu	1	AO	0.0043	0.0011	0.0013	0.0010	0.0357
Iron	T-Fe	0.3	AO	<0.030	0.133	0.102	**0.900**	**174**
Lead	T-Pb	0.010	MAC	0.0020	<0.0010	<0.0010	<0.0010	**0.0324**
Magnesium	T-Mg	-		26.1	14.5	23.7	23.8	25.9
Manganese	T-Mn	0.05	AO	<0.010	0.011	0.019	<0.010	**0.580**
Mercury	T-Hg	0.001	MAC	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Molybdenum	T-Mo	-		<0.0010	0.0012	<0.0010	<0.0010	0.0024
Nickel	T-Ni	-		<0.0050	<0.0050	<0.0050	<0.0050	0.028
Potassium	T-K	-		-	-	-	-	-
Selenium	T-Se	0.01	MAC	0.0011	<0.0010	<0.0010	<0.0010	<0.0020
Sodium	T-Na	200	AO	3.4	<2.0	3.3	3.2	3.3
Titanium	T-Ti	-		<0.050	<0.050	<0.050	<0.050	<0.050
Uranium	T-U	0.02	IMAC	0.00373	0.00151	0.00394	0.00373	0.00568
Vanadium	T-V	-		<0.030	<0.030	<0.030	<0.030	<0.030
Zinc	T-Zn	5	AO	0.0096	0.0096	0.0118	<0.0050	0.0972
Dissolved Metals (mg/L)								
Aluminum	D-Al	-		-	-	-	-	-
Antimony	D-Sb	0.006	IMAC	-	-	-	-	-
Arsenic	D-As	0.025	IMAC	-	-	-	-	-
Barium	D-Ba	1	MAC	-	-	-	-	-
Beryllium	D-Be	-		-	-	-	-	-
Boron	D-B	5	IMAC	-	-	-	-	-
Cadmium	D-Cd	0.005	MAC	-	-	-	-	-
Calcium	D-Ca	-		-	-	-	-	-
Chromium	D-Cr	0.05	MAC	-	-	-	-	-
Cobalt	D-Co	-		-	-	-	-	-
Copper	D-Cu	1	AO	-	-	-	-	-
Iron	D-Fe	0.3	AO	-	-	-	-	-
Lead	D-Pb	0.010	MAC	-	-	-	-	-
Magnesium	D-Mg	-		-	-	-	-	-
Manganese	D-Mn	0.05	AO	-	-	-	-	-
Mercury	D-Hg	0.001	MAC	-	-	-	-	-
Molybdenum	D-Mo	-		-	-	-	-	-
Nickel	D-Ni	-		-	-	-	-	-
Potassium	D-K	-		-	-	-	-	-
Selenium	D-Se	0.01	MAC	-	-	-	-	-
Sodium	D-Na	200	AO	-	-	-	-	-
Titanium	D-Ti	-		-	-	-	-	-
Uranium	D-U	0.02	IMAC	-	-	-	-	-
Vanadium	D-V	-		-	-	-	-	-
Zinc	D-Zn	5	AO	-	-	-	-	-

Notes:

[a]	Summary of Guidelines for Canadian Drinking Water Quality, April 2004
AO	aesthetic objective (taste, odour, appearance, etc.)
IMAC	Interim Maximum Acceptable Concentration
MAC	Maximum Acceptable Concentration
[1]	1 NTU maximum allowed for water entering distribution systems
<	indicates less than the detection limit
-	indicates no guideline or analysis for this parameter
bold	indicates parameter exceeded guideline

Table A-3. Surface Water and Groundwater Quality - April 5, 2005

Parameter		Canadian Drinking Water Quality Guidelines[a]		Pump House	Pelly River	Vangorda Creek	OB6	OB2
	Date Sampled			5-Apr-05	5-Apr-05	5-Apr-05	5-Apr-05	5-Apr-05
Physical Tests								
Colour	CU	15	AO	<5.0	<5.0	<5.0	<5.0	<5.0
Conductivity	uS/cm	-		584	398	728	640	610
Hardness	CaCO3	-		290	196	360	308	268
pH		6.5-8.5	AO	8.25	8.28	8.23	8.27	7.81
Total Dissolved Solids	mg/L	500	AO	378	241	495	417	386
Total Suspended Solids	mg/L	-		-	-	-	-	-
Turbidity	NTU	5	AO[1]	0.49	0.76	0.68	**12.0**	**>4000**
Dissolved Anions (mg/L)								
Alkalinity-Total	CaCO3	-		208	163	258	212	213
Chloride	Cl	250	AO	1.44	<0.50	2.02	1.83	1.40
Fluoride	F	1.5	MAC	0.118	0.106	0.185	0.122	0.165
Sulphate	SO4	500	AO	119	61.6	167	144	132
Nutrients								
Nitrate Nitrogen	N	10	MAC	0.349	0.0271	0.425	0.353	0.0066
Nitrite Nitrogen	N	1	MAC	<0.0010	<0.0010	0.0010	<0.0010	0.0037
Total Metals (mg/L)								
Aluminum	T-Al	-		<0.010	-	-	-	-
Antimony	T-Sb	0.006	IMAC	<0.00050	-	-	-	-
Arsenic	T-As	0.025	IMAC	0.00020	-	-	-	-
Barium	T-Ba	1	MAC	0.082	-	-	-	-
Beryllium	T-Be	-		-	-	-	-	-
Boron	T-B	5	IMAC	<0.10	-	-	-	-
Cadmium	T-Cd	0.005	MAC	<0.00020	-	-	-	-
Calcium	T-Ca	-		71.3	-	-	-	-
Chromium	T-Cr	0.05	MAC	<0.0020	-	-	-	-
Cobalt	T-Co	-		-	-	-	-	-
Copper	T-Cu	1	AO	0.0019	-	-	-	-
Iron	T-Fe	0.3	AO	<0.030	-	-	-	-
Lead	T-Pb	0.010	MAC	<0.0010	-	-	-	-
Magnesium	T-Mg	-		26.2	-	-	-	-
Manganese	T-Mn	0.05	AO	<0.0020	-	-	-	-
Mercury	T-Hg	0.001	MAC	<0.00020	-	-	-	-
Molybdenum	T-Mo	-		-	-	-	-	-
Nickel	T-Ni	-		-	-	-	-	-
Potassium	T-K	-		1.08	-	-	-	-
Selenium	T-Se	0.01	MAC	0.0014	-	-	-	-
Sodium	T-Na	200	AO	3.8	-	-	-	-
Titanium	T-Ti	-		-	-	-	-	-
Uranium	T-U	0.02	IMAC	0.00560	-	-	-	-
Vanadium	T-V	-		-	-	-	-	-
Zinc	T-Zn	5	AO	<0.050	-	-	-	-
Dissolved Metals (mg/L)								
Aluminum	D-Al	-		<0.010	<0.010	<0.010	<0.010	<0.010
Antimony	D-Sb	0.006	IMAC	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Arsenic	D-As	0.025	IMAC	0.00020	0.00039	0.00051	0.00018	0.00020
Barium	D-Ba	1	MAC	0.082	0.070	0.065	0.082	0.056
Beryllium	D-Be	-		-	-	-	-	-
Boron	D-B	5	IMAC	<0.10	<0.10	<0.10	<0.10	<0.10
Cadmium	D-Cd	0.005	MAC	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Calcium	D-Ca	-		72.4	53.5	85.9	76.6	67.2
Chromium	D-Cr	0.05	MAC	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Cobalt	D-Co	-		-	-	-	-	-
Copper	D-Cu	1	AO	0.0028	<0.0010	<0.0010	<0.0010	<0.0010
Iron	D-Fe	0.3	AO	<0.030	0.037	0.034	<0.030	**1.15**
Lead	D-Pb	0.010	MAC	0.0014	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium	D-Mg	-		26.6	15.0	35.3	28.2	24.2
Manganese	D-Mn	0.05	AO	<0.0020	0.0170	0.0342	<0.0020	**0.160**
Mercury	D-Hg	0.001	MAC	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Molybdenum	D-Mo	-		-	-	-	-	-
Nickel	D-Ni	-		-	-	-	-	-
Potassium	D-K	-		1.09	0.80	1.32	1.04	0.86
Selenium	D-Se	0.01	MAC	0.0014	0.0026	0.0014	0.0012	0.0017
Sodium	D-Na	200	AO	3.7	2.2	5.3	4.2	3.3
Titanium	D-Ti	-		-	-	-	-	-
Uranium	D-U	0.02	IMAC	0.00568	0.00154	0.00926	0.00743	0.00387
Vanadium	D-V	-		-	-	-	-	-
Zinc	D-Zn	5	AO	<0.050	<0.050	<0.050	<0.050	0.067

Notes:

[a]	Summary of Guidelines for Canadian Drinking Water Quality, April 2004
AO	aesthetic objective (taste, odour, appearance, etc.)
IMAC	Interim Maximum Acceptable Concentration
MAC	Maximum Acceptable Concentration
[1]	1 NTU maximum allowed for water entering distribution systems
<	indicates less than the detection limit
-	indicates no guideline or analysis for this parameter
bold	indicates parameter exceeded guideline

Table A-4. Surface Water and Groundwater Quality - June17, 2005

Parameter		Canadian Drinking Water Quality Guidelines[a]		Pump House	Pelly River	Vangorda Creek	OB6	OB2
	Date Sampled			17-Jun-05	17-Jun-05	17-Jun-05	17-Jun-05	17-Jun-05
Physical Tests								
Colour	CU	15	AO	<5.0	9.1	9.7	<5.0	<5.0
Conductivity	uS/cm	-		449	229	357	287	387
Hardness	CaCO3	-		223	108	169	137	202
pH		6.5-8.5	AO	7.98	7.61	8.13	7.86	8.02
Total Dissolved Solids	mg/L	500	AO	**700**	151	246	186	248
Total Suspended Solids	mg/L	-		-	-	-	-	-
Turbidity	NTU	5	AO[1]	0.24	**25.4**	1.95	**7.87**	**77.2**
Dissolved Anions (mg/L)								
Alkalinity-Total	CaCO3	-		166	82.7	95.3	106	163
Chloride	Cl	250	AO	0.86	<10	0.52	<10	<0.50
Fluoride	F	1.5	MAC	0.109	<0.40	0.091	<0.40	0.126
Sulphate	SO4	500	AO	85.5	36	100	47	54.3
Nutrients								
Nitrate Nitrogen	N	10	MAC	0.31	<0.10	0.134	<0.10	0.109
Nitrite Nitrogen	N	1	MAC	<0.10	<0.020	<0.0010	<0.020	<0.0010
Total Metals (mg/L)								
Aluminum	T-Al	-		<0.010	-	-	-	-
Antimony	T-Sb	0.006	IMAC	<0.00050	-	-	-	-
Arsenic	T-As	0.025	IMAC	0.00015	-	-	-	-
Barium	T-Ba	1	MAC	0.063	-	-	-	-
Beryllium	T-Be	-		-	-	-	-	-
Boron	T-B	5	IMAC	<0.10	-	-	-	-
Cadmium	T-Cd	0.005	MAC	<0.00020	-	-	-	-
Calcium	T-Ca	-		52.9	-	-	-	-
Chromium	T-Cr	0.05	MAC	<0.0020	-	-	-	-
Cobalt	T-Co	-		-	-	-	-	-
Copper	T-Cu	1	AO	<0.0010	-	-	-	-
Iron	T-Fe	0.3	AO	<0.030	-	-	-	-
Lead	T-Pb	0.010	MAC	<0.0010	-	-	-	-
Magnesium	T-Mg	-		19.8	-	-	-	-
Manganese	T-Mn	0.05	AO	<0.0020	-	-	-	-
Mercury	T-Hg	0.001	MAC	<0.00020	-	-	-	-
Molybdenum	T-Mo	-		-	-	-	-	-
Nickel	T-Ni	-		-	-	-	-	-
Potassium	T-K	-		0.90	-	-	-	-
Selenium	T-Se	0.01	MAC	<0.0010	-	-	-	-
Sodium	T-Na	200	AO	3.2	-	-	-	-
Titanium	T-Ti	-		-	-	-	-	-
Uranium	T-U	0.02	IMAC	0.00389	-	-	-	-
Vanadium	T-V	-		-	-	-	-	-
Zinc	T-Zn	5	AO	<0.050	-	-	-	-
Dissolved Metals (mg/L)								
Aluminum	D-Al	-		<0.010	0.043	0.015	<0.010	<0.010
Antimony	D-Sb	0.006	IMAC	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Arsenic	D-As	0.025	IMAC	0.00016	0.00058	0.00041	0.00040	<0.00010
Barium	D-Ba	1	MAC	0.065	0.051	0.042	0.040	0.049
Beryllium	D-Be	-		-	-	-	-	-
Boron	D-B	5	IMAC	<0.10	<0.10	<0.10	<0.10	<0.10
Cadmium	D-Cd	0.005	MAC	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Calcium	D-Ca	-		55.3	28.6	44.9	34.0	50.9
Chromium	D-Cr	0.05	MAC	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Cobalt	D-Co	-		-	-	-	-	-
Copper	D-Cu	1	AO	<0.0010	0.0012	<0.0010	<0.0010	<0.0010
Iron	D-Fe	0.3	AO	<0.030	0.060	<0.030	**0.686**	**0.777**
Lead	D-Pb	0.010	MAC	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium	D-Mg	-		20.6	8.98	13.7	12.7	18.1
Manganese	D-Mn	0.05	AO	<0.0020	0.0088	0.0237	0.0487	0.0291
Mercury	D-Hg	0.001	MAC	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Molybdenum	D-Mo	-		-		-	-	-
Nickel	D-Ni	-		-	-	-	-	-
Potassium	D-K	-		0.94	0.55	0.73	0.78	0.75
Selenium	D-Se	0.01	MAC	<0.0010	<0.0010	<0.0010	<0.0010	0.0013
Sodium	D-Na	200	AO	3.3	<2.0	2.4	2.2	2.8
Titanium	D-Ti	-		-	-	-	-	-
Uranium	D-U	0.02	IMAC	0.00387	0.00096	0.00200	0.00212	0.00351
Vanadium	D-V	-		-	-	-	-	-
Zinc	D-Zn	5	AO	<0.050	<0.050	<0.050	<0.050	<0.050

Notes:

[a]	Summary of Guidelines for Canadian Drinking Water Quality, April 2004
AO	aesthetic objective (taste, odour, appearance, etc.)
IMAC	Interim Maximum Acceptable Concentration
MAC	Maximum Acceptable Concentration
[1]	1 NTU maximum allowed for water entering distribution systems
<	indicates less than the detection limit
-	indicates no guideline or analysis for this parameter
bold	indicates parameter exceeded guideline

Table A-5. Surface Water and Groundwater Quality - July 20, 2005

Parameter		Canadian Drinking Water Quality Guidelines[a]		Pump House	Pelly River	Vangorda Creek	OB6	OB2
	Date Sampled			20-Jul-05	20-Jul-05	20-Jul-05	20-Jul-05	20-Jul-05
Physical Tests								
Colour	CU	15	AO	<5.0	6.5	9.2	<5.0	<5.0
Conductivity	uS/cm	-		534	285	411	568	463
Hardness	CaCO3	-		270	142	205	290	234
pH		6.5-8.5	AO	8.10	8.28	8.34	8.14	8.21
Total Dissolved Solids	mg/L	500	AO	368	180	277	402	308
Total Suspended Solids	mg/L	-		-	-	-	-	-
Turbidity	NTU	5	AO[1]	0.11	**5.24**	**7.97**	**13.6**	**14.4**
Dissolved Anions (mg/L)								
Alkalinity-Total	CaCO3	-		147	96.1	117	127	151
Chloride	Cl	250	AO	0.79	<0.50	0.61	0.62	0.70
Fluoride	F	1.5	MAC	0.123	0.115	0.119	0.132	0.144
Sulphate	SO4	500	AO	149	54.1	104	186	99.3
Nutrients								
Nitrate Nitrogen	N	10	MAC	0.25	<0.10	0.14	0.17	0.15
Nitrite Nitrogen	N	1	MAC	<0.10	<0.10	<0.10	<0.10	<0.10
Total Metals (mg/L)								
Aluminum	T-Al	-		<0.010	-	-	-	-
Antimony	T-Sb	0.006	IMAC	<0.00050	-	-	-	-
Arsenic	T-As	0.025	IMAC	0.00018	-	-	-	-
Barium	T-Ba	1	MAC	0.075	-	-	-	-
Beryllium	T-Be	-		-	-	-	-	-
Boron	T-B	5	IMAC	<0.10	-	-	-	-
Cadmium	T-Cd	0.005	MAC	<0.00020	-	-	-	-
Calcium	T-Ca	-		66.1	-	-	-	-
Chromium	T-Cr	0.05	MAC	<0.0020	-	-	-	-
Cobalt	T-Co	-		-	-	-	-	-
Copper	T-Cu	1	AO	0.0010	-	-	-	-
Iron	T-Fe	0.3	AO	<0.030	-	-	-	-
Lead	T-Pb	0.010	MAC	<0.0010	-	-	-	-
Magnesium	T-Mg	-		24.0	-	-	-	-
Manganese	T-Mn	0.05	AO	<0.0020	-	-	-	-
Mercury	T-Hg	0.001	MAC	<0.00020	-	-	-	-
Molybdenum	T-Mo	-		-	-	-	-	-
Nickel	T-Ni	-		-	-	-	-	-
Potassium	T-K	-		1.09	-	-	-	-
Selenium	T-Se	0.01	MAC	<0.0010	-	-	-	-
Sodium	T-Na	200	AO	3.1	-	-	-	-
Titanium	T-Ti	-		-	-	-	-	-
Uranium	T-U	0.02	IMAC	0.00363	-	-	-	-
Vanadium	T-V	-		-	-	-	-	-
Zinc	T-Zn	5	AO	<0.050	-	-	-	-
Dissolved Metals (mg/L)								
Aluminum	D-Al	-		<0.010	0.024	0.012	<0.010	<0.010
Antimony	D-Sb	0.006	IMAC	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Arsenic	D-As	0.025	IMAC	0.00018	0.00054	0.00050	0.00018	0.00013
Barium	D-Ba	1	MAC	0.076	0.055	0.045	0.084	0.056
Beryllium	D-Be	-		-	-	-	-	-
Boron	D-B	5	IMAC	<0.10	<0.10	<0.10	<0.10	<0.10
Cadmium	D-Cd	0.005	MAC	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Calcium	D-Ca	-		67.5	36.6	53.0	72.4	57.9
Chromium	D-Cr	0.05	MAC	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Cobalt	D-Co	-		-	-	-	-	-
Copper	D-Cu	1	AO	<0.0010	<0.0010	0.0011	<0.0010	<0.0010
Iron	D-Fe	0.3	AO	<0.030	<0.030	<0.030	0.038	0.552
Lead	D-Pb	0.010	MAC	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium	D-Mg	-		24.6	12.2	17.7	26.4	21.6
Manganese	D-Mn	0.05	AO	<0.0020	0.0042	0.0219	0.0030	0.0096
Mercury	D-Hg	0.001	MAC	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Molybdenum	D-Mo	-		-	-	-	-	-
Nickel	D-Ni	-		-	-	-	-	-
Potassium	D-K	-		1.11	0.60	0.85	1.15	0.84
Selenium	D-Se	0.01	MAC	<0.0010	0.0011	<0.0010	<0.0010	<0.0010
Sodium	D-Na	200	AO	3.3	<2.0	2.7	3.3	3.5
Titanium	D-Ti	-		-	-	-	-	-
Uranium	D-U	0.02	IMAC	0.00368	0.00133	0.00257	0.00333	0.00442
Vanadium	D-V	-		-	-	-	-	-
Zinc	D-Zn	5	AO	<0.050	<0.050	<0.050	<0.050	<0.050

Notes:

