

8.0 BUILDING M0134: BEAVER CREEK RCMP RESIDENCE

8.1 Description of Existing Water Supply System

Building M0134, a RCMP Residence in Beaver Creek, is currently served by a water supply system that delivers water from a well of unknown depth. The well is located in a pit approximately 3 m from the residence building. The well location and other details regarding the surrounding area are provided in Figure M0134-A in Appendix A8. The coordinates of the wellhead, as measured by a handheld GPS device, were recorded as:

- UTM ZONE 7
- Northing: 6917131
- Easting: 506146

The water system is equipped with a water softener and an in-line filter, but both were reportedly not functioning properly at the time of the water system assessment. There is no disinfection system present. A schematic detailing the water supply system is provided as Figure M0134-B in Appendix A8.

8.2 Description of Existing Wastewater Systems

There is a septic tank located west of the residence approximately 28 m northwest of the well. Septic effluent is discharged to the west of the tank in a septic field beginning at approximately 34 m from the well. Figure M0134-A in Appendix A8 gives a site plan showing the septic system.

8.3 Water Quality Results

8.3.1 Water Quality Results from Previous Sampling

Bacteriological

Four samples were collected from the M0134 Beaver Creek RCMP Residence water system between September 2004 and June 2005 and were tested for total coliform and *E. coli* by Yukon Environmental Health Services using the presence/absence test method. Results are tabulated in Table M0134-1 in Appendix A8. Coliform bacteria and *E. coli* were reported as absent in each of the four samples for which results are provided.

Potability

Water samples were previously collected from the M0134 Beaver Creek RCMP Residence water system on September 21, 2004 and June 15, 2005. The samples were submitted to Northwest Labs in Surrey, BC and ALS Environmental in Vancouver, BC for potability analyses. The results of these analyses are summarized in Table 3440-2 in Appendix A4. EBA reviewed the analytical results to compare them with the Canadian Drinking Water Quality Guidelines (CDWQG) to observe general water quality, identify and recommend additional sampling and analytical, and to identify indicators of potential contamination as follows:

- The water quality results indicated that all health based and aesthetic objectives were met for the parameters analyzed;
- The water quality results indicated that the groundwater from which this system receives its water supply is a calcium bicarbonate type water; and,
- The hardness (as CaCO₃) was 149 mg/L during the first sampling event and 140 mg/L during the second sampling event, and is considered hard.

8.3.2 Identification of Additional Analytical Testing Required

Additional analytical for the M0134 Beaver Creek RCMP Residence that was identified to be included during the water system assessments is detailed below:

- UV absorbance and UV transmissivity, as well as tannins and lignin, to determine potential for UV treatment as a disinfection option for this water system;
- Total organic carbon (TOC); and,
- Measurements in the field for total dissolved solids, conductivity, pH, and temperature.

Additional Analytical Results

A water sample was obtained during the water system assessment on July 27, 2005, and was submitted to ALS Environmental in Vancouver, BC for analysis. These results are summarized in Table M0134-2 in Appendix A8 and the laboratory reports are included in Appendix B. The water quality results from additional analytical sampling indicated that all health based and aesthetic objectives were met for the parameters analyzed.

8.3.3 Indicators of Potential Contamination

Chloride, nitrate and nitrite concentrations can indicate impacts from surfacewater sources or septic waste. Chloride concentrations were reported to be low and are considered to be within the normal background ranges for groundwater in the area. Nitrate and nitrite concentrations for this sample are also low and within the normal background range for this area. These water quality results do not suggest that the aquifer from which the groundwater is obtained for the M0134 Beaver Creek RCMP Residence is under the influence of surfacewater sources or septic wastes.

8.4 Conceptual Hydrogeology

There is no log available for this well. Most of the wells in the Beaver Creek indicate coarse sand and gravel with cobbles and small boulders to depths of at least 30 m. The well logs also indicate that discontinuous lenses of finer-grained sediments persist throughout the area, but in general the sediments are dominated by coarse alluvium. Some discontinuous permafrost is also interpreted to persist throughout the Beaver Creek area. The variability of sediments in the Beaver Creek area indicates limited aquifer protection from surficial sources of contamination. A study previously completed in the Beaver Creek area by EBA determined that the direction of groundwater flow in the vicinity of the site is north to northeasterly.

8.5 Potential Contaminant Sources

Potential contaminant sources identified during the water system assessment are compiled in field notes in Appendix A8. Photos of potential contaminant sources are also provided in Appendix A8.

Potential contaminant sources within 30 m of the wellhead are:

- An indoor fuel storage tank (AST) 3 m from the wellhead.

In addition, a septic tank is located 28 m away from the wellhead, and a septic field is located 34 m away.

8.5.1 Spills Records and Contaminated Sites Search Results

The Government of Yukon Environmental Programs Branch and Environment Canada Environmental Protection Branch did not identify any recorded spill events or contaminated sites issues for this site or neighbouring sites.

8.6 Identified Water System Deficiencies and Associated Risk

8.6.1 High and Medium Risk Deficiencies

- Poor surface completion of the wellhead (located in a pit below grade);
- There is no surface sanitary seal (grout or bentonite seal as required by the Canadian Groundwater Association's Guidelines for Water Well Construction; There is no well log available to review well construction and/or lithology;
- By definition of the Draft Yukon GUDI Assessment Guideline, the well is potentially under the direct influence because the well depth is unknown and the well construction does not meet the requirements of the Guidelines for Water Well Construction; and,
- There is no disinfection system.

8.6.2 Low Risk Deficiencies

- The in-line filter and water softener are both in poor condition. Water quality results and observations made during the water system assessment conclude that the water softener is not functioning properly; and,
- The softener drain is not installed to code.

8.7 Mitigative Options for Deficiencies

Mitigative options were developed to address the deficiencies identified in the previous section. Deficiencies are categorized by recommended level of priority (with Priority 1 being most critical).

8.7.1 Priority 1

- An NSF/ANSI 55 approved UV disinfection system should be installed. This is a conceptual design recommendations based on the information available for planning and budgeting purposes. Engineering input will be required for final system specifications.

8.7.2 Priority 2

- The wellhead at M0134 should be extended to a minimum of 500 mm above the surrounding grade, and the well pit should be backfilled with a low-permeability material to provide a surface seal around the well casing. A surface sanitary seal (grout or bentonite) should be installed as deep as possible during wellhead improvements.

8.7.3 Priority 3

- Upgrade plumbing to meet code;
- Repair water softener, and replace filter; and,
- Install secondary containment tray around AST.

8.8 Cost Estimates for Mitigative Options

Engineering costs for mitigative options are estimated to be 20% of construction costs, and would include inspection and completion reporting. The costs for materials and labour (not including engineering) are provided in the sections below. An additional contingency allowance of 20% is suggested for budgetary purposes.

8.8.1 Priority 1

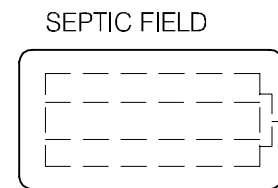
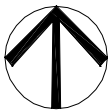
- It would cost approximately **\$2,200** for supply and installation of the recommended UV disinfection system.