[a]	Summary of Guidelines for Canadian Drinking Water Quality, April 2004
AO	aesthetic objective (taste, odour, appearance, etc.)
IMAC	Interim Maximum Acceptable Concentration
MAC	Maximum Acceptable Concentration
[1]	1 NTU maximum allowed for water entering distribution systems
<	indicates less than the detection limit
-	indicates no guideline or analysis for this parameter
bold	indicates parameter exceeded guideline

Table A-6. Surface Water and Groundwater Quality - October 6, 2005

Parameter		Canadian Drinking Water Quality Guidelines[a]		Pump House	Pelly River	Vangorda Creek	OB6	OB2
	Date Sampled			6-Oct-05	6-Oct-05	6-Oct-05	6-Oct-05	6-Oct-05
Physical Tests								
Colour	CU	15	AO	<5.0	10.3	6.5	<5.0	<5.0
Conductivity	uS/cm	-		501	302	414	467	720
Hardness	CaCO3	-		287	154	217	202	389
pH		6.5-8.5	AO	8.06	8.12	8.19	7.99	7.90
Total Dissolved Solids	mg/L	500	AO	348	182	258	296	496
Total Suspended Solids	mg/L	-		-	-	-	-	-
Turbidity	NTU	5	AO[1]	<0.10	4.30	0.96	60.9	78.1
Dissolved Anions (mg/L)								
Alkalinity-Total	CaCO3	-		166	105	152	146	177
Chloride	Cl	250	AO	1.03	<0.50	1.02	0.92	0.85
Fluoride	F	1.5	MAC	0.133	0.126	0.141	0.175	0.159
Sulphate	SO4	500	AO	111	54.1	81.1	106	222
Nutrients								
Nitrate Nitrogen	N	10	MAC	0.28	<0.0050	0.164	0.214	<0.0050
Nitrite Nitrogen	N	1	MAC	<0.10	<0.0010	<0.0010	<0.0010	<0.0010
Total Metals (mg/L)								
Aluminum	T-Al	-		<0.010	-	-	-	-
Antimony	T-Sb	0.006	IMAC	<0.00050	-	-	-	-
Arsenic	T-As	0.025	IMAC	0.00018	-	-	-	-
Barium	T-Ba	1	MAC	0.075	-	-	-	-
Beryllium	T-Be	-		-	-	-	-	-
Boron	T-B	5	IMAC	<0.10	-	-	-	-
Cadmium	T-Cd	0.005	MAC	<0.00020	-	-	-	-
Calcium	T-Ca	-		66.1	-	-	-	-
Chromium	T-Cr	0.05	MAC	<0.0020	-	-	-	-
Cobalt	T-Co	-		-	-	-	-	-
Copper	T-Cu	1	AO	0.0010	-	-	-	-
Iron	T-Fe	0.3	AO	<0.030	-	-	-	-
Lead	T-Pb	0.010	MAC	<0.0010	-	-	-	-
Magnesium	T-Mg	-		24.0	-	-	-	-
Manganese	T-Mn	0.05	AO	<0.0020	-	-	-	-
Mercury	T-Hg	0.001	MAC	<0.00020	-	-	-	-
Molybdenum	T-Mo	-		-	-	-	-	-
Nickel	T-Ni	-		-	-	-	-	-
Potassium	T-K	-		1.09	-	-	-	-
Selenium	T-Se	0.01	MAC	<0.0010	-	-	-	-
Sodium	T-Na	200	AO	3.1	-	-	-	-
Titanium	T-Ti	-		-	-	-	-	-
Uranium	T-U	0.02	IMAC	0.00363	-	-	-	-
Vanadium	T-V	-		-	-	-	-	-
Zinc	T-Zn	5	AO	<0.050	-	-	-	-
Dissolved Metals (mg/L)								
Aluminum	D-Al	-			0.027	<0.050	<0.010	<0.010
Antimony	D-Sb	0.006	IMAC		<0.00050	<0.0025	<0.00050	<0.00050
Arsenic	D-As	0.025	IMAC		0.00045	<0.00050	0.00031	0.00013
Barium	D-Ba	1	MAC		0.064	<0.10	0.068	0.114
Boron	D-B	5	IMAC		<0.10	<0.50	<0.10	<0.10
Cadmium	D-Cd	0.005	MAC		<0.00020	<0.0010	<0.00020	<0.00020
Calcium	D-Ca	-			41.4	55.3	53.2	98.6
Chromium	D-Cr	0.05	MAC		<0.0020	<0.010	<0.0020	<0.0020
Copper	D-Cu	1	AO		0.0011	<0.0050	<0.0010	<0.0010
Iron	D-Fe	0.3	AO		0.058	<0.030	0.678	2.35
Lead	D-Pb	0.010	MAC		<0.0010	<0.0050	<0.0010	<0.0010
Magnesium	D-Mg	-			12.4	19.2	16.8	34.7
Manganese	D-Mn	0.05	AO		0.0070	0.012	0.0744	0.0839
Mercury	D-Hg	0.001	MAC		<0.00020	<0.00020	<0.00020	<0.00020
Potassium	D-K	-			0.64	0.89	1.11	1.28
Selenium	D-Se	0.01	MAC		<0.0010	<0.0050	<0.0010	<0.0010
Sodium	D-Na	200	AO		<2.0	3.1	2.8	4.2
Uranium	D-U	0.02	IMAC		0.00139	0.00347	0.00170	0.00647
Zinc	D-Zn	5	AO		<0.050	<0.25	<0.050	<0.050

Notes:

[a]	Summary of Guidelines for Canadian Drinking Water Quality, April 2004
AO	aesthetic objective (taste, odour, appearance, etc.)
IMAC	Interim Maximum Acceptable Concentration
MAC	Maximum Acceptable Concentration
[1]	1 NTU maximum allowed for water entering distribution systems
<	indicates less than the detection limit
-	indicates no guideline or analysis for this parameter
bold	indicates parameter exceeded guideline

Appendix B

Field Parameter Measurements

Table B-1. Field Parameter Results

Date: Sept 10, 2004

Sample Location	Temperature C	Conductivity uS	pH	Dissolved Oxygen (mg/L)	Comments
PRGS01-04	5.54	321	8.16	12.62	Measurments were taken directly in Pelly River.
VCGS01-04	3.73	459	8.4	16.15	Measurments were taken direclty in Vangorda Creek
Well Head - Pump House#1 (Wells 1 and 2)	6	-	-	-	Measurment taken from thermometer on well head.

Date: Oct 7, 2004

Sample Location	Temperature C	Conductivity uS	pH	Dissolved Oxygen (mg/L)	Comments
PRGS01-04	4.66	316	8.08	12.48	Measurments were taken directly in Pelly River.
VCGS01-04	2.86	462	8.34	14.81	Measurments were taken direclty in Vangorda Creek
Well Head - Pump House#1 (Wells 1 and 2)	5.66	519	7.92	12.8	Measurments were taken from sample port on the well head.
OB2-Inch	6.85	555	7.57	-	Measurments were taken from purged well water. (multiple well volumes removed)
OB6-Inch	6.07	475	7.57	11.50	Measurments were taken from purged well water. (multiple well volumes removed)

Date: Apr 5, 2005

Sample Location	Temperature C	Conductivity uS	pH	Dissolved Oxygen (mg/L)	Comments
PRGS01-04	1.11	397	7.14	-	Measurments were taken directly in Pelly River.
VCGS01-04	0.2	752	7.85	-	Measurments were taken direclty in Vangorda Creek
Well Head - Pump House#1 (Wells 1 and 2)	2.5	593	7.23	13.76	Measurments were taken from sample port on the well head.
OB2-Inch	0.35	585	7.05	-	Measurments were taken from purged well water. (multiple well volumes removed)
OB6-Inch	1.55	509	7.3	9.52	Measurments were taken from purged well water. (multiple well volumes removed)

Date: Jun 17, 2005

Sample Location	Temperature C	Conductivity uS	pH	Dissolved Oxygen (mg/L)	Comments
PRGS01-04	12.9	230.4	7.94	-	Measurments were taken directly in Pelly River.
VCGS01-04	9.3	360.7	8.16	-	Measurments were taken direclty in Vangorda Creek
Well Head - Pump House#1 (Wells 1 and 2)	4	238.5	7.38	-	Measurments were taken from sample port on the well head.
OB2-Inch	4	398.7	7.73	-	Measurments were taken from purged well water. (multiple well volumes removed)
OB6-Inch	9.2	142.7	7.54	-	Measurments were taken from purged well water. (multiple well volumes removed)

Date: Jul 20, 2005

Sample Location	Temperature C	Conductivity uS	pH	Dissolved Oxygen (mg/L)	Comments
PRGS01-04	13.5	292.2	8.29	-	Measurments were taken directly in Pelly River.
VCGS01-04	10	423.3	8.33	-	Measurments were taken direclty in Vangorda Creek
Well Head - Pump House#1 (Wells 1 and 2)	4.5	534	7.49	-	Measurments were taken from waterra tubing attached to the sample port on the well head.
OB2-Inch	5.5	460.4	7.72	-	Measurments were taken from purged well water. (multiple well volumes removed)
OB6-Inch	7.7	564	7.61	-	Measurments were taken from purged well water. (multiple well volumes removed)

Date: Oct 6, 2005

Sample Location	Temperature C	Conductivity uS	pH	Dissolved Oxygen (mg/L)	Comments
PRGS01-04	3.2	321	7.45	-	Measurments were taken directly in Pelly River.
VCGS01-04	2.2	411	8.42	-	Measurments were taken direclty in Vangorda Creek
Well Head - Pump House#1 (Wells 1 and 2)	5.4	534	7.34	-	Measurments were taken from waterra tubing attached to the sample port on the well head.
OB2-Inch	4.7	601	7.35	-	Measurments were taken from purged well water. (multiple well volumes removed)
OB6-Inch	7.7	463	7.17	-	Measurments were taken from purged well water. (multiple well volumes removed)

Appendix C

Laboratory Reports

Invoice No: 040525C

Cavendish Analytical Laboratories Ltd.

400 - 2389 Health Sciences Mall
Vancouver, B.C. V6T 1Z4
Ph: (604) 251-4456 Fax: (604) 258-9497
accounting@cavendish.ca

Date: 05/25/04
Project: none given
Purchase Order: none given

INVOICE

Customer

Name: **Anvil Range Mining**
Address: **Postal Bag 1000** City: **Faro**
Pv/St: **YT** Cnty: **Canada** ZIP: **Y0B 1K0**
Phone: **867-994-2315** E-Mail: **dhaggar@rtmx.ca**

Sample Type: Water Total

Qty	Description	Rate	Amount
14	Preparation for metals: Aqua Regia	$10.00	$140.00
7	Alkalinity	$10.00	$70.00
7	Ammonia	$20.00	$140.00
7	Chloride	$10.00	$70.00
7	Conductivity	$5.00	$35.00
7	Hardness	$10.00	$70.00
14	ICP32	$30.00	$420.00
7	Nitrate and Nitrite	$20.00	$140.00
7	pH	$5.00	$35.00
7	Sulfate	$10.00	$70.00
7	Solids Total Dissolved	$10.00	$70.00
7	Solids Total Suspended	$10.00	$70.00
7	Total Organic Carbon	$50.00	$350.00
7	Color	$7.50	$52.50
7	Turbidity	$10.00	$70.00
	Handling Charge	$5.00	$5.00

GST# 12648 7776

Sub Total $1,807.50
Tax $126.53
Total **$1,934.03**

TERMS: NET 30 DAYS FROM DATE OF INVOICE
2% PER MONTH (24% PER ANNUM) ON OVERDUE ACCOUNTS)

Send all payments to
400 - 2389 Health Sciences Mall, Vancouver, B.C. V6T 1Z4
Any questions concerning this invoice, call Accounts, (604) 251-4456

THANK YOU FOR YOUR BUSINESS

Chain of Custody

Cavendish Analytical Laboratory Ltd . 165[illegible] ndora St. Vancouver BC, Canada 604-251-4456 login@cavendish.ca

cavendish lab ID: 040525C | by: HB

REQUIRED INFORMATION

Company Name	Anvil Range Mining
Street	Postal Bag 1000
City & Province	Faro, Yukon Canada Y0B-1K0
Phone	867-994-2647
Project	
Report to	Mr. Dana Haggar
email	dhaggar@rtmx.ca
Metals Prep	LIQUIDS
# Samples	13
Turnaround days	[X] 3-5 day Normal; [ ] 2 day rush 50% surcharge; [ ] 1 day rush 100% surcharge
Sample Matrix	WATER

OPTIONAL INFORMATION

Relinquished by	Year	Month	Day	Hour	Received by	Year	Month	Day	Hour
				:					:
				:					:
				:					:

Purchase Order: | Quote #:

Bill to: | Account contact:

Metals prep. Solids: TCLP - SWEP - Aqua regia - Multi Acid - Nitric Perchloric - Other

Liquids: Total (acid digest) - Dissolved (filter and acidify) - No prep (as is)

Sampling Date: 04 (year) 05 (month) (day) | Total # sample containers: 21 + TRAVEL BLANK

Sampled by: M.K. Wilson, MEARS, CARR.

Matrix: Soil - Pulp - Paint - Filter - Oil - Vegetation - Tissue - Hair - Vitamin - Other

Water - Effluent - Drinking-water - Acid-extract - SWEP-solution

	Sample Identification	Acidity	Alkalinity	Ammonia	BOD	BTEX + VPH	Chloride	COD	Coliforms Tot+Fec	Conductivity	Cyanide Tot	EPH LEPH/HEPH	Genmet	Genmet +	Hardness	ICP30 metals	ICP32 metals Tota	ICP32 metals Dis.	ICP50 metals	Kjeldahl-N	Lead	Mercury	MOG	Nitrate	Nitrite	PAH	pH	Phenols	PO4	Sulfate SULPHATE	TDS	TOG	TSS	VOC	TOTAL ORGANIC CARBON	COLOUR	TURBIDITY	Archive
1	LOWER VAN CREEK #1		X	X			X			X					X		X	X						X	X		X			X	X		X		X	X	X	
2	#2		X	X			X			X					X		X	X						X	X		X			X	X		X		X	X	X	
3	#3		X	X			X			X					X		X	X						X	X		X			X	X		X		X	X	X	
4																																						
5																																						
6	PELLY RIVER		X	X			X			X					X		X	X						X	X		X			X	X		X		X	X	X	
7	UPSTREAM VAN. CREEK																																					
8	TOWN WELL #1		X	X			X			X					X		X	X						X	X		X			X	X		X		X	X	X	
9	#2		X	X			X			X					X		X	X						X	X		X			X	X		X		X	X	X	
#	#3		X	X			X			X					X		X	X						X	X		X			X	X		X		X	X	X	
#																																						
#	LEAY COARSE																																					
#	SAMPLES W/ FRESHET																																					
#	DISSOLVED METAL																																					
#	SAMPLES HAVE																																					
#	BEEN FILTERED																																					
#																																						
#																																						
#																																							
#																																							

May 25/04
040525C

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PHONE 604 278-0331

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CHARGE TO (IF OTHER THAN ABOVE) AIR NORTH 287 00147265 | DECLARED VALUE $

NO. PCS.	DESCRIPTION	WEIGHT	RATE	SUMMARY OF CHARGES			
1	COOLER	38L		FREIGHT CHARGES		HOURLY	
				SPECIAL SERVICES		C.O.D. CHARGE	
				P.G.REQ'D DOCK LEVEL		OTHER	
REMARKS OR SPECIAL INSTRUCTIONS			GST YES ☐ NO ☐	1 TON REQUIRED		GST	
				TOTAL ▶			

SHIPPER	PICKUP DRIVER	RECEIVED IN GOOD CONDITION EXCEPT AS NOTED
X	18	X TH.
DATE 5 25 04 TIME	DELIVERY DRIVER	DATE 5 25 04 TIME 3:50

TERMS AND CONDITIONS: "Conditions of Carriage as prescribed by regulations of the Province of B.C. respecting Motor Carrier Services are hereby incorporated by reference and govern transportation services performed under this Bill of Lading. Limits of Carrier's liability are specified in current Tariff Item 80."

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To: **Anvil Range Mining**
Postal Bag 1000
Faro YT Canada
Attention: **Mr. Dana Haggar**
Project: **none given**

Samples: **6**
Date Received: **5/25/2004**
Date Out: **5/28/2004**

Certificate of Analysis: **040525C**

Sample Type: **Water Total**

Units	ug/ml
Sample Name	**TOC**
LOWER VAN CREEK #2 D	<1
LOWER VAN CREEK #2 D/Dup	n/a
STD	131
STD Certified	146
STD Blank	<1
STD Detection	1

TOC Method EPA-SW846

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Attention: **Mr. Dana Haggar**
Project: **none given**

Samples: **7**
Date Received: **5/25/2004**
Date Out: **5/28/2004**

Certificate of Analysis: **040525C**

Sample Type: **Water Total**

Units	ug/ml
Sample Name	**TOC**
LOWER VAN CREEK #1 D	2
LOWER VAN CREEK #2 D	<1
LOWER VAN CREEK #3 D	<1
PELLY RIVER D	1
UPSTREAM VAN CREEK TOWN WELL #1 D	2
UPSTREAM VAN CREEK TOWN WELL #2 D	<1
UPSTREAM VAN CREEK TOWN WELL #3 D	<1

TOC Method EPA-SW846

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Attention: **Mr. Dana Haggar**
Project: **none given**

Samples: **6**
Date Received: **5/25/2004**
Date Out: **6/2/2004**

Certificate of Analysis: **040525C**

Sample Type: **Water Total**

Units	ug/ml	ug/ml
Sample Name	**Hardness**	**SO4**
LOWER VAN CREEK #2 D	92	25
LOWER VAN CREEK #2 D/Dup	96	23
STD	713	172
STD Certified	706	168
STD Blank	<1	<1
STD Detection	1	1

Hardness Method APHA 2340C
SO4 Method EPA 6010

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Attention: **Mr. Dana Haggar**
Project: **none given**

Samples: **7**
Date Received: **5/25/2004**
Date Out: **6/2/2004**

Certificate of Analysis: **040525C**

Sample Type: **Water Total**

Units	ug/ml	ug/ml
Sample Name	**Hardness**	**SO4**
LOWER VAN CREEK #1 D	94	25
LOWER VAN CREEK #2 D	92	25
LOWER VAN CREEK #3 D	91	24
PELLY RIVER D	92	26
UPSTREAM VAN CREEK TOWN WELL #1 D	265	92
UPSTREAM VAN CREEK TOWN WELL #2 D	260	90
UPSTREAM VAN CREEK TOWN WELL #3 D	258	91

Hardness Method APHA 2340C
SO4 Method EPA 6010

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To: **Anvil Range Mining**
Postal Bag 1000
Faro, YT Canada Y0B 1K0