8.8.2 Priority 2

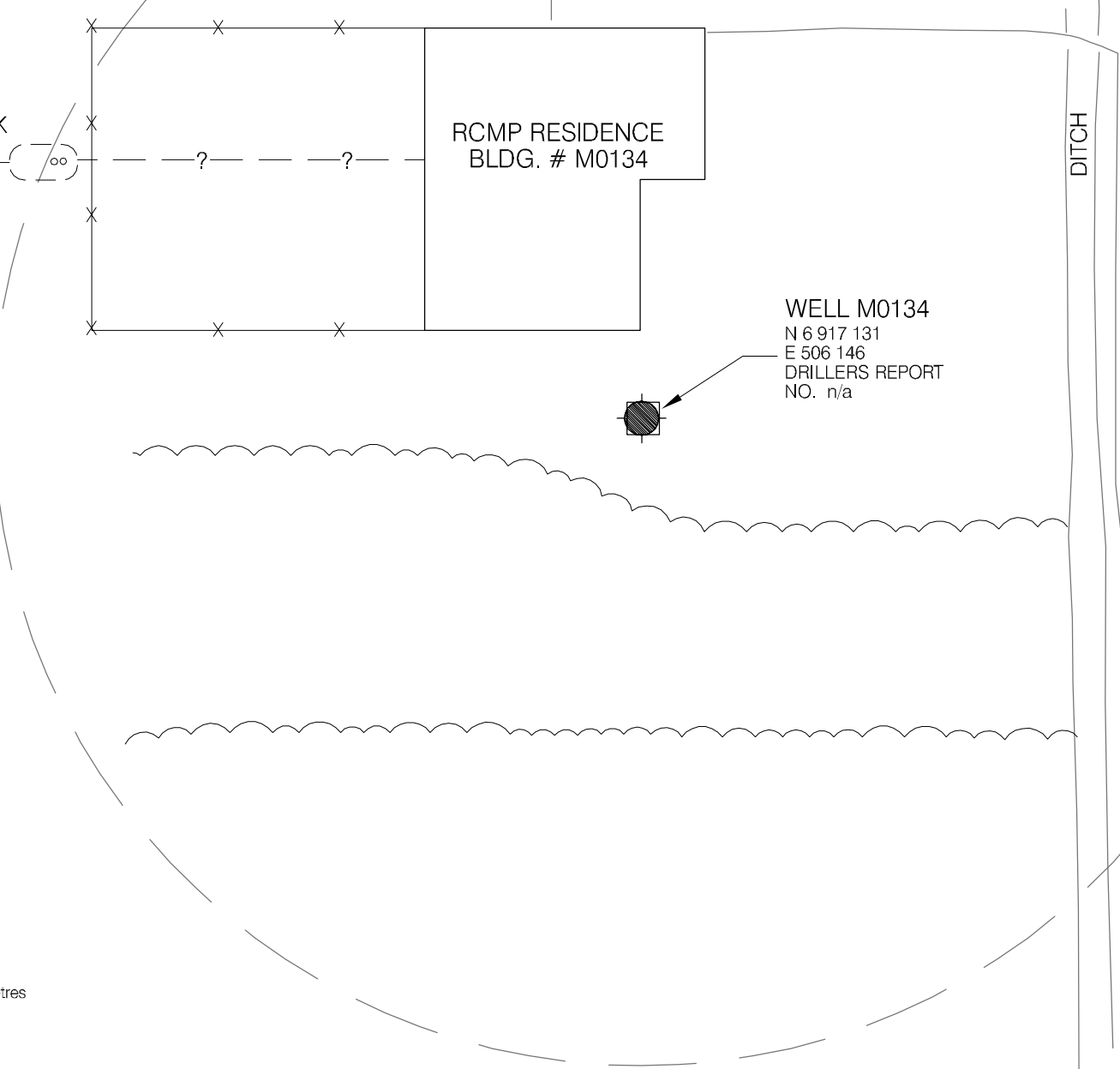
- Standard wellhead upgrades (casing extension, sanitary seal, plumbing and electrical extensions, and insulation and heat trace as necessary) would cost approximately **\$4,000**.
- Installation of NSF 61 NSF 61 filtration system (to 1 micron absolute) would cost in the order of **\$500**.

8.8.3 Priority 3

- It is estimated that the recommended plumbing upgrades would cost approximately **\$100**;
- To repair the water softener (replace media), and replace filter would cost approximately **\$600** for materials and labour; and,
- To supply and install a secondary containment tray around the AST would cost approximately **\$500**.



SEPTIC TANK



TO M00133 RESIDENCE

DRIVEWAY

RCMP RESIDENCE
BLDG. # M0134

DITCH

WELL M0134
N 6 917 131
E 506 146
DRILLERS REPORT
NO. n/a



SCALE 1:300


NOTES:
1. UTM COORDINATES OBTAINED WITH A HAND HELD GPS USING NAD83 SYSTEM AND ARE CONSIDERED TO BE ACCURATE TO 10.0 m, APPROXIMATELY.

 30 m RADIUS FROM WATER WELL FOR CONSIDERATION OF PROXIMITY TO POTENTIAL CONTAMINANT SOURCES.

No.	DESCRIPTION	DATE	APPROVED
0	ISSUED FOR CLIENT REVIEW	DD/MM/YY	XXX
	REVISION		

EBA Engineering Consultants Ltd.