Attention: **Mr. Dana Haggar**
Project: **none given**

Samples: **9**
Date Out: **02/06/04**
Date In: **25/05/04**

Sample Type: Water Total
Preparation: Aqua Regia
Type of Analysis: **ICP 32**

CERTIFICATE OF ANALYSIS : 040525C

Sample	ppb	ppm	ppm	ppm	ppm	ppb	ppm	ppm	ppb	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Name	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd	Co	Cr	Cu	Fe	K	La	Mg	Mn	Mo	Na	Ni	P	Pb	S	Sb	Se	Sn	Sr	Ti	Tl	V	W	Zn
LOWER VAN CREEK #2 D	<0.2	0.266	<0.003	0.06	0.072	0.3	0.02	25.7	<0.2	<0.001	<0.001	0.016	0.387	1.5	<0.001	8.6	0.023	0.004	0.5	0.003	<0.01	0.002	7.8	<0.002	<0.005	<0.002	0.080	0.013	<0.002	0.002	<0.03	0.036
LOWER VAN CREEK #2 D/Dup	0.2	0.271	<0.003	0.05	0.074	0.2	<0.01	26.6	<0.2	<0.001	<0.001	0.013	0.324	1.5	0.002	8.8	0.023	0.003	0.8	0.004	<0.01	0.004	7.9	<0.002	<0.005	<0.002	0.078	0.012	0.002	0.001	<0.03	0.035
UPSTREAM VAN CREEK TOWN WELL #1 T	<0.2	0.018	<0.003	0.07	0.070	0.2	<0.01	66.6	<0.2	0.001	0.005	0.042	0.064	1.2	<0.001	24.4	0.011	0.003	2.6	0.002	<0.01	0.021	27.5	<0.002	<0.005	<0.002	0.210	<0.001	<0.002	<0.001	<0.03	0.046
UPSTREAM VAN CREEK TOWN WELL #1 T/Dup	0.2	0.020	<0.003	0.06	0.070	<0.2	<0.01	66.4	<0.2	<0.001	0.005	0.045	0.059	1.2	0.002	24.5	0.010	0.005	2.7	<0.001	<0.01	0.013	28.3	0.003	<0.005	0.002	0.214	0.001	<0.002	<0.001	<0.03	0.049
STD-KW	23.1	8.069	0.336	1.91	0.111	28.2	0.45	201.2	100.6	0.278	0.249	0.497	19.071	113.7	0.500	51.8	0.590	0.054	106.1	0.207	3.04	0.540	56.2	0.422	0.461	0.667	0.499	0.398	0.064	0.101	0.35	0.587
c STD-KW	23.0	8.000	0.325	1.90	0.110	28.0	0.44	200.0	100.0	0.280	0.250	0.500	19.000	113.3	0.513	50.0	0.580	0.053	105.0	0.200	3.00	0.530	56.0	0.420	0.469	0.699	0.500	0.400	0.068	0.100	0.33	0.575
STD Blank	<0.2	<0.001	<0.003	<0.05	<0.001	<0.2	<0.01	0.2	<0.2	<0.001	<0.001	<0.001	<0.002	<0.1	<0.001	<0.1	<0.001	0.001	<0.1	<0.001	<0.01	<0.002	0.1	<0.002	<0.005	<0.002	<0.001	0.001	<0.002	<0.001	<0.03	0.002
STD Blank T	<0.2	0.002	<0.003	<0.05	<0.001	<0.2	<0.01	<0.1	<0.2	0.001	<0.001	0.001	0.002	<0.1	<0.001	<0.1	<0.001	<0.001	<0.1	<0.001	0.01	<0.002	<0.1	<0.002	<0.005	<0.002	<0.001	<0.001	<0.002	0.001	<0.03	<0.001
STD Detection	0.2	0.001	0.003	0.05	0.001	0.2	0.01	0.1	0.2	0.001	0.001	0.001	0.002	0.1	0.001	0.1	0.001	0.001	0.1	0.001	0.01	0.002	0.1	0.002	0.005	0.002	0.001	0.001	0.002	0.001	0.03	0.001

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To: **Anvil Range Mining**
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Faro, YT Canada Y0B 1K0

Attention: **Mr. Dana Haggar**
Project: **none given**

Samples: **14**
Date Out: **02/06/04**
Date In: **25/05/04**

Sample Type: Water Total
Preparation: Aqua Regia
Type of Analysis: **ICP 32**

CERTIFICATE OF ANALYSIS : 040525C

Sample Name	ppb Ag	ppm Al	ppm As	ppm B	ppm Ba	ppb Be	ppm Bi	ppm Ca	ppb Cd	ppm Co	ppm Cr	ppm Cu	ppm Fe	ppm K	ppm La	ppm Mg	ppm Mn	ppm Mo	ppm Na	ppm Ni	ppm P	ppm Pb	ppm S	ppm Sb	ppm Se	ppm Sn	ppm Sr	ppm Ti	ppm Tl	ppm V	ppm W	ppm Zn
LOWER VAN CREEK #1 D	0.2	0.365	<0.003	<0.05	0.077	0.3	0.01	26.1	0.4	0.001	0.001	0.015	0.571	1.5	0.002	8.8	0.024	0.003	1.1	0.006	<0.01	0.004	8.1	<0.002	<0.005	<0.002	0.083	0.019	0.002	0.002	<0.03	0.036
LOWER VAN CREEK #2 D	<0.2	0.266	<0.003	0.06	0.072	0.3	0.02	25.7	<0.2	<0.001	<0.001	0.016	0.387	1.5	<0.001	8.6	0.023	0.004	0.5	0.003	<0.01	0.002	7.8	<0.002	<0.005	<0.002	0.080	0.013	<0.002	0.002	<0.03	0.036
LOWER VAN CREEK #3 D	<0.2	0.267	<0.003	<0.05	0.072	0.3	<0.01	25.4	<0.2	0.002	<0.001	0.027	0.374	1.5	<0.001	8.5	0.023	<0.001	1.0	0.003	<0.01	<0.002	7.8	0.003	<0.005	<0.002	0.076	0.012	<0.002	0.001	<0.03	0.035
PELLY RIVER D	0.4	0.153	<0.003	0.08	0.091	0.2	<0.01	26.4	<0.2	<0.001	0.001	0.021	0.328	1.1	0.002	7.9	0.029	0.003	0.7	0.002	<0.01	<0.002	7.9	<0.002	<0.005	<0.002	0.087	0.007	<0.002	0.001	<0.03	0.034
UPSTREAM VAN CREEK TOWN WELL #1 D	<0.2	0.017	0.003	0.09	0.082	0.3	<0.01	68.3	<0.2	0.002	0.007	0.023	0.044	1.3	0.001	25.7	0.011	0.003	3.2	<0.001	<0.01	<0.002	29.1	0.003	<0.005	<0.002	0.227	<0.001	<0.002	<0.001	<0.03	0.023
UPSTREAM VAN CREEK TOWN WELL #2 D	<0.2	0.025	<0.003	0.08	0.081	0.3	<0.01	68.2	<0.2	0.001	0.007	0.029	0.037	1.3	0.001	25.6	0.013	<0.001	3.2	<0.001	<0.01	<0.002	29.0	0.011	<0.005	<0.002	0.223	<0.001	<0.002	<0.001	<0.03	0.016
UPSTREAM VAN CREEK TOWN WELL #3 D	<0.2	0.032	<0.003	0.09	0.082	0.3	<0.01	70.3	<0.2	<0.001	0.004	0.026	0.038	1.4	0.002	25.9	0.012	0.002	3.3	<0.001	<0.01	<0.002	30.0	<0.002	<0.005	<0.002	0.224	<0.001	<0.002	<0.001	<0.03	0.017
LOWER VAN CREEK #1 T	<0.2	2.426	<0.003	0.08	0.096	0.3	<0.01	29.1	0.2	0.003	0.007	0.017	4.012	2.0	0.004	10.4	0.128	0.003	1.1	0.011	0.16	0.015	7.7	0.004	<0.005	0.005	0.089	0.075	<0.002	0.007	<0.03	0.046
LOWER VAN CREEK #2 T	<0.2	2.385	<0.003	0.09	0.096	0.3	<0.01	28.4	0.3	0.003	0.008	0.020	3.857	1.9	0.004	10.2	0.117	<0.001	1.0	0.010	0.14	0.004	7.6	<0.002	<0.005	<0.002	0.089	0.071	<0.002	0.007	<0.03	0.043
LOWER VAN CREEK #3 T	<0.2	2.367	<0.003	0.09	0.091	0.3	0.01	28.7	<0.2	0.004	0.007	0.021	3.879	1.9	0.004	10.2	0.120	<0.001	1.2	0.009	0.14	0.003	7.8	0.003	<0.005	<0.002	0.087	0.074	<0.002	0.007	<0.03	0.050
PELLY RIVER T	0.5	1.553	0.003	0.09	0.193	0.2	<0.01	30.0	0.6	0.003	0.003	0.019	4.351	1.4	0.002	9.2	0.253	0.002	1.2	0.010	0.25	<0.002	7.9	0.003	<0.005	<0.002	0.098	0.034	<0.002	0.008	<0.03	0.081
UPSTREAM VAN CREEK TOWN WELL #1 T	<0.2	0.018	<0.003	0.07	0.070	0.2	<0.01	66.6	<0.2	0.001	0.005	0.042	0.064	1.2	<0.001	24.4	0.011	0.003	2.6	0.002	<0.01	0.021	27.5	<0.002	<0.005	<0.002	0.210	<0.001	<0.002	<0.001	<0.03	0.046
UPSTREAM VAN CREEK TOWN WELL #2 T	0.6	0.024	<0.003	0.07	0.072	<0.2	<0.01	66.1	<0.2	<0.001	0.005	0.050	0.045	1.2	0.002	24.5	0.012	<0.001	2.6	<0.001	<0.01	0.020	27.9	0.008	<0.005	<0.002	0.216	<0.001	<0.002	<0.001	<0.03	0.042
UPSTREAM VAN CREEK TOWN WELL #3 T	<0.2	0.025	<0.003	0.07	0.071	<0.2	<0.01	64.9	<0.2	<0.001	0.004	0.051	0.043	1.2	0.002	24.4	0.011	0.003	2.7	<0.001	<0.01	0.005	27.1	<0.002	<0.005	0.004	0.212	<0.001	<0.002	<0.001	<0.03	0.032

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Attention: **Mr. Dana Haggar**
Project: **none given**

Samples: **6**
Date Received: **5/25/2004**
Date Out: **5/28/2004**

Certificate of Analysis: **040525C**

Sample Type: **Water Total**

Units	ug/ml	ug/ml	TCU	uS	ug/ml	ug/ml	ug/ml	-	ug/ml	ug/ml	N.T.U.
Sample Name	**Alkalinity**	**Cl-**	**Color**	**Conductivity**	**NH3-N**	**NO2**	**NO3**	**pH**	**TDS**	**TSS**	**Turbidity**
LOWER VAN CREEK #2 D	67	<1	7	168	<0.05	0.07	0.66	7.86	159	1	<5
LOWER VAN CREEK #2 D/Dup	66	<1	8	169	<0.05	0.05	0.89	7.87	n/a	n/a	<5
STD	128	5	10	1380	1.68	4.84	66.01	7.01	102	n/a	80
STD Certified	127	5	10	1412	1.70	4.94	66.45	7.00	100	n/a	80
STD Blank	n/a	<1	<5	<2	<0.05	<0.01	<0.01	n/a	<1	<1	<5
STD Detection	1	1	5	2	0.05	0.01	0.01	0.01	1	1	5

Alkalinity Method APHA 2310B
Cl- Method APHA 4500
Color Method APHA 2120
Conductivity Method APHA 2510B
NH3-N Method APHA 4500
NO2 Method APHA 4500
NO3 Method APHA 4500
pH Method APHA 4500B
TDS Method APHA 2540D
TSS Method APHA 2540B
Turbidity Method APHA 2130

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Project: **none given**

Samples: **7**
Date Received: **5/25/2004**
Date Out: **5/28/2004**

Certificate of Analysis: **040525C**

Sample Type: **Water Total**

Units	ug/ml	ug/ml	TCU	uS	ug/ml	ug/ml	ug/ml	-	ug/ml	ug/ml	N.T.U.
Sample Name	**Alkalinity**	**Cl-**	**Color**	**Conductivity**	**NH3-N**	**NO2**	**NO3**	**pH**	**TDS**	**TSS**	**Turbidity**
LOWER VAN CREEK #1 D	69	<1	8	164	<0.05	0.03	1.11	7.75	191	<1	<5
LOWER VAN CREEK #2 D	67	<1	7	168	<0.05	0.07	0.66	7.86	159	1	<5
LOWER VAN CREEK #3 D	65	<1	10	167	<0.05	0.03	0.44	7.77	140	1	<5
PELLY RIVER D	65	<1	10	167	<0.05	<0.01	0.66	7.78	200	3	<5
UPSTREAM VAN CREEK TOWN WELL #1 D	162	<1	<5	445	<0.05	<0.01	1.33	7.78	297	2	<5
UPSTREAM VAN CREEK TOWN WELL #2 D	163	<1	<5	460	<0.05	<0.01	1.11	7.79	293	2	<5
UPSTREAM VAN CREEK TOWN WELL #3 D	162	<1	<5	475	<0.05	0.03	0.89	7.81	311	1	<5

Alkalinity Method APHA 2310B
Cl- Method APHA 4500

Color Method APHA 2120
Conductivity Method APHA 2510B
NH3-N Method APHA 4500
NO2 Method APHA 4500
NO3 Method APHA 4500

pH Method APHA 4500B
TDS Method APHA 2540D
TSS Method APHA 2540B
Turbidity Method APHA 2130

ALS Environmental

CERTIFICATE OF ANALYSIS

Date:	October 27, 2004
ALS File No.	U9341
Report On:	Town of Faro Wells Water Analysis
Report To:	**Gartner Lee Ltd.** Sperling Plaza Suite 490, 6400 Roberts Street Burnaby, BC V5G 4C9
Attention:	**Mr. Don McCallum**
Received:	October 13, 2004

ALS ENVIRONMENTAL
per:

Brent C. Mack, B.Sc. - Client Services Coordinator
Natasha Markovic-Mirovic, B.Sc. - Project Chemist

ALS CANADA LTD.
1988 Triumph Street, Vancouver, BC Canada V5L 1K5
Phone: 604-253-4188 Fax: 604-253-6700 Website: www.alsenviro.com

File No. U9341

RESULTS OF ANALYSIS - Water

Sample ID			Town	OB-Z	OB-6	Pelly River	Vangorda Creek
Sample Date			04-10-07	04-10-07	04-10-07	04-10-07	04-10-07
Sample Time			16:00	16:00	16:00	16:00	16:00
ALS ID			*1*	*2*	*3*	*4*	*5*
Physical Tests							
Colour	(CU)		<5.0	36.6	<5.0	<5.0	<5.0
Conductivity	(uS/cm)		516	584	483	318	459
Total Dissolved Solids			327	392	304	187	283
Hardness	CaCO3		277	298	255	164	247
Total Suspended Solids			<3.0	808	7.0	<3.0	5.5
Turbidity	(NTU)		0.19	1450	10.9	2.03	1.95
Dissolved Anions							
Alkalinity-Total		CaCO3	168	170	152	111	156
Chloride	Cl		1.05	1.15	1.20	<0.50	1.41
Sulphate	SO4		112	142	107	55.2	89.0
Nutrients							
Nitrate Nitrogen		N	0.223	0.0650	0.124	<0.0050	0.235
Nitrite Nitrogen		N	<0.0010	0.0316	<0.0010	<0.0010	<0.0010

Results are expressed as milligrams per litre except where noted.
< = Less than the detection limit indicated.

File No. U9341

RESULTS OF ANALYSIS - Water

Sample ID			Town	OB-Z	OB-6	Pelly River	Vangorda Creek
Sample Date			04-10-07	04-10-07	04-10-07	04-10-07	04-10-07
Sample Time			16:00	16:00	16:00	16:00	16:00
ALS ID			*1*	*2*	*3*	*4*	*5*
Total Metals							
Aluminum	T-Al		<0.010	0.350	0.010	0.031	0.030
Antimony	T-Sb		<0.00050	0.0086	<0.00050	<0.00050	<0.00050
Arsenic	T-As		<0.0010	0.0054	<0.0010	<0.0010	<0.0010
Barium	T-Ba		0.096	0.124	0.090	0.076	0.066
Beryllium	T-Be		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Boron	T-B		<0.10	<0.10	<0.10	<0.10	<0.10
Cadmium	T-Cd		<0.000050	0.00297	<0.000050	0.000096	<0.000050
Calcium	T-Ca		67.9	76.8	62.9	41.8	59.7
Chromium	T-Cr		<0.00060	0.0145	<0.00050	<0.00050	<0.00050
Cobalt	T-Co		<0.00050	0.0054	<0.00050	<0.00050	<0.00050
Copper	T-Cu		0.0043	0.0357	0.0010	0.0011	0.0013
Iron	T-Fe		<0.030	174	0.900	0.133	0.102
Lead	T-Pb		0.0020	0.0324	<0.0010	<0.0010	<0.0010
Lithium	T-Li		<0.050	<0.050	<0.050	<0.050	<0.050
Magnesium	T-Mg		26.1	25.9	23.8	14.5	23.7
Manganese	T-Mn		<0.010	0.580	<0.010	0.011	0.019
Mercury	T-Hg		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Molybdenum	T-Mo		<0.0010	0.0024	<0.0010	0.0012	<0.0010
Nickel	T-Ni		<0.0050	0.028	<0.0050	<0.0050	<0.0050
Selenium	T-Se		0.0011	<0.0020	<0.0010	<0.0010	<0.0010
Silver	T-Ag		<0.000050	<0.00010	<0.000050	<0.000050	<0.000050
Sodium	T-Na		3.4	3.3	3.2	<2.0	3.3
Thallium	T-Tl		<0.00020	<0.00040	<0.00020	<0.00020	<0.00020
Titanium	T-Ti		<0.050	<0.050	<0.050	<0.050	<0.050
Uranium	T-U		0.00373	0.00568	0.00373	0.00151	0.00394
Vanadium	T-V		<0.030	<0.030	<0.030	<0.030	<0.030
Zinc	T-Zn		0.0096	0.0972	<0.0050	0.0096	0.0118
Organic Parameters							
Total Organic Carbon		C	1.03	19.2	1.46	2.46	3.27

Results are expressed as milligrams per litre except where noted.
< = Less than the detection limit indicated.

File No. U9341

RESULTS OF ANALYSIS - Water

Sample ID			Vangorda -Z
Sample Date			04-10-07
Sample Time			16:00
ALS ID			*6*
Physical Tests			
Colour	(CU)		<5.0
Conductivity	(uS/cm)		463
Total Dissolved Solids			290
Hardness	CaCO3		245
Total Suspended Solids			3.5
Turbidity	(NTU)		1.54
Dissolved Anions			
Alkalinity-Total		CaCO3	156
Chloride	Cl		1.40
Sulphate	SO4		88.6
Nutrients			
Nitrate Nitrogen		N	0.133
Nitrite Nitrogen		N	<0.0010

Results are expressed as milligrams per litre except where noted.
< = Less than the detection limit indicated.

File No. U9341

RESULTS OF ANALYSIS - Water

Sample ID			Vangorda -Z
Sample Date			04-10-07
Sample Time			16:00
ALS ID			*6*
Total Metals			
Aluminum	T-Al		0.024
Antimony	T-Sb		<0.00050
Arsenic	T-As		<0.0010
Barium	T-Ba		0.061
Beryllium	T-Be		<0.0050
Boron	T-B		<0.10
Cadmium	T-Cd		0.000051
Calcium	T-Ca		59.3
Chromium	T-Cr		<0.00050
Cobalt	T-Co		<0.00050
Copper	T-Cu		0.0012
Iron	T-Fe		0.081
Lead	T-Pb		<0.0010
Lithium	T-Li		<0.050
Magnesium	T-Mg		23.7
Manganese	T-Mn		0.018
Mercury	T-Hg		<0.00020
Molybdenum	T-Mo		<0.0010
Nickel	T-Ni		<0.0050
Selenium	T-Se		<0.0010
Silver	T-Ag		<0.000050
Sodium	T-Na		3.4
Thallium	T-Tl		<0.00020
Titanium	T-Ti		<0.050
Uranium	T-U		0.00396
Vanadium	T-V		<0.030
Zinc	T-Zn		0.0107
Organic Parameters			
Total Organic Carbon		C	3.23

Results are expressed as milligrams per litre except where noted.
< = Less than the detection limit indicated.