DESIGNED BY: R. MARTIN
 DRAWN BY: J. BUYCK
 DATE: AUG. 2005
 SCALE: AS SHOWN
 PROJECT No.: 1260002.003
 ACAD FILENAME: 003-WESTERN REGION

CLIENT:

 Highways and Public Works
 Property Management Branch

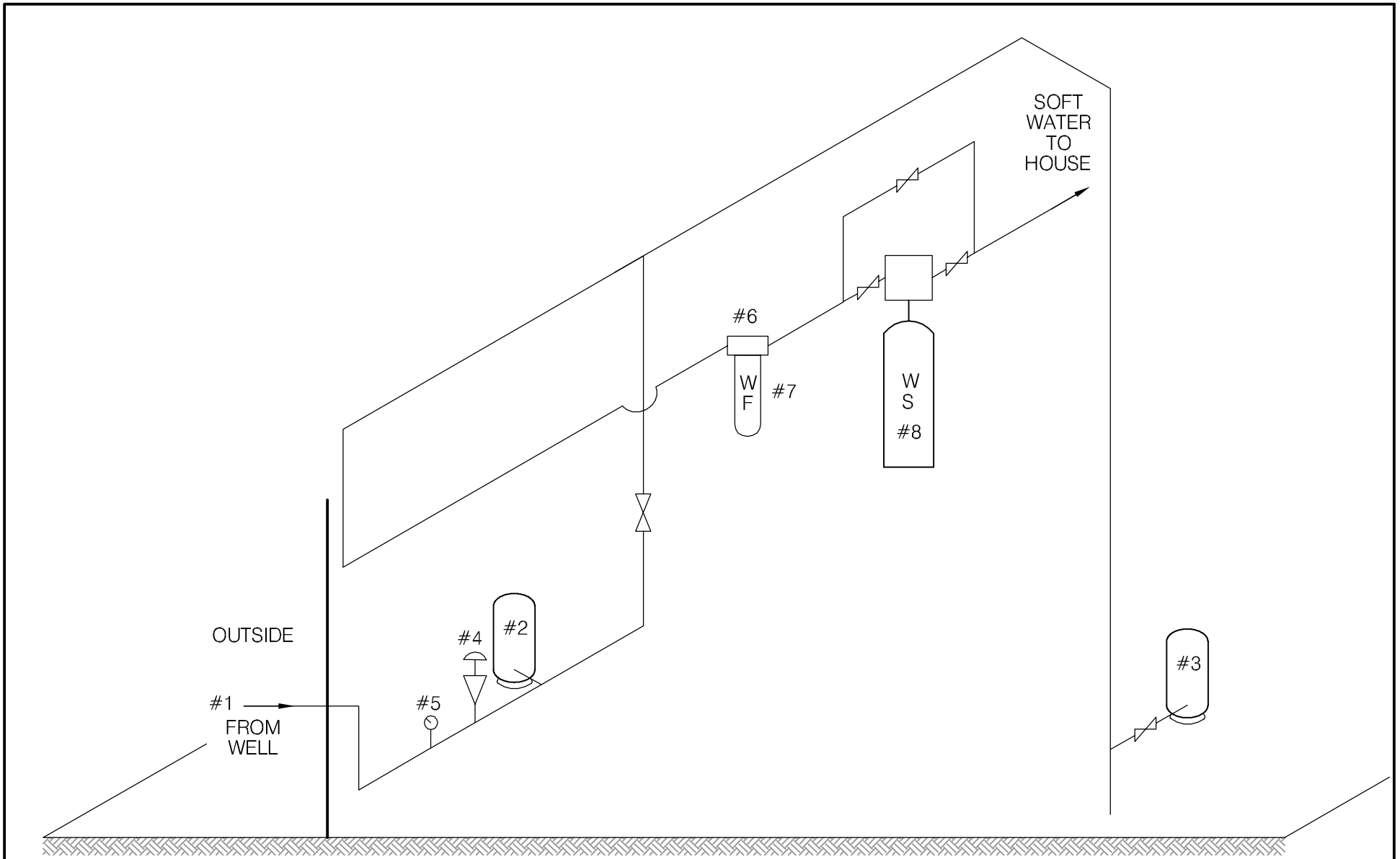
SMALL PUBLIC WATER SYSTEMS ASSESSMENT
WESTERN REGION

GOVERNMENT OF YUKON
HIGHWAYS & PUBLIC WORKS



BEAVER CREEK RCMP
RESIDENCE BUILDING # M0134
SITE LOCATION DIAGRAM
WELL ID: M0134

REVISION ISSUE
0

FIGURE No.
FIGURE M0134-A



SCHEMATIC PRODUCED BY BERT ALBISSER OF AQUA TECH SUPPLIES AND SERVICES LTD.

 EBA Engineering Consultants Ltd.		PROJECT SMALL PUBLIC WATER SYSTEMS ASSESSMENT WESTERN REGION							
CLIENT 		TITLE WATER SYSTEM DISTRIBUTION/TREATMENT SCHEMATIC SYSTEM ID.: M0134 BEAVER CREEK RCMP RESIDENCE							
DATE	SEPT. 2005	DWN.	JSB	CHKD.	FMM	FILE NO.	1260002.003	DWG.:	FIGURE M0134-B

Western Region – R.C.M.P. Housing
Building # MO134

DISTRIBUTION & TREATMENT SYSTEM DATA

Item	Description	Manufacturer	Model	Part No.	Serial No.	Size
1	SUB PUMP	GOULDS	7G505-412L		C771224Z	4" - 1/2 HP
2	PRESSURE TANK #1	GOULDS	V60		GG9914	
3	PRESSURE TANK #2	WELL RITE	NR-260			
4	PRESSURE SWITCH	SQARE D	FSG-2			2HP 1/4" NPT
5	PRESSURE GAUGE	MARSH	2"-(0-100 PSI)			2" 1/4" NPT
6	INLINE FILTER	CUNO	10" CLURE			
7	INLINE CART	CUNO	10"-AP110			
8	WATER SOFTNER	NOVATEK	HC20MI		202531	20K.
9						
10						

TABLE MO134- 1: SUMMARY OF BACTERIOLOGICAL RESULTS

Building #	Building Name	Number of Sampling Events	Time Period over which Sampling was Done	Any Positive Total Coliform Results? (yes or no)	Fraction of Positive Total Coliform Results vs. Total Sampling Events	Any positive E.Coli results? (yes or no)	Most Recent Sampling Event Available for EBA Review	Is Most Recent Result Positive?
M0134	Beaver Creek R.C.M.P. Residence	4	Sept-04 to Jun-05	no	0/4	no	16-Jun-05	no



Table M0134-2: Water Quality Results

SOURCE:		Building M0134 - Beaver Creek RCMP Residence			GCDWQ Criteria					
Location/ Resident		Beaver Creek								
Address										
Treatment		None								
Disinfection		None								
Source of Water		On-site well								
Purpose of Sampling		Base Line	Base Line	Additional Analytical						
Sample Location				Kitchen tap						
Date Sampled		23-Sep-04	15-Jun-05	27-Jul-05				Lower	Upper Limit	
Physical Tests (ALS)								AO	MAC	AO
Colour (CU)		<5	<5.0	-			15			
Conductivity (uS/cm)			310	-						
Total Dissolved Solids		164	188	-			500			
Hardness CaCO3		149	140	-	AO >200 = poor, > 500 unacceptable ^A					
pH		8.21	8.24	-	6.5		8.5			
Turbidity (NTU)		0.5	0.84	-		1	5			
UV Absorbance				0.0080						
% UV Transmittance				98.2						
Dissolved Anions (ALS)										
Alkalinity-Total CaCO3		119	131	-						
Chloride Cl		<0.5	1.08	-			250			
Fluoride F		<0.05	0.06	-		1.5				
Silicate SiO4				-						
Sulphate SO4		32.6	35.3	-			500			
Nitrate Nitrogen N		0.2	0.22	-		10				
Nitrite Nitrogen N		<0.05	<0.10	-		3.2				
Ammonia Nitrogen N				-						
Total Phosphate PO4				-						
Total Metals (ALS)										
Aluminum T-Al		<0.005	<0.010	-						
Antimony T-Sb		<0.0002	<0.00050	-		0.006				
Arsenic T-As		0.0011	0.00095	-		0.025				
Barium T-Ba		0.017	<0.020	-		1				
Boron T-B		0.026	<0.10	-		5				
Cadmium T-Cd		<0.00001	<0.00020	-		0.005				
Calcium T-Ca			44.9	-						
Chromium T-Cr		0.0007	<0.0020	-		0.05				
Copper T-Cu		0.153	0.139	-		1				
Iron T-Fe		0.03	<0.030	-			0.3			
Lead T-Pb		<0.0001	<0.0010	-		0.01				
Magnesium T-Mg			6.8	-						
Manganese T-Mn		<0.005	<0.0020	-			0.05			
Mercury T-Hg			<0.00020	-		0.001				
Potassium T-K			1.25	-						
Selenium T-Se			<0.0010	-		0.01				
Sodium T-Na			2.7	-			200			
Uranium T-U		<0.0005	0.00035	-		0.02				
Vanadium T-V				-						
Zinc T-Zn		0.003	<0.050	-			5			
Organic Parameters										
Tannin and Lignin				<0.10						
Total Organic Carbon C				0.72						
Field Chemistry (EBA)										
pH				8.31	6.5		8.5			
TDS (ppm)				149			500			
EC (uS/cm)				308						
Temperature (°C)				9.6						
Free Available Chlorine										