File No. U9341

Appendix 1 - QUALITY CONTROL - Replicates

Water			OB-6	OB-6
			04-10-07 16:00	QC # 411465
Physical Tests				
Colour	(CU)		<5.0	<5.0
Conductivity	(uS/cm)		483	484
Hardness	CaCO3		255	254
Turbidity	(NTU)		10.9	11.1
Dissolved Anions				
Alkalinity-Total		CaCO3	152	152
Chloride	Cl		1.20	1.20
Sulphate	SO4		107	108
Nutrients				
Nitrate Nitrogen		N	0.124	0.128
Nitrite Nitrogen		N	<0.0010	<0.0010

Results are expressed as milligrams per litre except where noted.
< = Less than the detection limit indicated.

File No. U9341

Appendix 1 - QUALITY CONTROL - Replicates

Water			OB-6	OB-6
			04-10-07 16:00	QC # 411465
Total Metals				
Aluminum	T-Al		0.010	0.010
Antimony	T-Sb		<0.00050	<0.00050
Arsenic	T-As		<0.0010	<0.0010
Barium	T-Ba		0.090	0.090
Beryllium	T-Be		<0.0050	<0.0050
Boron	T-B		<0.10	<0.10
Cadmium	T-Cd		<0.000050	<0.000050
Calcium	T-Ca		62.9	62.8
Chromium	T-Cr		<0.00050	<0.00050
Cobalt	T-Co		<0.00050	<0.00050
Copper	T-Cu		0.0010	<0.0010
Iron	T-Fe		0.900	0.830
Lead	T-Pb		<0.0010	<0.0010
Lithium	T-Li		<0.050	<0.050
Magnesium	T-Mg		23.8	23.6
Manganese	T-Mn		<0.010	<0.010
Mercury	T-Hg		<0.00020	<0.00020
Molybdenum	T-Mo		<0.0010	<0.0010
Nickel	T-Ni		<0.0050	<0.0050
Selenium	T-Se		<0.0010	<0.0010
Silver	T-Ag		<0.000050	<0.000050
Sodium	T-Na		3.2	3.1
Thallium	T-Tl		<0.00020	<0.00020
Titanium	T-Ti		<0.050	<0.050
Uranium	T-U		0.00373	0.00368
Vanadium	T-V		<0.030	<0.030
Zinc	T-Zn		<0.0050	<0.0050
Organic Parameters				
Total Organic Carbon		C	1.46	1.35

Results are expressed as milligrams per litre except where noted.
< = Less than the detection limit indicated.

Appendix 2 - METHODOLOGY

Outlines of the methodologies utilized for the analysis of the samples submitted are as follows

Colour in Water

This analysis is carried out using procedures adapted from APHA Method 2120 "Color". Colour (true colour) is determined by filtering a sample through a 0.45 micron membrane filter followed by analysis of the filtrate using the platinum-cobalt colourimetric method. The analysis is carried out without pH adjustment.

Recommended Holding Time:
Sample: 2 days
Reference: APHA

Laboratory Location: ALS Environmental, Vancouver

Conductivity in Water

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

Recommended Holding Time:
Sample: 28 days
Reference: APHA

Laboratory Location: ALS Environmental, Vancouver

Solids in Water

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total dissolved solids (TDS) and total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius, TSS is determined by drying the filter at 104 degrees celsius. Total solids are determined by evaporating a sample to dryness at 104 degrees celsius. Fixed and volatile solids are determined by igniting a dried sample residue at 550 degrees celsius.

Recommended Holding Time:
Sample: 7 days
Reference: APHA

Laboratory Location: ALS Environmental, Vancouver

Turbidity of Water

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

Recommended Holding Time:
Sample: 2 days
Reference: APHA

Laboratory Location: ALS Environmental, Vancouver

Alkalinity in Water by Colourimetry

This analysis is carried out using procedures adapted from EPA Method 310.2 "Alkalinity". Total Alkalinity is determined using the methyl orange colourimetric method.

Recommended Holding Time:
Sample: 14 days
Reference: APHA

Laboratory Location: ALS Environmental, Vancouver

Dissolved Anions in Water by Ion Chromatography

This analysis is carried out using procedures adapted from APHA Method 4110 "Determination of Anions by Ion Chromatography" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Anions are determined by filtering the sample through a 0.45 micron membrane filter and injecting the filtrate onto a Dionex IonPac AG17 anion exchange column with a hydroxide eluent stream. Anions routinely determined by this method include: bromide, chloride, fluoride, nitrate, nitrite and sulphate.

Recommended Holding Time:
Sample: 28 days (bromide, chloride, fluoride, sulphate)
Sample: 2 days (nitrate, nitrite)
Reference: APHA and EPA

Laboratory Location: ALS Environmental, Vancouver

Metals in Water

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" 20th Edition 1998 published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotplate or microwave oven, or filtration (EPA Method 3005A). Instrumental analysis is by atomic absorption/emission spectrophotometry (EPA Method 7000 series), inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B), and/or inductively coupled plasma - mass spectrometry (EPA Method 6020).

Recommended Holding Time:
Sample: 6 months

Reference: EPA

Laboratory Location: ALS Environmental, Vancouver

Mercury in Water

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" 20th Edition 1998 published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedure involves a cold-oxidation of the acidified sample using bromine monochloride prior to reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry (EPA Method 245.7).

Recommended Holding Time:
Sample: 28 days
Reference: EPA

Laboratory Location: ALS Environmental, Vancouver

Carbon in Water

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". All fractions of carbon are determined by the combustion-infrared method. Total carbon includes organic carbon (covalently bonded in organic molecules) and inorganic carbon (carbonate, bicarbonate and dissolved carbon dioxide). Total organic carbon is the calculated difference between the total carbon and the inorganic carbon determination. Dissolved carbon fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

Recommended Holding Time:
Sample: 28 days
Reference: APHA

Laboratory Location: ALS Environmental, Vancouver

Results contained within this certificate relate only to the samples as submitted.

End of Report

ALS Environmental

CHEMICAL ANALYSIS REPORT

Date:	April 20, 2005
ALS File No.	V6818
Report On:	50294 Water Analysis
Report To:	**Gartner Lee Ltd.** 2251 2nd Ave Whitehorse, YT Y1A 5W1
Attention:	**Mr. Jonathan Kerr**
Received:	April 7, 2005

ALS ENVIRONMENTAL
per:

Brent C. Mack, B.Sc. - Section Coordinator
Natasha Markovic-Mirovic, B.Sc. - Project Chemist

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File No. V6818

RESULTS OF ANALYSIS - Water

Sample ID			Vangorda Creek	Pelly River	OB6	OB2	Pump House S1
Sample Date			05-04-05	05-04-05	05-04-05	05-04-05	05-04-05
ALS ID			*1*	*2*	*3*	*4*	*5*
Physical Tests							
Colour	(CU)		<5.0	<5.0	<5.0	<5.0	<5.0
Conductivity	(uS/cm)		728	398	640	610	584
Total Dissolved Solids			495	241	417	386	378
Hardness	CaCO3		360	196	308	268	290
pH			8.23	8.28	8.27	7.81	8.25
Turbidity	(NTU)		0.68	0.76	12.0	>4000	0.49
Dissolved Anions							
Alkalinity-Total		CaCO3	258	163	212	213	208
Chloride	Cl		2.02	<0.50	1.83	1.40	1.44
Fluoride	F		0.185	0.106	0.122	0.165	0.118
Sulphate	SO4		167	61.6	144	132	119
Nutrients							
Nitrate Nitrogen		N	0.425	0.0271	0.353	0.0066	0.349
Nitrite Nitrogen		N	0.0010	<0.0010	<0.0010	0.0037	<0.0010
Total Metals							
Aluminum	T-Al		-	-	-	-	<0.010
Antimony	T-Sb		-	-	-	-	<0.00050
Arsenic	T-As		-	-	-	-	0.00020
Barium	T-Ba		-	-	-	-	0.082
Boron	T-B		-	-	-	-	<0.10
Cadmium	T-Cd		-	-	-	-	<0.00020
Calcium	T-Ca		-	-	-	-	71.3
Chromium	T-Cr		-	-	-	-	<0.0020
Copper	T-Cu		-	-	-	-	0.0019
Iron	T-Fe		-	-	-	-	<0.030
Lead	T-Pb		-	-	-	-	<0.0010
Magnesium	T-Mg		-	-	-	-	26.2
Manganese	T-Mn		-	-	-	-	<0.0020
Mercury	T-Hg		-	-	-	-	<0.00020
Potassium	T-K		-	-	-	-	1.08
Selenium	T-Se		-	-	-	-	0.0014
Sodium	T-Na		-	-	-	-	3.8
Uranium	T-U		-	-	-	-	0.00560
Zinc	T-Zn		-	-	-	-	<0.050

Results are expressed as milligrams per litre except where noted.
< = Less than the detection limit indicated.

File No. V6818

RESULTS OF ANALYSIS - Water

Sample ID		Vangorda Creek	Pelly River	OB6	OB2	Pump House S1
Sample Date		05-04-05	05-04-05	05-04-05	05-04-05	05-04-05
ALS ID		*1*	*2*	*3*	*4*	*5*
Dissolved Metals						
Aluminum	D-Al	<0.010	<0.010	<0.010	<0.010	<0.010
Antimony	D-Sb	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Arsenic	D-As	0.00051	0.00039	0.00018	0.00020	0.00020
Barium	D-Ba	0.065	0.070	0.082	0.056	0.082
Boron	D-B	<0.10	<0.10	<0.10	<0.10	<0.10
Cadmium	D-Cd	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Calcium	D-Ca	85.9	53.5	76.6	67.2	72.4
Chromium	D-Cr	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Copper	D-Cu	<0.0010	<0.0010	<0.0010	<0.0010	0.0028
Iron	D-Fe	0.034	0.037	<0.030	1.15	<0.030
Lead	D-Pb	<0.0010	<0.0010	<0.0010	<0.0010	0.0014
Magnesium	D-Mg	35.3	15.0	28.2	24.2	26.6
Manganese	D-Mn	0.0342	0.0170	<0.0020	0.160	<0.0020
Mercury	D-Hg	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Potassium	D-K	1.32	0.80	1.04	0.86	1.09
Selenium	D-Se	0.0014	0.0026	0.0012	0.0017	0.0014
Sodium	D-Na	5.3	2.2	4.2	3.3	3.7
Uranium	D-U	0.00926	0.00154	0.00743	0.00387	0.00568
Zinc	D-Zn	<0.050	<0.050	<0.050	0.067	<0.050

Results are expressed as milligrams per litre except where noted.
< = Less than the detection limit indicated.

File No. V6818

RESULTS OF ANALYSIS - Water

Sample ID			Pump House S2
Sample Date			05-04-05
ALS ID			*6*
Physical Tests			
Colour	(CU)		<5.0
Conductivity	(uS/cm)		584
Total Dissolved Solids			376
Hardness	CaCO3		293
pH			8.29
Turbidity	(NTU)		0.46
Dissolved Anions			
Alkalinity-Total		CaCO3	205
Chloride	Cl		1.45
Fluoride	F		0.126
Sulphate	SO4		120
Nutrients			
Nitrate Nitrogen		N	0.35
Nitrite Nitrogen		N	<0.10
Total Metals			
Aluminum	T-Al		<0.010
Antimony	T-Sb		<0.00050
Arsenic	T-As		0.00020
Barium	T-Ba		0.084
Boron	T-B		<0.10
Cadmium	T-Cd		<0.00020
Calcium	T-Ca		72.8
Chromium	T-Cr		<0.0020
Copper	T-Cu		0.0018
Iron	T-Fe		<0.030
Lead	T-Pb		<0.0010
Magnesium	T-Mg		27.1
Manganese	T-Mn		<0.0020
Mercury	T-Hg		<0.00020
Potassium	T-K		1.10
Selenium	T-Se		0.0013
Sodium	T-Na		3.7
Uranium	T-U		0.00572
Zinc	T-Zn		<0.050

Results are expressed as milligrams per litre except where noted.
< = Less than the detection limit indicated.

File No. V6818

Appendix 1 - REGULATORY CRITERIA

Health Canada

Summary of Guidelines for Canadian Drinking Water Quality, April 2003. Please see the guidelines for further details.
All limits are Maximum Acceptable Concentration (MAC) unless otherwise indicated. Limits are expressed as mg/L except for pH, Turbidity, Colour and Bacteriolgical Tests.

			Lower Limit	Upper Limit		Notes
Physical Tests						
Colour	(CU)		-	15	CU	1
Total Dissolved Solids			-	500	mg/L	1
pH			6.5	8.5		1
Turbidity	(NTU)		-	5	NTU	1, 2
Dissolved Anions						
Chloride	Cl		-	250	mg/L	1
Fluoride	F		-	1.5	mg/L	
Sulphate	SO4		-	500	mg/L	1, 3
Nutrients						
Nitrate Nitrogen		N	-	10	mg/L	
Nitrite Nitrogen		N	-	1	mg/L	
Total Metals						
Antimony	T-Sb		-	0.006	mg/L	4, 5
Arsenic	T-As		-	0.025	mg/L	4
Barium	T-Ba		-	1	mg/L	
Boron	T-B		-	5	mg/L	4
Cadmium	T-Cd		-	0.005	mg/L	
Chromium	T-Cr		-	0.05	mg/L	
Copper	T-Cu		-	1	mg/L	1, 6
Iron	T-Fe		-	0.3	mg/L	1
Lead	T-Pb		-	0.01	mg/L	6, 5
Manganese	T-Mn		-	0.05	mg/L	1
Mercury	T-Hg		-	0.001	mg/L	
Selenium	T-Se		-	0.01	mg/L	
Sodium	T-Na		-	200	mg/L	1
Uranium	T-U		-	0.02	mg/L	4
Zinc	T-Zn		-	5	mg/L	1, 6

1 Aesthetic Objective (AO) (taste, odour, appearance, etc.)
2 1 NTU maximum allowed for water entering distribution systems.
3 There may be a laxative effect in some individuals when sulphate levels exceed 500 mg/L.
4 Interim Maximum Acceptable Concentration (IMAC)
5 First drawn water may be high, flush system before sampling.
6 At point of consumption.

File No. V6818

Appendix 1 - REGULATORY CRITERIA

Health Canada

Summary of Guidelines for Canadian Drinking Water Quality, April 2003. Please see the guidelines for further details.
All limits are Maximum Acceptable Concentration (MAC) unless otherwise indicated. Limits are expressed as mg/L except for pH, Turbidity, Colour and Bacteriolgical Tests.

		Lower Limit	Upper Limit		Notes
Dissolved Metals					
Antimony	D-Sb	-	0.006	mg/L	1, 2
Arsenic	D-As	-	0.025	mg/L	1
Barium	D-Ba	-	1	mg/L	
Boron	D-B	-	5	mg/L	1
Cadmium	D-Cd	-	0.005	mg/L	
Chromium	D-Cr	-	0.05	mg/L	
Copper	D-Cu	-	1	mg/L	3, 4
Iron	D-Fe	-	0.3	mg/L	3
Lead	D-Pb	-	0.01	mg/L	4, 2
Manganese	D-Mn	-	0.05	mg/L	3
Mercury	D-Hg	-	0.001	mg/L	
Selenium	D-Se	-	0.01	mg/L	
Sodium	D-Na	-	200	mg/L	3
Uranium	D-U	-	0.02	mg/L	1
Zinc	D-Zn	-	5	mg/L	3, 4

1 Interim Maximum Acceptable Concentration (IMAC)
2 First drawn water may be high, flush system before sampling.
3 Aesthetic Objective (AO) (taste, odour, appearance, etc.)
4 At point of consumption.

File No. V6818

Appendix 2 - QUALITY CONTROL - Replicates

Water			OB6	OB6
			05-04-05	QC # 436154
Physical Tests				
Colour	(CU)		<5.0	<5.0
Conductivity	(uS/cm)		640	637
Hardness	CaCO3		308	312
pH			8.27	8.27
Turbidity	(NTU)		12.0	12.0
Dissolved Anions				
Alkalinity-Total		CaCO3	212	218
Chloride	Cl		1.83	1.82
Fluoride	F		0.122	0.120
Sulphate	SO4		144	143
Nutrients				
Nitrate Nitrogen		N	0.353	0.358
Nitrite Nitrogen		N	<0.0010	<0.0010

Results are expressed as milligrams per litre except where noted.
< = Less than the detection limit indicated.

File No. V6818

Appendix 2 - QUALITY CONTROL - Replicates

Water		OB6	OB6
		05-04-05	QC # 436154
Dissolved Metals			
Aluminum	D-Al	<0.010	<0.010
Antimony	D-Sb	<0.00050	<0.00050
Arsenic	D-As	0.00018	0.00018
Barium	D-Ba	0.082	0.083
Boron	D-B	<0.10	<0.10
Cadmium	D-Cd	<0.00020	<0.00020
Calcium	D-Ca	76.6	77.6
Chromium	D-Cr	<0.0020	<0.0020
Copper	D-Cu	<0.0010	<0.0010
Iron	D-Fe	<0.030	<0.030
Lead	D-Pb	<0.0010	<0.0010
Magnesium	D-Mg	28.2	28.7
Manganese	D-Mn	<0.0020	<0.0020
Mercury	D-Hg	<0.00020	<0.00020
Potassium	D-K	1.04	1.04
Selenium	D-Se	0.0012	0.0014
Sodium	D-Na	4.2	4.2
Uranium	D-U	0.00743	0.00737
Zinc	D-Zn	<0.050	<0.050

Results are expressed as milligrams per litre except where noted.
< = Less than the detection limit indicated.

Appendix 3 - METHODOLOGY

Outlines of the methodologies utilized for the analysis of the samples submitted are as follows

Colour in Water

This analysis is carried out using procedures adapted from APHA Method 2120 "Color". Colour (true colour) is determined by filtering a sample through a 0.45 micron membrane filter followed by analysis of the filtrate using the platinum-cobalt colourimetric method. The analysis is carried out without pH adjustment.

Recommended Holding Time:
Sample: 2 days
Reference: APHA
For more detail see ALS Environmental "Collection & Sampling Guide"

Conductivity in Water

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

Recommended Holding Time:
Sample: 28 days
Reference: APHA
For more detail see ALS Environmental "Collection & Sampling Guide"

Solids in Water

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total dissolved solids (TDS) and total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius, TSS is determined by drying the filter at 104 degrees celsius. Total solids are determined by evaporating a sample to dryness at 104 degrees celsius. Fixed and volatile solids are determined by igniting a dried sample residue at 550 degrees celsius.

Recommended Holding Time:
Sample: 7 days
Reference: APHA
For more detail see ALS Environmental "Collection & Sampling Guide"

Conventional Parameters in Water

These analyses are carried out in accordance with procedures described in "Methods for Chemical Analysis of Water and Wastes" (USEPA), "Manual for the Chemical Analysis of Water, Wastewaters, Sediments and Biological Tissues" (BCMOE), and/or "Standard Methods for the Examination of Water and Wastewater" (APHA). Further details are available on request.

pH in Water

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode.

Recommended Holding Time:
Sample: 2 hours
Reference: APHA
For more detail see ALS Environmental "Collection & Sampling Guide"

Turbidity of Water

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

Recommended Holding Time:
Sample: 2 days
Reference: APHA
For more detail see ALS Environmental "Collection & Sampling Guide"

Alkalinity in Water by Colourimetry

This analysis is carried out using procedures adapted from EPA Method 310.2 "Alkalinity". Total Alkalinity is determined using the methyl orange colourimetric method.

Recommended Holding Time:
Sample: 14 days
Reference: APHA
For more detail see ALS Environmental "Collection & Sampling Guide"

Dissolved Anions in Water by Ion Chromatography

This analysis is carried out using procedures adapted from APHA Method 4110 "Determination of Anions by Ion Chromatography" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Anions are determined by filtering the sample through a 0.45 micron membrane filter and injecting the filtrate onto a Dionex IonPac AG17 anion exchange column with a hydroxide eluent stream. Anions routinely determined by this method include: bromide, chloride, fluoride, nitrate, nitrite and sulphate.

Recommended Holding Time:
Sample: 28 days (bromide, chloride, fluoride, sulphate)
Sample: 2 days (nitrate, nitrite)
Reference: APHA and EPA
For more detail see ALS Environmental "Collection & Sampling Guide"

Metals in Water

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" 20th Edition 1998 published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotplate or microwave oven, or filtration (EPA Method 3005A). Instrumental analysis is by atomic absorption/emission spectrophotometry (EPA Method 7000 series), inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B), and/or inductively coupled plasma - mass spectrometry (EPA Method 6020).

Recommended Holding Time:

Sample:	6 months
Reference:	EPA
For more detail see:	ALS "Collection & Sampling Guide"

Mercury in Water

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" 20th Edition 1998 published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedure involves a cold-oxidation of the acidified sample using bromine monochloride prior to reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry (EPA Method 245.7).

Recommended Holding Time:

Sample:	28 days
Reference:	EPA

For more detail see ALS Environmental "Collection & Sampling Guide"

Alkalinity in Water by Titration

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

Recommended Holding Time:

Sample: 14 days
Reference: APHA
For more detail see ALS Environmental "Collection & Sampling Guide"

Results contained within this report relate only to the samples as submitted.

This Chemical Analysis Report shall only be reproduced in full, except with the written approval of ALS Environmental.

End of Report

CHAIN OF CUSTODY / ANALYTICAL REQUEST FORM

CLIENT: GARTNER LEE LTD
ADDRESS: 2251 2nd Ave
CITY: Whitehorse PROV.: YT POSTAL CODE: Y1A 5W4
CONTACT: Jonathan Kerr SAMPLER: JK + EM
TELEPHONE: 867 633 6474 FAX: 867 633 6321
PROJECT NAME/NO.: 50294 Town of Faro
P.O. NO.: 50294 QUOTE NO.:
DATE SUBMITTED: April 6 2005 ALS CONTACT: Brent Mack

ALS Environmental

1988 Triumph Street
Vancouver, BC Canada V5L 1K5
TEL: 604-253-4188, 1-800-665-0243
FAX: 604-253-6700

#2 - 21 Highfield Circle SE
Calgary, AB Canada T2G 5N8
TEL: 403-214-5431, 1-888-722-8231
FAX: 403-214-5430

www.alsenviro.com

ANALYSIS REQUESTED

FOR LAB USE ONLY

LAB USE ONLY	SAMPLE IDENTIFICATION	DATE / TIME COLLECTED (Y M D)	MATRIX	dissolved metals (field filtered + acidified)	total metals (acidified)	gen chem + DOC	Drinking H2O Package	NOTES
V6818	VANGORDA CREEK	05 04 05 ___:___ AM/PM	WATER	X		X		
	PELLY RIVER	___:___ AM/PM		X		X		
	OB6	___:___ AM/PM		X		X		
	OB2	___:___ AM/PM		X		X		
	PUMP HOUSE S1	___:___ AM/PM		X	X	X		
	PUMP HOUSE S2	___:___ AM/PM		X	X	X		

TURN AROUND REQUIRED:

☐ ROUTINE (7 - 10 WORKING DAYS)

☐ RUSH (SPECIFY DATE): _____ (SURCHARGES MAY APPLY)

SPECIAL INSTRUCTIONS (BILLING DETAILS, QC REPORTING, ETC.):

*please run Canadian Drinking Water Quality Guidelines package

RELINQUISHED BY:	DATE	RECEIVED BY:	DATE
	TIME		TIME
RELINQUISHED BY:	DATE	RECEIVED BY:	DATE
	TIME		TIME

FOR LAB USE ONLY

COOLER SEAL INTACT UPON RECEIPT? ☐ YES ☐ NO ☐ N/A

SAMPLE TEMPERATURE UPON RECEIPT: ____°C

FROZEN? ☐ YES ☐ NO

ALS COPY

SEE WHITE PAPER SOURCE VI

TSI

ALS Environmental

CHEMICAL ANALYSIS REPORT

Faro Water Wells.

Date:	July 7, 2005
ALS File No.	V9595
Report On:	50564 Water Analysis
Report To:	**Gartner Lee Ltd.** 2251 2nd Ave Whitehorse, YT Y1A 5W1
Attention:	**Mr. Jonathan Kerr**
Received:	June 21, 2005

ALS ENVIRONMENTAL
per:

Brent C. Mack, B.Sc. - Section Coordinator
Natasha Markovic-Mirovic, B.Sc. - Project Chemist

ALS CANADA LTD.
1988 Triumph Street, Vancouver, BC Canada V5L 1K5
Phone: 604-253-4188 Fax: 604-253-6700 Website: www.alsenviro.com

File No. V9595

RESULTS OF ANALYSIS - Water

Sample ID			PUMP HOUSE	OB2	OB6	PRWLSI -04	VCSGI
Sample Date			05-06-17	05-06-17	05-06-17	05-06-17	05-06-17
Sample Time			08:50	09:15	11:45	09:55	13:00
ALS ID			*1*	*2*	*3*	*4*	*5*
Physical Tests							
Colour	(CU)		<5.0	<5.0	<5.0	9.1	9.7
Conductivity	(uS/cm)		449	387	287	229	357
Total Dissolved Solids			700	248	186	151	246
Hardness	CaCO3		223	202	137	108	169
pH			7.98	8.02	7.86	7.61	8.13
Turbidity	(NTU)		0.24	77.2	7.87	25.4	1.95
Dissolved Anions							
Alkalinity-Total		CaCO3	166	163	106	82.7	95.3
Chloride	Cl		0.86	<0.50	<10	<10	0.52
Fluoride	F		0.109	0.126	<0.40	<0.40	0.091
Sulphate	SO4		85.5	54.3	47	36	100
Nutrients							
Nitrate Nitrogen		N	0.31	0.109	<0.10	<0.10	0.134
Nitrite Nitrogen		N	<0.10	<0.0010	<0.020	<0.020	<0.0010

Results are expressed as milligrams per litre except for pH, Colour (CU), Conductivity (umhos/cm), and Turbidity (NTU).
< = Less than the detection limit indicated.
Results are expressed as milligrams per litre except where noted.
Results are expressed as milligrams per litre except for pH, Conductivity (umhos/cm), Turbidity (NTU), and Colour (CU).

File No. V9595

RESULTS OF ANALYSIS - Water

Sample ID		PUMP HOUSE
Sample Date		05-06-17
Sample Time		08:50
ALS ID		*1*
Total Metals		
Aluminum	T-Al	<0.010
Antimony	T-Sb	<0.00050
Arsenic	T-As	0.00015
Barium	T-Ba	0.063
Boron	T-B	<0.10
Cadmium	T-Cd	<0.00020
Calcium	T-Ca	52.9
Chromium	T-Cr	<0.0020
Copper	T-Cu	<0.0010
Iron	T-Fe	<0.030
Lead	T-Pb	<0.0010
Magnesium	T-Mg	19.8
Manganese	T-Mn	<0.0020
Mercury	T-Hg	<0.00020
Potassium	T-K	0.90
Selenium	T-Se	<0.0010
Sodium	T-Na	3.2
Uranium	T-U	0.00389
Zinc	T-Zn	<0.050

Results are expressed as milligrams per litre except for pH, Colour (CU), Conductivity (umhos/cm), and Turbidity (NTU).
< = Less than the detection limit indicated.
Results are expressed as milligrams per litre except where noted.
Results are expressed as milligrams per litre except for pH, Conductivity (umhos/cm), Turbidity (NTU), and Colour (CU).

File No. V9595

RESULTS OF ANALYSIS - Water

Sample ID		PUMP HOUSE	OB2	OB6	PRWLSI -04	VCSGI
Sample Date		05-06-17	05-06-17	05-06-17	05-06-17	05-06-17
Sample Time		08:50	09:15	11:45	09:55	13:00
ALS ID		*1*	*2*	*3*	*4*	*5*
Dissolved Metals						
Aluminum	D-Al	<0.010	<0.010	<0.010	0.043	0.015
Antimony	D-Sb	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Arsenic	D-As	0.00016	<0.00010	0.00040	0.00058	0.00041
Barium	D-Ba	0.065	0.049	0.040	0.051	0.042
Boron	D-B	<0.10	<0.10	<0.10	<0.10	<0.10
Cadmium	D-Cd	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Calcium	D-Ca	55.3	50.9	34.0	28.6	44.9
Chromium	D-Cr	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Copper	D-Cu	<0.0010	<0.0010	<0.0010	0.0012	<0.0010
Iron	D-Fe	<0.030	0.777	0.686	0.060	<0.030
Lead	D-Pb	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium	D-Mg	20.6	18.1	12.7	8.98	13.7
Manganese	D-Mn	<0.0020	0.0291	0.0487	0.0088	0.0237
Mercury	D-Hg	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Potassium	D-K	0.94	0.75	0.78	0.55	0.73
Selenium	D-Se	<0.0010	0.0013	<0.0010	<0.0010	<0.0010
Sodium	D-Na	3.3	2.8	2.2	<2.0	2.4
Uranium	D-U	0.00387	0.00351	0.00212	0.00096	0.00200
Zinc	D-Zn	<0.050	<0.050	<0.050	<0.050	<0.050

Results are expressed as milligrams per litre except for pH, Colour (CU), Conductivity (umhos/cm), and Turbidity (NTU).
< = Less than the detection limit indicated.
Results are expressed as milligrams per litre except where noted.
Results are expressed as milligrams per litre except for pH, Conductivity (umhos/cm), Turbidity (NTU), and Colour (CU).

File No. V9595

RESULTS OF ANALYSIS - Water

Sample ID			VCSGI-D
Sample Date			05-06-17
Sample Time			13:00
ALS ID			*6*
Physical Tests			
Colour	(CU)		9.7
Conductivity	(uS/cm)		359
Total Dissolved Solids			238
Hardness	CaCO3		171
pH			8.14
Turbidity	(NTU)		1.98
Dissolved Anions			
Alkalinity-Total		CaCO3	93.5
Chloride	Cl		<0.50
Fluoride	F		0.091
Sulphate	SO4		98.2
Nutrients			
Nitrate Nitrogen		N	0.132
Nitrite Nitrogen		N	<0.0010

Results are expressed as milligrams per litre except for pH, Colour (CU), Conductivity (umhos/cm), and Turbidity (NTU).
< = Less than the detection limit indicated.
Results are expressed as milligrams per litre except where noted.
Results are expressed as milligrams per litre except for pH, Conductivity (umhos/cm), Turbidity (NTU), and Colour (CU).

File No. V9595

RESULTS OF ANALYSIS - Water

Sample ID		VCSGI-D
Sample Date		05-06-17
Sample Time		13:00
ALS ID		*6*
Dissolved Metals		
Aluminum	D-Al	0.014
Antimony	D-Sb	<0.00050
Arsenic	D-As	0.00042
Barium	D-Ba	0.044
Boron	D-B	<0.10
Cadmium	D-Cd	<0.00020
Calcium	D-Ca	45.6
Chromium	D-Cr	<0.0020
Copper	D-Cu	0.0011
Iron	D-Fe	<0.030
Lead	D-Pb	<0.0010
Magnesium	D-Mg	13.8
Manganese	D-Mn	0.0239
Mercury	D-Hg	<0.00020
Potassium	D-K	0.74
Selenium	D-Se	<0.0010
Sodium	D-Na	2.3
Uranium	D-U	0.00202
Zinc	D-Zn	<0.050

Results are expressed as milligrams per litre except for pH, Colour (CU), Conductivity (umhos/cm), and Turbidity (NTU).
< = Less than the detection limit indicated.
Results are expressed as milligrams per litre except where noted.
Results are expressed as milligrams per litre except for pH, Conductivity (umhos/cm), Turbidity (NTU), and Colour (CU).

File No. V9595

Appendix 1 - QUALITY CONTROL - Replicates

Water			PUMP HOUSE 05-06-17 08:50	PUMP HOUSE QC # 447420
Physical Tests				
Colour	(CU)		<5.0	<5.0
Conductivity	(uS/cm)		449	450
Hardness	CaCO3		223	228
pH			7.98	8.06
Turbidity	(NTU)		0.24	0.23
Dissolved Anions				
Alkalinity-Total		CaCO3	166	168
Total Metals				
Aluminum	T-Al		<0.010	<0.010
Antimony	T-Sb		<0.00050	<0.00050
Arsenic	T-As		0.00015	0.00017
Barium	T-Ba		0.063	0.067
Boron	T-B		<0.10	<0.10
Cadmium	T-Cd		<0.00020	<0.00020
Calcium	T-Ca		52.9	57.6
Chromium	T-Cr		<0.0020	<0.0020
Copper	T-Cu		<0.0010	0.0010
Iron	T-Fe		<0.030	<0.030
Lead	T-Pb		<0.0010	<0.0010
Magnesium	T-Mg		19.8	20.9
Manganese	T-Mn		<0.0020	<0.0020
Mercury	T-Hg		<0.00020	<0.00020
Potassium	T-K		0.90	0.98
Selenium	T-Se		<0.0010	<0.0010
Sodium	T-Na		3.2	3.1
Uranium	T-U		0.00389	0.00405
Zinc	T-Zn		<0.050	<0.050

Results are expressed as milligrams per litre except for pH, Colour (CU), Conductivity (umhos/cm), and Turbidity (NTU).
< = Less than the detection limit indicated.
Results are expressed as milligrams per litre except where noted.
Results are expressed as milligrams per litre except for pH, Conductivity (umhos/cm), Turbidity (NTU), and Colour (CU).

File No. V9595

Appendix 1 - QUALITY CONTROL - Replicates

Water		PUMP HOUSE 05-06-17 08:50	PUMP HOUSE QC # 447420
Dissolved Metals			
Aluminum	D-Al	<0.010	<0.010
Antimony	D-Sb	<0.00050	<0.00050
Arsenic	D-As	0.00016	0.00018
Barium	D-Ba	0.065	0.067
Boron	D-B	<0.10	<0.10
Cadmium	D-Cd	<0.00020	<0.00020
Calcium	D-Ca	55.3	56.7
Chromium	D-Cr	<0.0020	<0.0020
Copper	D-Cu	<0.0010	<0.0010
Iron	D-Fe	<0.030	<0.030
Lead	D-Pb	<0.0010	<0.0010
Magnesium	D-Mg	20.6	21.0
Manganese	D-Mn	<0.0020	<0.0020
Mercury	D-Hg	<0.00020	<0.00020
Potassium	D-K	0.94	0.97
Selenium	D-Se	<0.0010	<0.0010
Sodium	D-Na	3.3	3.3
Uranium	D-U	0.00387	0.00394
Zinc	D-Zn	<0.050	<0.050

Results are expressed as milligrams per litre except for pH, Colour (CU), Conductivity (umhos/cm), and Turbidity (NTU).
< = Less than the detection limit indicated.
Results are expressed as milligrams per litre except where noted.
Results are expressed as milligrams per litre except for pH, Conductivity (umhos/cm), Turbidity (NTU), and Colour (CU).

Appendix 2 - METHODOLOGY

Outlines of the methodologies utilized for the analysis of the samples submitted are as follows

Colour in Water

This analysis is carried out using procedures adapted from APHA Method 2120 "Color". Colour (true colour) is determined by filtering a sample through a 0.45 micron membrane filter followed by analysis of the filtrate using the platinum-cobalt colourimetric method. The analysis is carried out without pH adjustment.

Recommended Holding Time:
Sample: 2 days
Reference: APHA
For more detail see ALS Environmental "Collection & Sampling Guide"

Conductivity in Water

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

Recommended Holding Time:
Sample: 28 days
Reference: APHA
For more detail see ALS Environmental "Collection & Sampling Guide"

Solids in Water

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total dissolved solids (TDS) and total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius, TSS is determined by drying the filter at 104 degrees celsius. Total solids are determined by evaporating a sample to dryness at 104 degrees celsius. Fixed and volatile solids are determined by igniting a dried sample residue at 550 degrees celsius.

Recommended Holding Time:
Sample: 7 days
Reference: APHA
For more detail see ALS Environmental "Collection & Sampling Guide"

Conventional Parameters in Water

These analyses are carried out in accordance with procedures described in "Methods for Chemical Analysis of Water and Wastes" (USEPA), "Manual for the Chemical Analysis of Water, Wastewaters, Sediments and Biological Tissues" (BCMOE), and/or "Standard Methods for the Examination of Water and Wastewater" (APHA). Further details are available on request.

pH in Water

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode.

Recommended Holding Time:
Sample: 2 hours
Reference: APHA
For more detail see ALS Environmental "Collection & Sampling Guide"

Turbidity of Water

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

Recommended Holding Time:
Sample: 2 days
Reference: APHA
For more detail see ALS Environmental "Collection & Sampling Guide"

Alkalinity in Water by Colourimetry

This analysis is carried out using procedures adapted from EPA Method 310.2 "Alkalinity". Total Alkalinity is determined using the methyl orange colourimetric method.

Recommended Holding Time:
Sample: 14 days
Reference: APHA
For more detail see ALS Environmental "Collection & Sampling Guide"

Dissolved Anions in Water by Ion Chromatography

This analysis is carried out using procedures adapted from APHA Method 4110 "Determination of Anions by Ion Chromatography" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Anions are determined by filtering the sample through a 0.45 micron membrane filter and injecting the filtrate onto a Dionex IonPac AG17 anion exchange column with a hydroxide eluent stream. Anions routinely determined by this method include: bromide, chloride, fluoride, nitrate, nitrite and sulphate.

Recommended Holding Time:
Sample: 28 days (bromide, chloride, fluoride, sulphate)
Sample: 2 days (nitrate, nitrite)
Reference: APHA and EPA
For more detail see ALS Environmental "Collection & Sampling Guide"

Metals in Water

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" 20th Edition 1998 published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotplate or microwave oven, or filtration (EPA Method 3005A). Instrumental analysis is by atomic absorption/emission spectrophotometry (EPA Method 7000 series), inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B), and/or inductively coupled plasma - mass spectrometry (EPA Method 6020).

Recommended Holding Time:

Sample:	6 months
Reference:	EPA
For more detail see:	ALS "Collection & Sampling Guide"

Mercury in Water

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" 20th Edition 1998 published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedure involves a cold-oxidation of the acidified sample using bromine monochloride prior to reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry (EPA Method 245.7).

Recommended Holding Time:

Sample:	28 days
Reference:	EPA

For more detail see ALS Environmental "Collection & Sampling Guide"

Results contained within this report relate only to the samples as submitted.

End of Report

ALS Environmental
excellence in analytical testing

1988 Triumph Street, **Vancouver**, BC Canada V5L 1K5 Tel: 604-253-4188 Toll Free: 1-800-665-0243 Fax: 604-253-6700
#2 -21 Highfield Circle SE, **Calgary**, AB Canada T2G 5N6 Tel: 403-214-5431 Toll Free: 1-866-722-6231 Fax: 403-214-5430
#2 - 8820 100th Street, **Fort St. John**, BC Canada V1J 3W9 Tel: 250-785-8281 Fax: 250-785-8286
www.alsenviro.com

CHAIN OF CUSTODY FORM

PAGE 1 OF 1

SEND REPORT TO:

COMPANY:	Gartner Lee Limited				
ADDRESS:	2251 2nd Avenue				
CITY:	Whitehorse	PROV: YT	POSTAL CODE:	Y1A 5W1	
T	867.633.6474	FAX: 867.633.6321	CONTACT:	Jonathan Kerr	
PROJECT NAME AND NO.:		Town of Faro / 50564	SAMPLER:	CD, JF	
QUOTE NO.:		PO NO.:	ALS CONTACT:	Brent Mosle	
REPORT FORMAT:	☑ HARDCOPY ☑ EMAIL - ADDRESS: jkerr@gartnerlee.com				
	☐ FAX ☐ EXCEL ☐ PDF ☐ OTHER:				

ANALYSIS REQUESTED:

V9595	SAMPLE IDENTIFICATION	DATE / TIME COLLECTED YYYY-MM-DD	TIME	MATRIX	dissolved metals (field filtered + acidified)	total metals (acidified)	gen chem → drinking H2O package	NOTES (sample specific comments, due dates, etc.)
FOR LAB USE ONLY	Pump House	2005/06/17	8:50	water	X	X	X	
	OB2	"	9:15		X		X	
	OB6	"	11:45		X		X	
	PRWL51-04	"	9:55		X		X	
	VCSG1	"	13:00		X		X	
	VCSG1-D	"	13:00	↓	X		X	

TURN AROUND REQUIRED: ◉ ROUTINE ○ RUSH SPECIFY DATE: _____ (surcharge may apply)

SEND INVOICE TO: ☐ SAME AS REPORT ☐ DIFFERENT FROM REPORT (provide details below)

INVOICE FORMAT: ☐ HARDCOPY ☐ PDF ☐ FAX

SPECIAL INSTRUCTIONS:
* Please run Canadian Drinking Water Quality Guidelines Package.