Notes:

A. Guidelines indicated for hardness are not CDWQG, rather they are general aesthetic guidelines - exceedences are indicated in yellow highlighting.

Italics and underline indicates exceedence of proposed MAC (ie. arsenic)

Bold with Yellow highlighting indicates exceedence of CDWQG Aesthetic Objective (AO)

Bold Underline with Yellow highlighting indicates exceedence of CDWQG MAC

Results are expressed as milligrams per litre except for pH and Colour (CU)

Conductivity (umhos/cm), Temperature (°C) and Turbidity (NTU)

< = Less than the detection limit indicated.

AO = Aesthetic Objective

MAC = Maximum Acceptable Concentration (Health Based)



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SMALL PUBLIC WATER SYSTEM ASSESSMENT

PART A: EBA Site Inspection

Inspector: Ryan Martin, Luke Lebel

Date July 27, 2005

WELL ID #	Owner	Location Description
M0134	RCMP	Beaver Creek RCMP Residence (South)

1. Well Location and Potential Contaminant Sources

a. General location of well: (Community, Subdivision, etc.)

Beaver Creek

b. Specific location: (Road or street, Building number, name of owner and/, legal description,

c. GPS location: N 6917131 E 506146 elev 669m ±6m

d. Is there electric power? Yes No

e. Is there outside water access? Yes No

f. Does the well system have:

15 or more service connections to a piped distribution system? If so how many _____
RCMP Residence

5 or more delivery sites on a trucked distribution system? If so how many _____

g. Nearest building, specify RCMP Residence

h. Distance from well to building ~3m

i. If there is an effluent disposal field, is its location known? Yes No

j. Distance from well to nearest point of known field: ~28m to tank, ~37m to field

k. Well location relative to field: upslope downslope lateral

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l. Is there any part of a sewage disposal system(s) or other potential sources of pollution that may pose a health and safety risk within 30 m? Yes No

m. Is the well located within 300 m from a sewage lagoon or pit? Yes No unlikely

n. Is the well located within 120 m from a solid waste site or dump, cemetery? Yes No unlikely

o. Is the infrastructure protecting the wellhead, pumphouse, storage tank and/or water treatment plant designed and secured to prevent:

Unauthorized access by humans? Yes No *unlocked enclosure* Entrance by animals? Yes No *Access possible*

p. Is well site subject to flooding? Yes No *Dampness in pit*

q. Is the well site well drained? Yes No

r. Is there a buried fuel tank on the property? Yes No unlikely

If yes, is it in use abandoned

Is the location known? Yes No

Distance from the well to known buried tank _____

s. Are there any other known contaminant sources on the property?