RELINQUISHED BY:	DATE: June 20/05	RECEIVED BY:	DATE:	06/21/05	
[signature]	TIME: 10:00	[signature]	TIME:	1:45	
RELINQUISHED BY:	DATE:	RECEIVED BY:	DATE:		
	TIME:		TIME:		

FOR LAB USE ONLY

Cooler Seal Intact? ___Yes ___No ☑N/A	Sample Temperature: 6 °C Frozen? ___Yes ☑No	Cooling Method? ☑Icepacks ___Ice ___None

ALS Environmental

CHEMICAL ANALYSIS REPORT

Date:	August 8, 2005
ALS File No.	W1967
Report On:	50564 Water Analysis
Report To:	**Gartner Lee Ltd.** 2251 2nd Ave Whitehorse, YT Y1A 5W1
Attention:	**Ms. Jen Funston**
Received:	July 22, 2005

ALS ENVIRONMENTAL
per:

Leanne Harris, B.Sc. - Project Chemist
Heather A. Ross-Easton, B.Sc. - Project Chemist

ALS CANADA LTD.
1988 Triumph Street, Vancouver, BC Canada V5L 1K5
Phone: 604-253-4188 Fax: 604-253-6700 Website: www.alsenviro.com

REMARKS

For some of the submitted water samples, the measured concentration of specific dissolved metals is greater than the corresponding total metals concentration. The explanation for these findings is one or a combination of the following:

- laboratory method variability;
- field sampling method variability;
- bias introduced during field sample filtration;
- bias introduced during general handling, storage and/or transportation of the sample;
- field sample grab bias - where separate grab samples are processed to produce total and dissolved samples;
- field sample split bias - where total and dissolved metals samples are produced from the same grab sample.

For further clarification on any of the above information, please contact your ALS representative.

File No. W1967

RESULTS OF ANALYSIS - Water

Sample ID			PUMP HOUSE	OB2	OB6	V05G1	PRWLS1 -04
Sample Date			05-07-20	05-07-20	05-07-20	05-07-20	05-07-20
Sample Time			08:50	09:45	12:30	13:00	10:00
ALS ID			*1*	*2*	*3*	*4*	*5*
Physical Tests							
Colour	(CU)		<5.0	<5.0	<5.0	9.2	6.5
Conductivity	(uS/cm)		534	463	568	411	285
Total Dissolved Solids			368	308	402	277	180
Hardness	CaCO3		270	234	290	205	142
pH			8.10	8.21	8.14	8.34	8.28
Turbidity	(NTU)		0.11	14.4	13.6	7.97	5.24
Dissolved Anions							
Alkalinity-Total		CaCO3	147	151	127	117	96.1
Chloride	Cl		0.79	0.70	0.62	0.61	<0.50
Fluoride	F		0.123	0.144	0.132	0.119	0.115
Sulphate	SO4		149	99.3	186	104	54.1
Nutrients							
Nitrate Nitrogen		N	0.25	0.15	0.17	0.14	<0.10
Nitrite Nitrogen		N	<0.10	<0.10	<0.10	<0.10	<0.10

Remarks regarding the analyses appear at the beginning of this report.
Results are expressed as milligrams per litre except where noted.
< = Less than the detection limit indicated.

File No. W1967

RESULTS OF ANALYSIS - Water

Sample ID		PUMP HOUSE
Sample Date		05-07-20
Sample Time		08:50
ALS ID		*1*
Total Metals		
Aluminum	T-Al	<0.010
Antimony	T-Sb	<0.00050
Arsenic	T-As	0.00018
Barium	T-Ba	0.075
Boron	T-B	<0.10
Cadmium	T-Cd	<0.00020
Calcium	T-Ca	66.1
Chromium	T-Cr	<0.0020
Copper	T-Cu	0.0010
Iron	T-Fe	<0.030
Lead	T-Pb	<0.0010
Magnesium	T-Mg	24.0
Manganese	T-Mn	<0.0020
Mercury	T-Hg	<0.00020
Potassium	T-K	1.09
Selenium	T-Se	<0.0010
Sodium	T-Na	3.1
Uranium	T-U	0.00363
Zinc	T-Zn	<0.050

Remarks regarding the analyses appear at the beginning of this report.
Results are expressed as milligrams per litre except where noted.
< = Less than the detection limit indicated.

File No. W1967

RESULTS OF ANALYSIS - Water

Sample ID		PUMP HOUSE	OB2	OB6	V05G1	PRWLS1 -04
Sample Date		05-07-20	05-07-20	05-07-20	05-07-20	05-07-20
Sample Time		08:50	09:45	12:30	13:00	10:00
ALS ID		*1*	*2*	*3*	*4*	*5*
Dissolved Metals						
Aluminum	D-Al	<0.010	<0.010	<0.010	0.012	0.024
Antimony	D-Sb	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Arsenic	D-As	0.00018	0.00013	0.00018	0.00050	0.00054
Barium	D-Ba	0.076	0.056	0.084	0.045	0.055
Boron	D-B	<0.10	<0.10	<0.10	<0.10	<0.10
Cadmium	D-Cd	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Calcium	D-Ca	67.5	57.9	72.4	53.0	36.6
Chromium	D-Cr	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Copper	D-Cu	<0.0010	<0.0010	<0.0010	0.0011	<0.0010
Iron	D-Fe	<0.030	0.552	0.038	<0.030	<0.030
Lead	D-Pb	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium	D-Mg	24.6	21.6	26.4	17.7	12.2
Manganese	D-Mn	<0.0020	0.0096	0.0030	0.0219	0.0042
Mercury	D-Hg	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Potassium	D-K	1.11	0.84	1.15	0.85	0.60
Selenium	D-Se	<0.0010	<0.0010	<0.0010	<0.0010	0.0011
Sodium	D-Na	3.3	3.5	3.3	2.7	<2.0
Uranium	D-U	0.00368	0.00442	0.00333	0.00257	0.00133
Zinc	D-Zn	<0.050	<0.050	<0.050	<0.050	<0.050

Remarks regarding the analyses appear at the beginning of this report.
Results are expressed as milligrams per litre except where noted.
< = Less than the detection limit indicated.

File No. W1967

RESULTS OF ANALYSIS - Water

Sample ID			PRWLS1 -04
Sample Date			05-07-20
Sample Time			10:00
ALS ID			*6*
Physical Tests			
Colour	(CU)		6.8
Conductivity	(uS/cm)		286
Total Dissolved Solids			181
Hardness	CaCO3		142
pH			8.28
Turbidity	(NTU)		5.36
Dissolved Anions			
Alkalinity-Total		CaCO3	96.7
Chloride	Cl		<0.50
Fluoride	F		0.115
Sulphate	SO4		54.0
Nutrients			
Nitrate Nitrogen		N	<0.10
Nitrite Nitrogen		N	<0.10

Remarks regarding the analyses appear at the beginning of this report.
Results are expressed as milligrams per litre except where noted.
< = Less than the detection limit indicated.

File No. W1967

RESULTS OF ANALYSIS - Water

Sample ID		PRWLS1 -04
Sample Date		05-07-20
Sample Time		10:00
ALS ID		*6*
Dissolved Metals		
Aluminum	D-Al	0.025
Antimony	D-Sb	<0.00050
Arsenic	D-As	0.00055
Barium	D-Ba	0.055
Boron	D-B	<0.10
Cadmium	D-Cd	<0.00020
Calcium	D-Ca	36.8
Chromium	D-Cr	<0.0020
Copper	D-Cu	<0.0010
Iron	D-Fe	<0.030
Lead	D-Pb	<0.0010
Magnesium	D-Mg	12.2
Manganese	D-Mn	0.0042
Mercury	D-Hg	<0.00020
Potassium	D-K	0.61
Selenium	D-Se	0.0010
Sodium	D-Na	<2.0
Uranium	D-U	0.00136
Zinc	D-Zn	<0.050

Remarks regarding the analyses appear at the beginning of this report.
Results are expressed as milligrams per litre except where noted.
< = Less than the detection limit indicated.

File No. W1967

Appendix 1 - REGULATORY CRITERIA

Health Canada

Summary of Guidelines for Canadian Drinking Water Quality, April 2003. Please see the guidelines for further details.
All limits are Maximum Acceptable Concentration (MAC) unless otherwise indicated. Limits are expressed as mg/L except for pH, Turbidity, Colour and Bacteriolgical Tests.

			Lower Limit	Upper Limit		Notes
Physical Tests						
Colour	(CU)		-	15	CU	1
Total Dissolved Solids			-	500	mg/L	1
pH			6.5	8.5		1
Turbidity	(NTU)		-	5	NTU	1, 2
Dissolved Anions						
Chloride	Cl		-	250	mg/L	1
Fluoride	F		-	1.5	mg/L	
Sulphate	SO4		-	500	mg/L	1, 3
Nutrients						
Nitrate Nitrogen		N	-	10	mg/L	
Nitrite Nitrogen		N	-	1	mg/L	
Total Metals						
Antimony	T-Sb		-	0.006	mg/L	4, 5
Arsenic	T-As		-	0.025	mg/L	4
Barium	T-Ba		-	1	mg/L	
Boron	T-B		-	5	mg/L	4
Cadmium	T-Cd		-	0.005	mg/L	
Chromium	T-Cr		-	0.05	mg/L	
Copper	T-Cu		-	1	mg/L	1, 6
Iron	T-Fe		-	0.3	mg/L	1
Lead	T-Pb		-	0.01	mg/L	6, 5
Manganese	T-Mn		-	0.05	mg/L	1
Mercury	T-Hg		-	0.001	mg/L	
Selenium	T-Se		-	0.01	mg/L	
Sodium	T-Na		-	200	mg/L	1
Uranium	T-U		-	0.02	mg/L	4
Zinc	T-Zn		-	5	mg/L	1, 6

1 Aesthetic Objective (AO) (taste, odour, appearance, etc.)
2 1 NTU maximum allowed for water entering distribution systems.
3 There may be a laxative effect in some individuals when sulphate levels exceed 500 mg/L.
4 Interim Maximum Acceptable Concentration (IMAC)
5 First drawn water may be high, flush system before sampling.
6 At point of consumption.

File No. W1967

Appendix 1 - REGULATORY CRITERIA

Health Canada

Summary of Guidelines for Canadian Drinking Water Quality, April 2003. Please see the guidelines for further details.
All limits are Maximum Acceptable Concentration (MAC) unless otherwise indicated. Limits are expressed as mg/L except for pH, Turbidity, Colour and Bacteriolgical Tests.

		Lower Limit	Upper Limit		Notes
Dissolved Metals					
Antimony	D-Sb	-	0.006	mg/L	1, 2
Arsenic	D-As	-	0.025	mg/L	1
Barium	D-Ba	-	1	mg/L	
Boron	D-B	-	5	mg/L	1
Cadmium	D-Cd	-	0.005	mg/L	
Chromium	D-Cr	-	0.05	mg/L	
Copper	D-Cu	-	1	mg/L	3, 4
Iron	D-Fe	-	0.3	mg/L	3
Lead	D-Pb	-	0.01	mg/L	4, 2
Manganese	D-Mn	-	0.05	mg/L	3
Mercury	D-Hg	-	0.001	mg/L	
Selenium	D-Se	-	0.01	mg/L	
Sodium	D-Na	-	200	mg/L	3
Uranium	D-U	-	0.02	mg/L	1
Zinc	D-Zn	-	5	mg/L	3, 4

1 Interim Maximum Acceptable Concentration (IMAC)
2 First drawn water may be high, flush system before sampling.
3 Aesthetic Objective (AO) (taste, odour, appearance, etc.)
4 At point of consumption.

File No. W1967

Appendix 2 - QUALITY CONTROL - Replicates

Water			OB2	OB2
			05-07-20 09:45	QC # 453152
Physical Tests				
Colour	(CU)		<5.0	<5.0
Conductivity	(uS/cm)		463	461
Hardness	CaCO3		234	231
pH			8.21	8.23
Turbidity	(NTU)		14.4	15.1
Dissolved Anions				
Alkalinity-Total		CaCO3	151	153
Chloride	Cl		0.70	0.70
Fluoride	F		0.144	0.144
Sulphate	SO4		99.3	99.3
Nutrients				
Nitrate Nitrogen		N	0.15	0.15
Nitrite Nitrogen		N	<0.10	<0.10

Remarks regarding the analyses appear at the beginning of this report.
Results are expressed as milligrams per litre except where noted.
< = Less than the detection limit indicated.

File No. W1967

Appendix 2 - QUALITY CONTROL - Replicates

Water		OB2	OB2
		05-07-20 09:45	QC # 453152
Dissolved Metals			
Aluminum	D-Al	<0.010	<0.010
Antimony	D-Sb	<0.00050	<0.00050
Arsenic	D-As	0.00013	0.00012
Barium	D-Ba	0.056	0.056
Boron	D-B	<0.10	<0.10
Cadmium	D-Cd	<0.00020	<0.00020
Calcium	D-Ca	57.9	56.7
Chromium	D-Cr	<0.0020	<0.0020
Copper	D-Cu	<0.0010	<0.0010
Iron	D-Fe	0.552	0.556
Lead	D-Pb	<0.0010	<0.0010
Magnesium	D-Mg	21.6	21.7
Manganese	D-Mn	0.0096	0.0095
Mercury	D-Hg	<0.00020	<0.00020
Potassium	D-K	0.84	0.83
Selenium	D-Se	<0.0010	<0.0010
Sodium	D-Na	3.5	3.4
Uranium	D-U	0.00442	0.00436
Zinc	D-Zn	<0.050	<0.050

Remarks regarding the analyses appear at the beginning of this report.
Results are expressed as milligrams per litre except where noted.
< = Less than the detection limit indicated.

Appendix 3 - METHODOLOGY

Outlines of the methodologies utilized for the analysis of the samples submitted are as follows

Colour in Water

This analysis is carried out using procedures adapted from APHA Method 2120 "Color". Colour (true colour) is determined by filtering a sample through a 0.45 micron membrane filter followed by analysis of the filtrate using the platinum-cobalt colourimetric method. The analysis is carried out without pH adjustment.

Recommended Holding Time:
Sample: 2 days
Reference: APHA
For more detail see ALS Environmental "Collection & Sampling Guide"

Conductivity in Water

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

Recommended Holding Time:
Sample: 28 days
Reference: APHA
For more detail see ALS Environmental "Collection & Sampling Guide"

Solids in Water

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total dissolved solids (TDS) and total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius, TSS is determined by drying the filter at 104 degrees celsius. Total solids are determined by evaporating a sample to dryness at 104 degrees celsius. Fixed and volatile solids are determined by igniting a dried sample residue at 550 degrees celsius.

Recommended Holding Time:
Sample: 7 days
Reference: APHA
For more detail see ALS Environmental "Collection & Sampling Guide"

Conventional Parameters in Water

These analyses are carried out in accordance with procedures described in "Methods for Chemical Analysis of Water and Wastes" (USEPA), "Manual for the Chemical Analysis of Water, Wastewaters, Sediments and Biological Tissues" (BCMOE), and/or "Standard Methods for the Examination of Water and Wastewater" (APHA). Further details are available on request.

pH in Water

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode.

Recommended Holding Time:
Sample: 2 hours
Reference: APHA
For more detail see ALS Environmental "Collection & Sampling Guide"

Turbidity of Water

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

Recommended Holding Time:
Sample: 2 days
Reference: APHA
For more detail see ALS Environmental "Collection & Sampling Guide"

Alkalinity in Water by Colourimetry

This analysis is carried out using procedures adapted from EPA Method 310.2 "Alkalinity". Total Alkalinity is determined using the methyl orange colourimetric method.

Recommended Holding Time:
Sample: 14 days
Reference: APHA
For more detail see ALS Environmental "Collection & Sampling Guide"

Dissolved Anions in Water by Ion Chromatography

This analysis is carried out using procedures adapted from APHA Method 4110 "Determination of Anions by Ion Chromatography" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Anions are determined by filtering the sample through a 0.45 micron membrane filter and injecting the filtrate onto a Dionex IonPac AG17 anion exchange column with a hydroxide eluent stream. Anions routinely determined by this method include: bromide, chloride, fluoride, nitrate, nitrite and sulphate.

Recommended Holding Time:
Sample: 28 days (bromide, chloride, fluoride, sulphate)
Sample: 2 days (nitrate, nitrite)
Reference: APHA and EPA
For more detail see ALS Environmental "Collection & Sampling Guide"

Metals in Water

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" 20th Edition 1998 published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotplate or microwave oven, or filtration (EPA Method 3005A). Instrumental analysis is by atomic absorption/emission spectrophotometry (EPA Method 7000 series), inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B), and/or inductively coupled plasma - mass spectrometry (EPA Method 6020).

Recommended Holding Time:

Sample:	6 months
Reference:	EPA
For more detail see:	ALS "Collection & Sampling Guide"

Mercury in Water

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" 20th Edition 1998 published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedure involves a cold-oxidation of the acidified sample using bromine monochloride prior to reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry (EPA Method 245.7).

Recommended Holding Time:

Sample:	28 days
Reference:	EPA

For more detail see ALS Environmental "Collection & Sampling Guide"

Results contained within this report relate only to the samples as submitted.

End of Report

CHAIN OF CUSTODY / ANALYTICAL REQUEST FORM

CLIENT: Gartner Lee Limited
ADDRESS: 2251 2nd Avenue
CITY: Whitehorse PROV.: ON POSTAL CODE: Y1A 5W1
CONTACT: Jen Funston SAMPLER: JG, JF
TELEPHONE: 867.633.6474 FAX: 867.633.6321
PROJECT NAME/NO.: Town of Faro
P.O. NO.: 50564 QUOTE NO.:
DATE SUBMITTED: July 21/05 ALS CONTACT: Brent Mach

ALS Environmental
1988 Triumph Street
Vancouver, BC
Canada V5L 1K5
TEL: 604-253-4188
TOLL FREE: 1-800-665-0243
FAX: 604-253-6700
www.alsenviro.com

ANALYSIS REQUESTED

LAB USE ONLY: W1967

FOR LAB USE ONLY

SAMPLE IDENTIFICATION	DATE / TIME COLLECTED Y	M	D		MATRIX	Dissolved Metals (field filtered & acidified)	Total Metals (acidified)	Geochem → (drinking water package)	NOTES
Pump House	05	07	20	8:50 AM/PM	Water	X	X	X	
OB2				9:45 AM/PM		X		X	
OB6				12:30 AM/PM		X		X	
VOSG1				1:00 AM/PM		X		X	
PRWLS1-04				10:00 AM/PM		X		X	
PRWLS1-04-D				10:00 AM/PM		X		X	
				AM/PM					
				AM/PM					
				AM/PM					
				AM/PM					
				AM/PM					
				AM/PM					
				AM/PM					
				AM/PM					
				AM/PM					
				AM/PM					

TURN AROUND REQUIRED:

☐ ROUTINE (7 - 10 WORKING DAYS) ☐ RUSH (SPECIFY DATE): _____

SPECIAL INSTRUCTIONS (BILLING DETAILS, QC REPORTING, ETC.):

** Please run Canadian Drinking Water Guidelines package.

RELINQUISHED BY:	DATE	TIME	RECEIVED BY:	DATE	TIME
Jen Funston	July 20/05	10:00 pm			
RELINQUISHED BY:	DATE	TIME	RECEIVED BY:	DATE	TIME
				07/22	2020

FOR LAB USE ONLY

COOLER SEAL INTACT UPON-RECEIPT? ☐ YES ☐ NO ☐ N/A

SAMPLE TEMPERATURE UPON RECEIPT: 8 °C

FROZEN? ☐ YES ☐ NO

REPORT COPY

ALS Environmental

CERTIFICATE OF ANALYSIS

Date:	October 25, 2005
ALS File No.	W5746
Report On:	50564 Water Analysis
Report To:	**Gartner Lee Ltd.** 2251 2nd Ave Whitehorse, YT Y1A 5W1
Received:	October 7, 2005

ALS ENVIRONMENTAL
per:

Heather A. Ross-Easton, B.Sc. - Project Chemist
Leanne Harris, B.Sc. - Project Chemist

ALS CANADA LTD.
1988 Triumph Street, Vancouver, BC Canada V5L 1K5
Phone: 604-253-4188 Fax: 604-253-6700 Website: www.alsenviro.com

REMARKS

Please note that the detection limits for certain Dissolved and Total Metals have been increased for some of the samples reported in the following data tables due to sample matrix interferences.