Yes No Describe _____

If yes, specify the source: dump sewage lagoon cemetery other

Potential Source 1: Indoor AST; Distance from well to Potential Source 1: _____

Potential Source 2: _____; Distance from well to Potential Source 2: _____

Potential Source 3: _____; Distance from well to Potential Source 3: _____

Potential Source 4: _____; Distance from well to Potential Source 4: _____

t. Are there other wells on this property? Yes No

How many? _____ in use abandoned require proper sealing

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2. Well and Wellhead information:

- a. When was well installed? Year unknown ^{- within the last 5 years} Month _____
- b. Type: drilled dug sand point other _____
- c. Is there a drillers log for the well: Yes No
- d. Is there a surface seal to 6 m Yes No unknown unlikely
- e. Surface casing: Yes Diameter _____ No
- f. Well casing: Diameter 15cm Material: steel plastic concrete
- g. Depth of well: unknown measured (if possible) reported from log
- h. Static water level below ground: unknown
 measured (if possible) reported from log flowing
- i. (If granular) Is the well completed: open end casing with a well screen
 with slotted pipe unknown other _____
- j. (If bedrock) Does the well have a liner? yes No steel plastic
- k. If there is a well screen: length unknown slot size(s) _____
Location of screen: from _____ to _____ from log reported
- l. Is there a sump below the screen? Yes No unlikely
- m. Is the well head: in pumphouse in pit pitless adaptor in a building
 in a wooden enclosure other, describe _____
- n. If the well head is located in a wooden enclosure,

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- i. Is the well head below grade? describe in detail ~ 1.05 m below grade
- ii. Are there signs of ponding on the enclosure(e.g. water stains, etc.)? Yes No
- iii. Is the wellhead enclosed by fiberglass insulations? Yes No
- iv. Any evidence of rodents? Specify Yes,
- v. Does the well casing have a proper seal cap? Yes No
If no, describe condition split gasket cap

3. Water Supplying This Well:

- a. By definition is the water from a surface water source or under the direct influence of surface water?
 Yes No farther investigation required.

If yes is there treatment or disinfection Yes No

Explain (filtration, disinfection etc...) _____

4. Aquifer Supplying This Well:

- a. The aquifer is: bedrock granular sediment unknown
likely
- b. Does water level and/or well capacity show seasonal fluctuation? Yes No
unlikely

5. Pump Installation:

- a. Is the well equipped with a pump? yes No
- b. Type of pump: hand electric submersible jet
 shallow well centrifugal other, _____
- c. Description: Manufacturer _____ Model _____
horsepower _____ capacity _____ voltage _____

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d. Date installed: _____ By: _____

e. For submersible pump, depth of setting below surface _____

f. Drop pipe for submersible pump: steel plastic

g. Pump delivers water to: pressure tank elevated tank other

h. Are there automatic pump controls: Yes No

i. Is there provision for taking water samples before water reaches storage? Yes No

j. Is there a water meter on the system? Yes No

k. Is the pump and piping protected from freezing? Yes No

If yes, describe: Insulation and heat trace

l. Comments on pump installation: _____

6. Conclusions

a. Comments on overall installation:

b. Recommendations: _____

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PART B: EBA Site Inspection

Inspector: BERT ALBISSER

Date JULY 27/05

WELL ID #	Owner	Location Description
<u>M0134</u>	<u>YTG</u>	<u>RAMP RES BEAVER CREEK</u>

6. Water Treatment

- a. Is well water treated? Yes No; Type of treatment: WATER SOFTENER
- chlorination iron and or manganese removal other _____
- b. Is water entering plumbing or piped distribution system treated with chlorine or another treatment that is as effective as chlorine used to achieve disinfection throughout the system?
- Yes No If so how _____
- c. If treated with chlorine, is the free residual chlorine concentration less than 0.2 mg/L
- Yes No _____ reading.
- Tested at _____ (location)
- d. Is testing for chlorine residual concentration done at the tap (eg. Kitchen faucet) or from representative points in a piped distribution system, including a point from tap at the end line
- Yes No If yes how often? _____
- e. If the drinking water is being transported by water delivery truck does it have a minimum chlorine free residual of 0.4 mg/L at the time of fill. Yes No

7. Water Quality (observations):

- a. Does the water stain plumbing? yes No slight severe
- Type of stain: brown red black
- b. Does the water contain sediment? Yes No occasional constant
- c. Is there an unpleasant odour? Yes No H₂S Other _____