File No. W5746

RESULTS OF ANALYSIS - Water

Sample ID			OB2	OB6	PRWLS1	VCWLS1	PUMPHSE
Sample Date			05-10-06	05-10-06	05-10-06	05-10-06	05-10-06
ALS ID			*1*	*2*	*3*	*4*	*5*
Physical Tests							
Colour	(CU)		<5.0	<5.0	10.3	6.5	-
Conductivity	(uS/cm)		720	467	302	414	-
Total Dissolved Solids			496	296	182	258	-
Hardness	CaCO3		389	202	154	217	285
pH			7.90	7.99	8.12	8.19	-
Turbidity	(NTU)		78.1	60.9	4.30	0.96	-
Dissolved Anions							
Alkalinity-Total		CaCO3	177	146	105	152	-
Chloride	Cl		0.85	0.92	<0.50	1.02	-
Fluoride	F		0.159	0.175	0.126	0.141	-
Sulphate	SO4		222	106	54.1	81.1	-
Nutrients							
Nitrate Nitrogen		N	<0.0050	0.214	<0.0050	0.164	-
Nitrite Nitrogen		N	<0.0010	<0.0010	<0.0010	<0.0010	-
Total Metals							
Aluminum	T-Al		-	-	-	-	0.188
Antimony	T-Sb		-	-	-	-	<0.0025
Arsenic	T-As		-	-	-	-	<0.00050
Barium	T-Ba		-	-	-	-	<0.10
Boron	T-B		-	-	-	-	<0.50
Cadmium	T-Cd		-	-	-	-	<0.0010
Calcium	T-Ca		-	-	-	-	74.0
Chromium	T-Cr		-	-	-	-	<0.010
Copper	T-Cu		-	-	-	-	0.0175
Iron	T-Fe		-	-	-	-	0.197
Lead	T-Pb		-	-	-	-	<0.0050
Magnesium	T-Mg		-	-	-	-	24.4
Manganese	T-Mn		-	-	-	-	<0.010
Mercury	T-Hg		-	-	-	-	<0.00020
Potassium	T-K		-	-	-	-	1.30
Selenium	T-Se		-	-	-	-	<0.0050
Sodium	T-Na		-	-	-	-	3.1
Uranium	T-U		-	-	-	-	0.00409
Zinc	T-Zn		-	-	-	-	<0.25

Remarks regarding the analyses appear at the beginning of this report.
Results are expressed as milligrams per litre except where noted.
< = Less than the detection limit indicated.
EPH = Extractable Petroleum Hydrocarbons.
EPH10-19 is equivalent to EHw10-19.
LEPH & HEPH = Light and Heavy Extractable Petroleum Hydrocarbons.
VPH = Volatile Petroleum Hydrocarbons.

File No. W5746

RESULTS OF ANALYSIS - Water

Sample ID		OB2	OB6	PRWLS1	VCWLS1	PUMPHSE
Sample Date		05-10-06	05-10-06	05-10-06	05-10-06	05-10-06
ALS ID		*1*	*2*	*3*	*4*	*5*
Dissolved Metals						
Aluminum	D-Al	<0.010	<0.010	0.027	<0.050	-
Antimony	D-Sb	<0.00050	<0.00050	<0.00050	<0.0025	-
Arsenic	D-As	0.00013	0.00031	0.00045	<0.00050	-
Barium	D-Ba	0.114	0.068	0.064	<0.10	-
Boron	D-B	<0.10	<0.10	<0.10	<0.50	-
Cadmium	D-Cd	<0.00020	<0.00020	<0.00020	<0.0010	-
Calcium	D-Ca	98.6	53.2	41.4	55.3	-
Chromium	D-Cr	<0.0020	<0.0020	<0.0020	<0.010	-
Copper	D-Cu	<0.0010	<0.0010	0.0011	<0.0050	-
Iron	D-Fe	2.35	0.678	0.058	<0.030	-
Lead	D-Pb	<0.0010	<0.0010	<0.0010	<0.0050	-
Magnesium	D-Mg	34.7	16.8	12.4	19.2	-
Manganese	D-Mn	0.0839	0.0744	0.0070	0.012	-
Mercury	D-Hg	<0.00020	<0.00020	<0.00020	<0.00020	-
Potassium	D-K	1.28	1.11	0.64	0.89	-
Selenium	D-Se	<0.0010	<0.0010	<0.0010	<0.0050	-
Sodium	D-Na	4.2	2.8	<2.0	3.1	-
Uranium	D-U	0.00647	0.00170	0.00139	0.00347	-
Zinc	D-Zn	<0.050	<0.050	<0.050	<0.25	-
Non-Halogenated Volatiles						
Benzene		-	-	-	-	<0.00050
Ethylbenzene		-	-	-	-	<0.00050
Styrene		-	-	-	-	<0.0010
Toluene		-	-	-	-	<0.0010
meta- & para-Xylene		-	-	-	-	<0.00050
ortho-Xylene		-	-	-	-	<0.00050
Total Xylenes		-	-	-	-	<0.0010
Volatile Hydrocarbons (VH6-10)		-	-	-	-	<0.10
VPH		-	-	-	-	<0.10

Remarks regarding the analyses appear at the beginning of this report.
Results are expressed as milligrams per litre except where noted.
< = Less than the detection limit indicated.
EPH = Extractable Petroleum Hydrocarbons.
EPH10-19 is equivalent to EHw10-19.
LEPH & HEPH = Light and Heavy Extractable Petroleum Hydrocarbons.
VPH = Volatile Petroleum Hydrocarbons.

File No. W5746

RESULTS OF ANALYSIS - Water

Sample ID	PUMPHSE
Sample Date	05-10-06
ALS ID	*5*

Polycyclic Aromatic Hydrocarbons

Acenaphthene	<0.000050
Acenaphthylene	<0.000050
Acridine	<0.000050
Anthracene	<0.000050
Benz(a)anthracene	<0.000050
Benzo(a)pyrene	<0.000010
Benzo(b)fluoranthene	<0.000050
Benzo(g,h,i)perylene	<0.000050
Benzo(k)fluoranthene	<0.000050
Chrysene	<0.000050
Dibenz(a,h)anthracene	<0.000050
Fluoranthene	<0.000050
Fluorene	<0.000050
Indeno(1,2,3-c,d)pyrene	<0.000050
Naphthalene	<0.000050
Phenanthrene	<0.000050
Pyrene	<0.000050
Quinoline	<0.000050

Extractable Hydrocarbons

EPH10-19	<0.30
EPH19-32	<1.0
LEPH	<0.30
HEPH	<1.0

Remarks regarding the analyses appear at the beginning of this report.
Results are expressed as milligrams per litre except where noted.
< = Less than the detection limit indicated.
EPH = Extractable Petroleum Hydrocarbons.
EPH10-19 is equivalent to EHw10-19.
LEPH & HEPH = Light and Heavy Extractable Petroleum Hydrocarbons.
VPH = Volatile Petroleum Hydrocarbons.

File No. W5746

RESULTS OF ANALYSIS - Water

Sample ID		PUMPHSE -R
Sample Date		05-10-06
ALS ID		*6*
Physical Tests		
Colour	(CU)	-
Conductivity	(uS/cm)	-
Total Dissolved Solids		-
Hardness	CaCO3	282
pH		-
Turbidity	(NTU)	-
Total Metals		
Aluminum	T-Al	<0.050
Antimony	T-Sb	<0.0025
Arsenic	T-As	<0.00050
Barium	T-Ba	<0.10
Boron	T-B	<0.50
Cadmium	T-Cd	<0.0010
Calcium	T-Ca	73.2
Chromium	T-Cr	<0.010
Copper	T-Cu	0.0451
Iron	T-Fe	0.248
Lead	T-Pb	<0.0050
Magnesium	T-Mg	24.0
Manganese	T-Mn	<0.010
Mercury	T-Hg	<0.00020
Potassium	T-K	1.26
Selenium	T-Se	<0.0050
Sodium	T-Na	3.1
Uranium	T-U	0.00409
Zinc	T-Zn	<0.25

Remarks regarding the analyses appear at the beginning of this report.
Results are expressed as milligrams per litre except where noted.
< = Less than the detection limit indicated.
EPH = Extractable Petroleum Hydrocarbons.
EPH10-19 is equivalent to EHw10-19.
LEPH & HEPH = Light and Heavy Extractable Petroleum Hydrocarbons.
VPH = Volatile Petroleum Hydrocarbons.

File No. W5746

RESULTS OF ANALYSIS - Water

Sample ID	PUMPHSE -R
Sample Date	05-10-06
ALS ID	*6*

Non-Halogenated Volatiles

Benzene	<0.00050
Ethylbenzene	<0.00050
Styrene	<0.0010
Toluene	<0.0010
meta- & para-Xylene	<0.00050
ortho-Xylene	<0.00050
Total Xylenes	<0.0010
Volatile Hydrocarbons (VH6-10)	<0.10
VPH	<0.10

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Results are expressed as milligrams per litre except where noted.
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LEPH & HEPH = Light and Heavy Extractable Petroleum Hydrocarbons.
VPH = Volatile Petroleum Hydrocarbons.

File No. W5746

RESULTS OF ANALYSIS - Water

Sample ID	PUMPHSE -R
Sample Date	05-10-06
ALS ID	*6*

Polycyclic Aromatic Hydrocarbons

Acenaphthene	<0.000050
Acenaphthylene	<0.000050
Acridine	<0.000050
Anthracene	<0.000050
Benz(a)anthracene	<0.000050
Benzo(a)pyrene	<0.000010
Benzo(b)fluoranthene	<0.000050
Benzo(g,h,i)perylene	<0.000050
Benzo(k)fluoranthene	<0.000050
Chrysene	<0.000050
Dibenz(a,h)anthracene	<0.000050
Fluoranthene	<0.000050
Fluorene	<0.000050
Indeno(1,2,3-c,d)pyrene	<0.000050
Naphthalene	<0.000050
Phenanthrene	<0.000050
Pyrene	<0.000050
Quinoline	<0.000050

Extractable Hydrocarbons

EPH10-19	<0.30
EPH19-32	<1.0
LEPH	<0.30
HEPH	<1.0

Remarks regarding the analyses appear at the beginning of this report.
Results are expressed as milligrams per litre except where noted.
< = Less than the detection limit indicated.
EPH = Extractable Petroleum Hydrocarbons.
EPH10-19 is equivalent to EHw10-19.
LEPH & HEPH = Light and Heavy Extractable Petroleum Hydrocarbons.
VPH = Volatile Petroleum Hydrocarbons.

Appendix 1 - REGULATORY CRITERIA

Health Canada

Summary of Guidelines for Canadian Drinking Water Quality, April 2003. Please see the guidelines for further details.
All limits are Maximum Acceptable Concentration (MAC) unless otherwise indicated. Limits are expressed as mg/L except for pH, Turbidity, Colour and Bacteriolgical Tests.

			Lower Limit	Upper Limit		Notes
Physical Tests						
Colour	(CU)		-	15	CU	1
Total Dissolved Solids			-	500	mg/L	1
pH			6.5	8.5		1
Turbidity	(NTU)		-	5	NTU	1, 2
Dissolved Anions						
Chloride	Cl		-	250	mg/L	1
Fluoride	F		-	1.5	mg/L	
Sulphate	SO4		-	500	mg/L	1, 3
Nutrients						
Nitrate Nitrogen		N	-	10	mg/L	
Nitrite Nitrogen		N	-	1	mg/L	
Total Metals						
Antimony	T-Sb		-	0.006	mg/L	4, 5
Arsenic	T-As		-	0.025	mg/L	4
Barium	T-Ba		-	1	mg/L	
Boron	T-B		-	5	mg/L	4
Cadmium	T-Cd		-	0.005	mg/L	
Chromium	T-Cr		-	0.05	mg/L	
Copper	T-Cu		-	1	mg/L	1, 6
Iron	T-Fe		-	0.3	mg/L	1
Lead	T-Pb		-	0.01	mg/L	6, 5
Manganese	T-Mn		-	0.05	mg/L	1
Mercury	T-Hg		-	0.001	mg/L	
Selenium	T-Se		-	0.01	mg/L	
Sodium	T-Na		-	200	mg/L	1
Uranium	T-U		-	0.02	mg/L	4
Zinc	T-Zn		-	5	mg/L	1, 6

1 Aesthetic Objective (AO) (taste, odour, appearance, etc.)
2 1 NTU maximum allowed for water entering distribution systems.
3 There may be a laxative effect in some individuals when sulphate levels exceed 500 mg/L.
4 Interim Maximum Acceptable Concentration (IMAC)
5 First drawn water may be high, flush system before sampling.
6 At point of consumption.

Appendix 1 - REGULATORY CRITERIA

Health Canada

Summary of Guidelines for Canadian Drinking Water Quality, April 2003. Please see the guidelines for further details.
All limits are Maximum Acceptable Concentration (MAC) unless otherwise indicated. Limits are expressed as mg/L except for pH, Turbidity, Colour and Bacteriolgical Tests.

		Lower Limit	Upper Limit		Notes
Dissolved Metals					
Antimony	D-Sb	-	0.006	mg/L	1, 2
Arsenic	D-As	-	0.025	mg/L	1
Barium	D-Ba	-	1	mg/L	
Boron	D-B	-	5	mg/L	1
Cadmium	D-Cd	-	0.005	mg/L	
Chromium	D-Cr	-	0.05	mg/L	
Copper	D-Cu	-	1	mg/L	3, 4
Iron	D-Fe	-	0.3	mg/L	3
Lead	D-Pb	-	0.01	mg/L	4, 2
Manganese	D-Mn	-	0.05	mg/L	3
Mercury	D-Hg	-	0.001	mg/L	
Selenium	D-Se	-	0.01	mg/L	
Sodium	D-Na	-	200	mg/L	3
Uranium	D-U	-	0.02	mg/L	1
Zinc	D-Zn	-	5	mg/L	3, 4
Non-Halogenated Volatiles					
Benzene		-	0.005	mg/L	
Ethylbenzene		-	0.0024	mg/L	3
Toluene		-	0.024	mg/L	3
meta- & para-Xylene		-	0.3	mg/L	3, 5
ortho-Xylene		-	0.3	mg/L	3, 5
Total Xylenes		-	0.3	mg/L	3
Polycyclic Aromatic Hydrocarbons					
Benzo(a)pyrene		-	0.00001	mg/L	

1 Interim Maximum Acceptable Concentration (IMAC)
2 First drawn water may be high, flush system before sampling.
3 Aesthetic Objective (AO) (taste, odour, appearance, etc.)
4 At point of consumption.
5 Xylenes (total) should not exceed 0.3 mg/L.

File No. W5746

Appendix 2 - QUALITY CONTROL - Replicates

Water			VCWLS1	VCWLS1
			05-10-06	QC # 469202
Physical Tests				
Colour	(CU)		6.5	6.6
Total Dissolved Solids			258	270
Hardness	CaCO3		217	214
Turbidity	(NTU)		0.96	1.08
Dissolved Anions				
Chloride	Cl		1.02	1.17
Fluoride	F		0.141	0.147
Sulphate	SO4		81.1	81.7
Nutrients				
Nitrate Nitrogen		N	0.164	0.166
Nitrite Nitrogen		N	<0.0010	<0.0010
Dissolved Metals				
Aluminum	D-Al		<0.050	<0.050
Antimony	D-Sb		<0.0025	<0.0025
Arsenic	D-As		<0.00050	<0.00050
Barium	D-Ba		<0.10	<0.10
Boron	D-B		<0.50	<0.50
Cadmium	D-Cd		<0.0010	<0.0010
Calcium	D-Ca		55.3	54.4
Chromium	D-Cr		<0.010	<0.010
Copper	D-Cu		<0.0050	<0.0050
Iron	D-Fe		<0.030	<0.030
Lead	D-Pb		<0.0050	<0.0050
Magnesium	D-Mg		19.2	18.9
Manganese	D-Mn		0.012	0.012
Mercury	D-Hg		<0.00020	<0.00020
Potassium	D-K		0.89	0.90
Selenium	D-Se		<0.0050	<0.0050
Sodium	D-Na		3.1	3.0
Uranium	D-U		0.00347	0.00341
Zinc	D-Zn		<0.25	<0.25

Remarks regarding the analyses appear at the beginning of this report.
Results are expressed as milligrams per litre except where noted.
< = Less than the detection limit indicated.
EPH = Extractable Petroleum Hydrocarbons.
EPH10-19 is equivalent to EHw10-19.
LEPH & HEPH = Light and Heavy Extractable Petroleum Hydrocarbons.
VPH = Volatile Petroleum Hydrocarbons.

Appendix 3 - METHODOLOGY

Outlines of the methodologies utilized for the analysis of the samples submitted are as follows

Colour in Water

This analysis is carried out using procedures adapted from APHA Method 2120 "Color". Colour (true colour) is determined by filtering a sample through a 0.45 micron membrane filter followed by analysis of the filtrate using the platinum-cobalt colourimetric method. The analysis is carried out without pH adjustment.

Recommended Holding Time:
Sample: 2 days
Reference: APHA

Laboratory Location: ALS Environmental, Vancouver

Conductivity in Water

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

Recommended Holding Time:
Sample: 28 days
Reference: APHA

Laboratory Location: ALS Environmental, Vancouver

Solids in Water

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total dissolved solids (TDS) and total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius, TSS is determined by drying the filter at 104 degrees celsius. Total solids are determined by evaporating a sample to dryness at 104 degrees celsius. Fixed and volatile solids are determined by igniting a dried sample residue at 550 degrees celsius.

Recommended Holding Time:
Sample: 7 days
Reference: APHA

Laboratory Location: ALS Environmental, Vancouver

pH in Water

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode.

Recommended Holding Time:
Sample: 2 hours
Reference: APHA

Laboratory Location: ALS Environmental, Vancouver

Turbidity of Water

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

Recommended Holding Time:
Sample: 2 days
Reference: APHA

Laboratory Location: ALS Environmental, Vancouver

Alkalinity in Water by Colourimetry

This analysis is carried out using procedures adapted from EPA Method 310.2 "Alkalinity". Total Alkalinity is determined using the methyl orange colourimetric method.