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- d. Is there an unpleasant taste? Yes No brackish Other _____
- e. Is there a history of bad bacterial analyses? Yes No
- f. Is there a chemical analysis? Yes No adequate incomplete
- g. Is there analysis of trihalomethanes (THMs) where the water source is a surface water supply or a well under the direct influence of surface water? Yes No
- h. Is the drinking water tested daily with an accurate reading chlorine test kit capable of reading in the range 0 to 3.5 mg/L of free chlorine residual in increments of 0.1mg/L? Yes No unknown
- i. If yes is the test performed in accordance with manufactures directions? Yes No unknown
- j. Is a record of the date, time, name of person performing the test and results of the drinking water sample kept? Yes No

TANK AND PIPING DETAILS

Tank Room

Is there a water tank? Yes No Details: PRESSURE TANK.

Where is it located?

Comments: BASEMENT

Is the room in which the water tank is located heated to maintain an optimum temperature of 4°C for stored water?

YES NO

Comments: _____

Are there windows in the add-on that may allow direct sunlight onto the water holding tank? YES

NO

Comments: _____

Are there other heat sources near the tank? YES NO

Comments: _____

Is there waterproof flooring with a sealed base to contain spills? YES NO

Comments: _____

Overall Tank

What are the tank size and dimensions?

What material is the tank constructed of? _____

Is tank and associated piping constructed of safe materials (i.e. CSA approved and material that does not affect the taste of the water)? YES NO

Comments: _____

Tank Inlet, Outlet and Lid

Is there adequate access on the tank for cleaning (i.e. min 15" access lid)? YES NO

Does the lid have a tight seal and is it watertight when closed? YES NO

Does the tank have an overflow or high level whistle? YES NO

Is the water tank drain accessible? YES NO

WATER TANK AND WATER QUALITY CONDITION

Are there signs of staining or biofouling? YES NO

Comments: _____

Is there any sediment or scum in bottom of tank? YES NO

Comments: _____

Is there any odour associated with the water or tank? YES NO

Have there been any bacteriological analyses conducted previously? YES NO

Does the tank appear that it has been cleaned recently? YES NO

Are the tanks easily assessed for the purpose of cleaning and disinfection? YES NO

8. Conclusions

a. Comments on overall installation:

INSIDE INSTALLATION IS OF GOOD QUALITY.
INLINE FILTER AND WATER SOFTENER IS IN
VERY BAD CONDITION.
SOFTENER DRAIN NOT TO CODE.

b. Recommendations:

REPAIR SOFTENER & INLINE FILTER AS
NECESSARY TO PROVIDE PRETREAT FOR UV
SYSTEM. INSTALL UV SYSTEM FOR
APPROPRIATE FLOW.
INSTITUTE BI-ANNUAL WELL MAINTENANCE
PROGRAM. MAINTAIN TREATMENT SYSTEM
IN WORKING ORDER.



Photo 0549: M0134 Beaver Creek RCMP Residence (right), wellhead enclosure (left)



Photo 0547: M0134 Septic field looking east towards residence

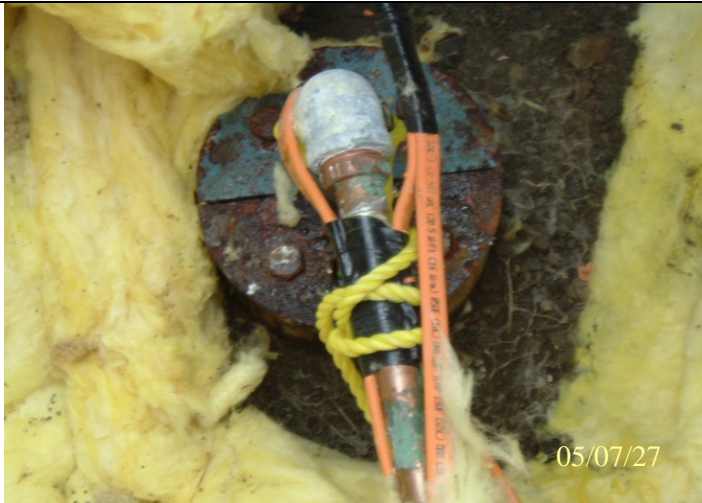


Photo 0550: M0134 Wellhead in pit



Photo 0094: M0134 pressure tank and pump controls