Recommended Holding Time:
Sample: 14 days
Reference: APHA

Laboratory Location: ALS Environmental, Vancouver

Dissolved Anions in Water by Ion Chromatography

This analysis is carried out using procedures adapted from APHA Method 4110 "Determination of Anions by Ion Chromatography" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Anions are determined by filtering the sample through a 0.45 micron membrane filter and injecting the filtrate onto a Dionex IonPac AG17 anion exchange column with a hydroxide eluent stream. Anions routinely determined by this method include: bromide, chloride, fluoride, nitrate, nitrite and sulphate.

Recommended Holding Time:
Sample: 28 days (bromide, chloride, fluoride, sulphate)
Sample: 2 days (nitrate, nitrite)
Reference: APHA and EPA

Laboratory Location: ALS Environmental, Vancouver

Metals in Water

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" 20th Edition 1998 published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotplate or microwave oven, or filtration (EPA Method 3005A). Instrumental analysis is by atomic absorption/emission spectrophotometry (EPA Method 7000 series), inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B), and/or inductively coupled plasma - mass spectrometry (EPA Method 6020).

Recommended Holding Time:
Sample: 6 months
Reference: EPA

Laboratory Location: ALS Environmental, Vancouver

Mercury in Water

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" 20th Edition 1998 published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedure involves a cold-oxidation of the acidified sample using bromine monochloride prior to reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry (EPA Method 245.7).

Recommended Holding Time:
Sample: 28 days
Reference: EPA

Laboratory Location: ALS Environmental, Vancouver

Volatile Organic Compounds and Volatile Hydrocarbons in Water

This procedure involves the purge and trap extraction of the sample prior to analysis for Volatile Hydrocarbons (VH) by capillary column gas chromatography with flame-ionization detection (GC/FID) and for specific Volatile Organic Compounds (VOC) by capillary column gas chromatography with mass spectrometric detection (GC/MS). The VH analysis is carried out in accordance with the British Columbia Ministry of Environment, Lands and Parks (BCMELP) Analytical Method for Contaminated Sites "Volatile Hydrocarbons in Water by GC/FID" (Version 2.1, July 1999). The VOC analysis is carried out using procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846, Method 8260, published by the United States Environmental Protection Agency (EPA).

Note:

For chlorinated waters certain conditions may cause the formation of trihalomethanes after sample collection. Appropriate chemical treatment of chlorinated waters will prevent trihalomethane formation in the samples.

Recommended Holding Time:
Sample: 7 days (VH); 14 days (VOC)
Reference: BCWLAP (VH); EPA (VOC)

Laboratory Location: ALS Environmental, Vancouver

Calculation of Total Xylenes

Total Xylenes is the sum of the concentrations of the ortho, meta, and para Xylene isomers. Results below detection limit (DL) are treated as zero. The DL for Total Xylenes is set to a value no less than the sum of the DLs of the individual Xylenes.

Laboratory Location: ALS Environmental, Vancouver

Volatile Petroleum Hydrocarbons (VPH) in Water

These results are determined according to the British Columbia Ministry of Environment, Lands, and Parks Analytical Method for Contaminated Sites "Calculation of Volatile Petroleum Hydrocarbons in Solids or Water" (Version 2.1, July 20, 1999). According to this method, the concentrations of specific Monocyclic Aromatic Hydrocarbons (Benzene, Toluene, Ethylbenzene, and Xylenes) are subtracted from the collective concentration of Volatile Hydrocarbons (VH) that elute between n-hexane (nC6) and n-decane (nC10). Analysis of Volatile Hydrocarbons adheres to all prescribed elements of BCMELP method "Volatile Hydrocarbons in Water by GC/FID" (Version 2.1, July 20, 1999).

Recommended Holding Time: Not Applicable

Laboratory Location: ALS Environmental, Vancouver

Polycyclic Aromatic Hydrocarbons in Water

This analysis is carried out using procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846, Methods 3510, 3630 & 8270, published by the United States Environmental Protection Agency (EPA). The procedure involves extraction of the entire water sample with dichloromethane. The extract is then solvent exchanged to toluene prior to analysis by capillary column gas chromatography with mass spectrometric detection (GC/MS).

Recommended Holding Time:
Sample: 7 days Extract: 40 days
Reference: EPA

Laboratory Location: ALS Environmental, Vancouver

Extractable Hydrocarbons in Water

This analysis is carried out in accordance with the British Columbia Ministry of Environment, Lands and Parks (BCMELP) Analytical Method for Contaminated Sites "Extractable Petroleum Hydrocarbons in Water by GC/FID" (Version 2.1, July 1999). The procedure involves extraction of the entire water sample with dichloromethane. The extract is then solvent exchanged to toluene and analysed by capillary column gas chromatography with flame ionization detection (GC/FID). EPH results include Polycyclic Aromatic Hydrocarbons (PAH) and are therefore not equivalent to Light and Heavy Extractable Petroleum Hydrocarbons (LEPH/HEPH).

Recommended Holding Time:
Sample: 7 days Extract: 40 days
Reference: BCMELP

Laboratory Location: ALS Environmental, Vancouver

Light and Heavy Extractable Petroleum Hydrocarbons in Water

These results are determined according to the British Columbia Ministry of Environment, Lands, and Parks Analytical Method for Contaminated Sites "Calculation of Light and Heavy Extractable Petroleum Hydrocarbons in Solids or Water". According to this method, LEPH and HEPH are calculated by subtracting selected Polynuclear Aromatic Hydrocarbon results from Extractable Petroleum Hydrocarbon results. To calculate LEPH, the individual results for Acenaphthene, Acridine, Anthracene, Fluorene, Naphthalene, and Phenanthrene are subtracted from EPH(C10-19). To calculate HEPH, the individual results for Benz(a)anthracene, Benzo(a)pyrene, Fluoranthene, and Pyrene are subtracted from EPH(C19-32). Analysis of Extractable Petroleum Hydrocarbons adheres to all prescribed elements of the BCMELP method "Extractable Petroleum Hydrocarbons in Water by GC/FID" (Version 2.1, July 20, 1999).

Recommended Holding Time: Not Applicable

Laboratory Location: ALS Environmental, Vancouver

Results contained within this certificate relate only to the samples as submitted.

End of Report

30519

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CHAIN OF CUSTODY FORM

PAGE 1 OF 1

SEND REPORT TO:

CLIENT: Gartner Lee Ltd
ADDRESS: 2251 2nd Ave
CITY: Whitehorse PROV.: YT POSTAL CODE: Y1A 5W1
TELEPHONE: (867) 633-6474 FAX: (867) 632-6531 CONTACT: C. Dewey
PROJECT NAME & NO.: 50564 Town of Faro SAMPLER: C. Dewey
QUOTE NO.: _____ PO NO.: _____ ALS CONTACT: B. Mack
REPORT FORMAT: ☑ HARDCOPY ☐ EMAIL - ADDRESS: cdewey@gartnerlee.com
☐ FAX ☐ EXCEL ☐ PDF ☐ OTHER: _____

ANALYSIS REQUESTED:

FOR LAB USE ONLY	SAMPLE IDENTIFICATION	DATE / TIME COLLECTED YYYY-MM-DD	TIME	MATRIX	General Chem	Total Metals	Dissolved Metals	LEAH (HEM)	OTEX	NOTES (sample specific comments, due dates, etc.)
W5746	OB2	2005/10/06		FW	X		X			
	OB6				X		X			
	PRWLS1				X		X			
	VCWLS1				X		X			
	Pumphouse					X		X	X	
	Pumphouse (R)					X		X	X	

TURN AROUND REQUIRED: ☑ ROUTINE ☐ RUSH - SPECIFY DATE: _____ (surcharge may apply)

SEND INVOICE TO: ☑ SAME AS REPORT INVOICE FORMAT: ☐ HARDCOPY ☐ PDF ☐ FAX
☐ DIFFERENT FROM REPORT (provide details below)

SPECIAL INSTRUCTIONS:
DW PKG.

RELINQUISHED BY:	DATE	RECEIVED BY:	DATE
	Oct 6/05	DL	10/07/05
	TIME 16:45		TIME 3:30
RELINQUISHED BY:	DATE	RECEIVED BY:	DATE
	TIME		TIME

FOR LAB USE ONLY

COOLER SEAL INTACT? ☐ YES ☐ NO ☑ N/A
SAMPLE TEMPERATURE: 11 °C FROZEN? ☐ YES ☑ NO
COOLING METHOD? ☑ ICEPACKS ☐ ICE ☐ NONE

REPORT COPY

SEE WHITEPAPER FOR SOURCE VERSIONR_07

Appendix D

Environmental Isotope Analysis

Appendix D

Environmental Isotope Analysis

Analysis of the heavy isotopes of oxygen and hydrogen is often used as a tool to understand the origin of, and distinguish between, different water sources. This analysis was conducted by Department of Earth Sciences, University of Waterloo on a set of grab samples from Vangorda Creek, Pelly River and the town water wells to determine its potential application to address the current study objectives. The results of the analysis in the table below indicate (in parts per thousand) the abundance of the stable heavy isotopes in each of the samples relative to standard mean ocean water. The similarity in source characteristics for all three samples, measured by the isotope analysis, precluded this technique from further use in this study.

Table: Environmental Isotope Analysis

Isotope Analyzed[1]	**Sample Locations**					
	Town of Faro Water Supply FA-1		**Pelly River @PRWLS 1-04**		**Vangorda Creek @ VCWLS 1-04**	
	Result	**Repeat**	**Result**	**Repeat**	**Result**	**Repeat**
Date Sampled	10-Sep-04		10-Sep-04		10-Sep-04	
Oxygen-18 (^{18}O *o/oo* relative to SMOW[2])	-21.41		-20.52	-20.74	-21.04	
Hydrogen-2 (^{2}H *o/oo* relative to SMOW[2])	-168.16	-167.90	-164.02	-163.42	-167.00	-166.51

Notes:

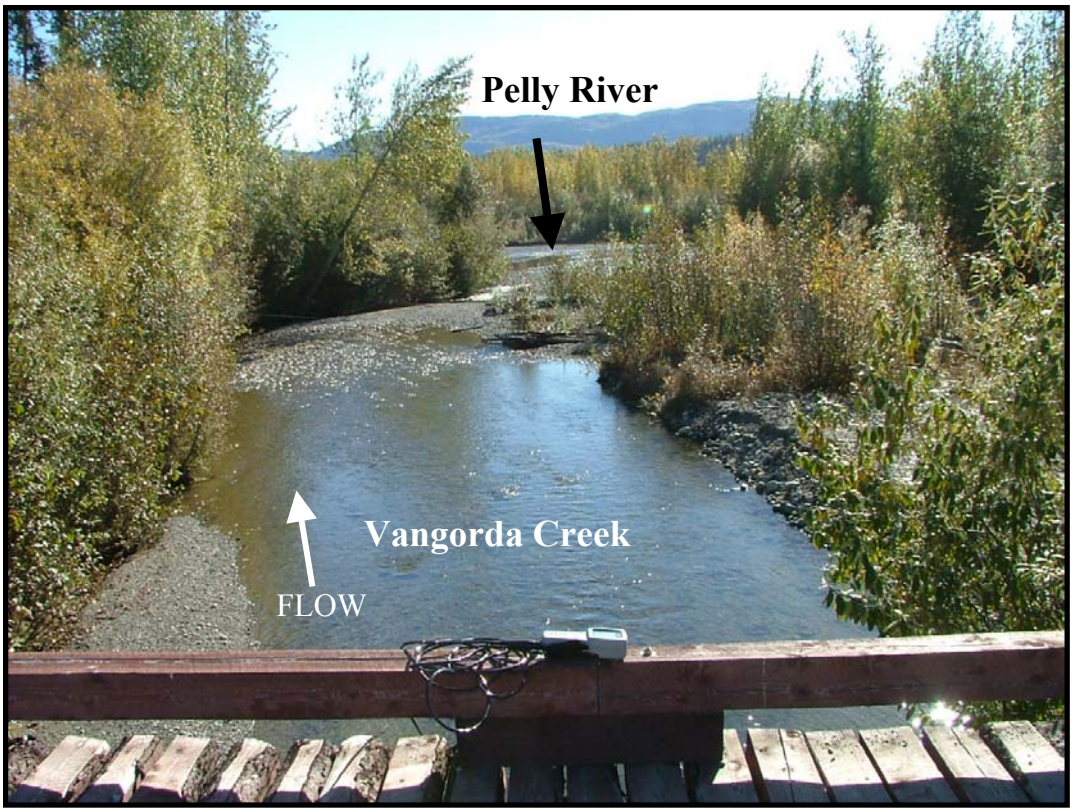
1. *Samples analyzed at Environmental Isotope Lab, Department of Earth Sciences, University of Waterloo, Ontario.*
2. *SMOW refers to Standard Mean Ocean Water.*

Appendix E

Photo Log of Site Visits

Photo of Staff Gauge constructed in permeable sediments adjacent to the Pelly River. A Level Logger sensor is hanging within the Staff Gauge collecting water elevations

OB2 located just south west of Pump House #1. Note that a protective cap has been installed. A Level Logger sensor has been hung from inside the cap to collect groundwater elevation data.



View looking south down Vangorda Creek from bridge. Pelly River flowing left to right in background.

View looking north up Vangorda Creek from bridge. Note the silt terrace in the background upon which the Town of Faro is located.

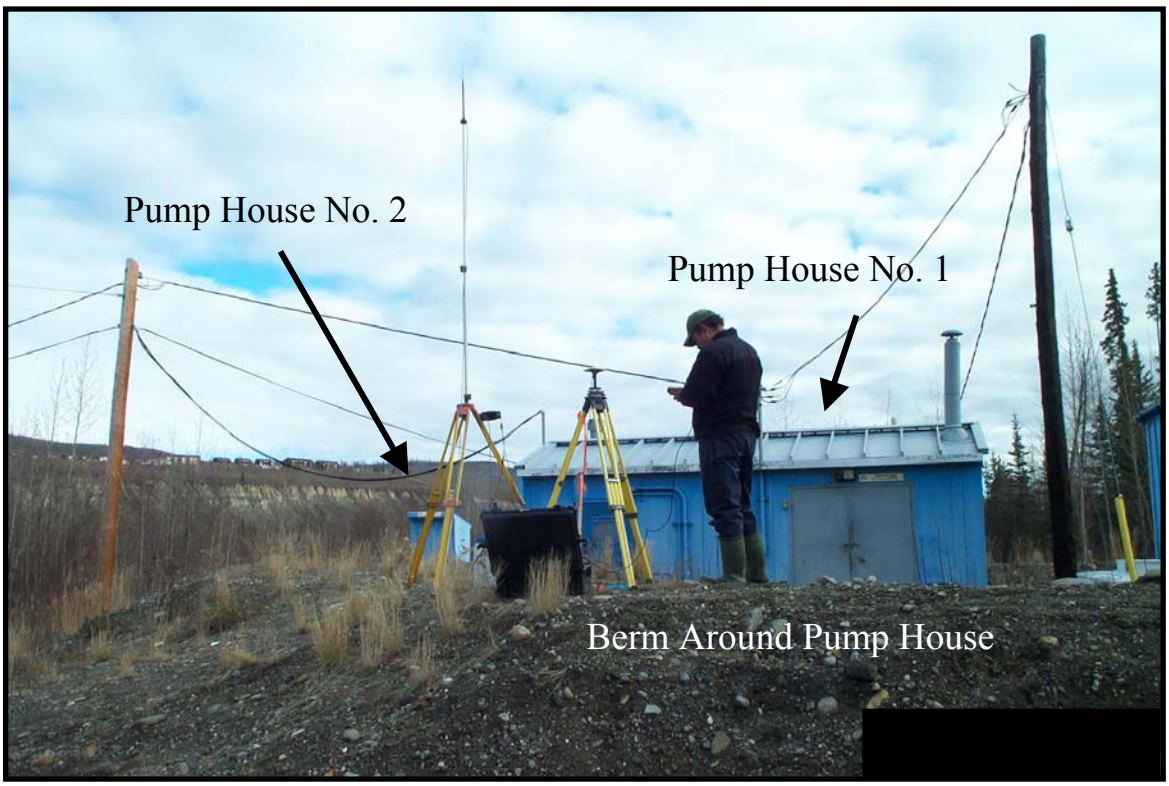
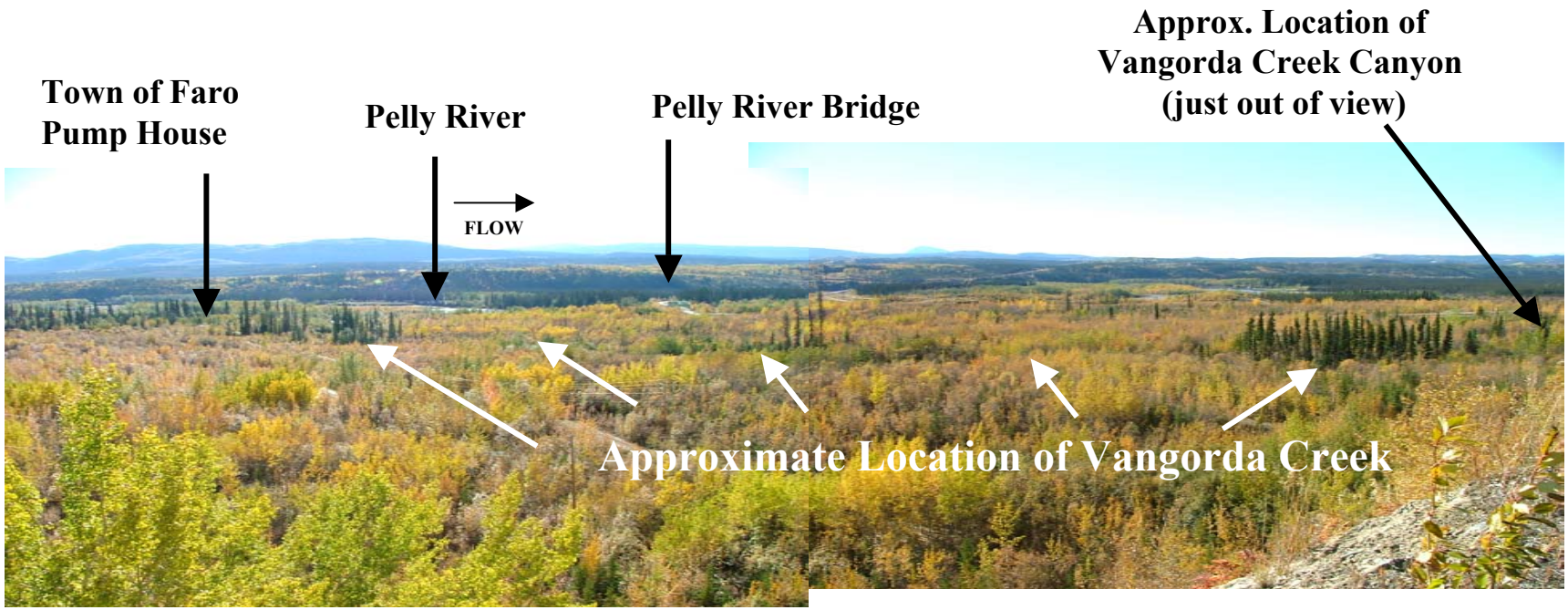


Photo of survey crew on top of berm – Town of Faro Pumphouses in background.

Photo of Forest Pearson (GLL) measuring the depth to groundwater water atOB6. Brush around wells has since been cleared and a PVC cap and Level Logger installed to collected groundwater elevation data at this location.

View of Vangorda Creek as it comes out of the Canyon onto the Vangorda Alluvial fan type deposits.

View of Vangorda Creek, just down stream (approx 20 m) of the photo location shown above. GS2 and a small foot bridge is just out of photo view to the right.



View looking out over Vangorda Alluvial deposits onto the Pelly River water coarse and flood plan. Note the moderate slope change following the exit of Vangorda Creek from the Canyon down onto the flood plan. The slope of the creek is reduced slightly as the creek comes off alluvial fan type deposits and onto the lower lying Pelly River flood plane type deposits.