

25.0 BUILDING 6975: CARMACKS HEALTH CENTRE

25.1 Description of Existing Water Supply System

Building 6975, the Carmacks Health Centre, is currently supplied water from a 17.7 m deep well located in a well house approximately 3 m from the Health Centre building. The well supply serves both the Health Centre and the adjacent Nurses Residence. The well location and other site details are provided as Figure 6975-A in Appendix A25. There is a filtration and water softening system included on the water supply system that delivers water to the Health Centre. A schematic detailing the water supply system is provided as Figure 6975-B in Appendix A25. The coordinates of the wellhead, as measured by a hand held GPS device, were recorded as:

- UTM ZONE 8
- Northing: 6884848
- Easting: 433110

25.2 Description of Existing Wastewater Systems

The Health Centre and Nursing Station are serviced by a piped sewer collection system provided by the Village of Carmacks. There are service lines, and potentially sewer mains that are within 30 m the well.

25.3 Water Quality Results

25.3.1 Water Quality Results from Previous Sampling

Bacteriological

Bacteriological sampling of water from the Carmacks Health Centre water system has previously been completed by YTG this year. EBA was provided access to the YTG database in order to review the results of this previous bacteriological sampling. Two samples were collected from this system in 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 6975-1 located in Appendix A25.

According to the YTG database, *E. coli* and Total Coliform Bacteria were absent in each of the two samples for which results were provided.

Detailed Potability Analyses

PMA representatives previously collected a water sample from the Carmacks Health Centre water system on October 5, 2004. The sample was submitted to ETL EnviroTest in Surrey BC for detailed potability analyses. The results of these analyses are summarized in Table 6975-2 in Appendix A25. EBA reviewed the analytical results to compare them with the CDWQG and to observe general water quality, identify and recommend additional sampling and analytical, and to identify potential indicators of contamination.

- The water quality for the softened water sample obtained on October 5, 2004 indicated that the water is a potassium sulphate type due to the softening process, but that the groundwater type, as evidenced from the surrounding well water quality is likely calcium bi-carbonate type.
- The water quality results indicated that all health based and aesthetic objectives were met for the parameters analyzed. The hardness (as CaCO₃) was reported to be less than 1 mg/L, is considered very soft as expected of softened water treated with an ion exchange system.

25.3.2 Identification of Additional Analytical Testing Required

Additional analytical for the Carmacks Health Centre that was identified to be included during the water system assessments is detailed below:

- UV absorbance, to determine potential for UV treatment as a disinfection option in both the main Health Centre building.
- Measurements in the field for total dissolved solids, conductivity, pH, and temperature were completed at both the main Health Centre Building and the Nursing Residence at the time of sampling.
- Extractable Petroleum Hydrocarbons (EPH) and Polycyclic Aromatic Hydrocarbons (PAH) were also collected for analysis to determine whether the documented fuel spill at the site had resulted in contamination of the water supply.

Additional Analytical Results

A water sample was collected by EBA during the field program on May 10, 2005, and was submitted to ALS Environmental in Vancouver BC for UV absorbance, PAH and EPH analysis. These results are summarized in Table 6975-2 in Appendix A25 and the laboratory reports are included in Appendix B.

EPH and PAH were below analytical detection limits, suggesting that at this time, the previously documented fuel spill is not impacting this well.

25.3.3 Indicators of Potential Contamination

Chloride, nitrate and nitrite concentrations can indicate impacts from surfacewater sources or septic waste. Chloride concentrations for the sample obtained on October 5 2004 is low and can be considered to be within the normal background ranges for groundwater in the Carmacks area. Nitrate and nitrite concentrations for this sample were also low and within the normal background range for the Carmacks area. Therefore, these water quality results suggest that the aquifer from which the groundwater is obtained for the Carmacks Health Center was not under the influence of anthropogenic sources of nutrients or anions such as septic wastes at the time of sampling.

25.4 Conceptual Hydrogeology

Residents of the Central Village of Carmacks obtain their water supply from wells completed in a permeable unconfined sand and gravel aquifer in glaciofluvial and recent alluvial deposits. The regional groundwater flow direction in the vicinity of Village Core is northeast toward the Yukon River.

25.5 Potential Contaminant Sources

Potential contaminant sources from observations during the site investigation are compiled in Table 6975 in Appendix A25. Photos of potential contaminant sources are provided in Appendix A25.

A summary of potential contaminant sources within 30 m of the wells is provided below:

- Fuel powered generator at 2 m; and,
- Above ground fuel storage tank at 11 m.

25.5.1 Spills Records and Contaminated Sites Search Results

Investigation of available spills record information did not identify any concerns for this site. It was reported by the Environment Branch, however, that a soil relocation permit had been issued for this site in 2003. We understand that the a heating fuel oil leak in the underground line between the AST and the Health Centre had occurred approximately 4 years ago. EBA has not reviewed the results of the remedial excavation to remove the contaminated soils. The most recent water quality analysis shows no evidence of hydrocarbon contamination despite the close proximity to the well and the shallow nature of the aquifer.

25.6 Identified Water System Deficiencies and Associated Risk

25.6.1 High and Medium Risk Deficiencies

The following deficiencies were identified as high-risk for the Carmacks Health Centre:

- The wellhead is located within 30 m of potential sources of contamination. There is an above ground storage tank located 11 m from the well, and the fuel line that runs to the health centre has leaked in the past;
- The well is not equipped with a surface sanitary seal (grout or bentonite seal as required by the Canadian Groundwater Association's Well Construction Guidelines);
- By definition of the Draft Yukon GUDI Assessment Guideline, the well is potentially under the direct influence of surface water because it does not meet the requirements of the Guidelines for Water Well Construction;
- The hydrogeology of the area also indicates that there are no protective low permeability layers between the surface and the water table. At 17.7 m deep, the well is considered to be a relatively shallow. The well, therefore, would be considered to be at high-risk of contamination from surface sources;
- The wellhead is located in a pump house that contains a back-up generator for the health centre and the well casing only extends 60 mm above floor level.

25.7 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).

25.7.1 Priority 1

The following Priority 1 mitigative recommendations should be implemented to address the deficiencies associated with the water system at the Carmacks Health Centre.

- The existing 20-micron filtration system should be replaced with an NSF 61 certified inline commercial filtration system capable of removing particles down to 1 micron (absolute) in size.
- A NSF/ANSI 55 certified UV disinfection system should be installed, and the existing water softener should be adequate for use as a pretreatment system. This is a conceptual design recommendation based on the information available for planning and budgeting purposes. Engineering input will be required for final system specifications.
- It would not be possible to install a proper surface seal to 6 m below grade. The well casing should; however, be extended to at least 500 mm above the pump house floor, and a secondary containment system should be installed around the generator to mitigate any risk of fuel leakage.
- Secondary containment should be installed on the above ground storage tank, or else the tank should be replaced with double walled fuel storage tanks.
- The Point of Entry treatment system should be installed in the pump house if there is room available, so that it can offer treatment to both water supply systems that are dependent on the well.

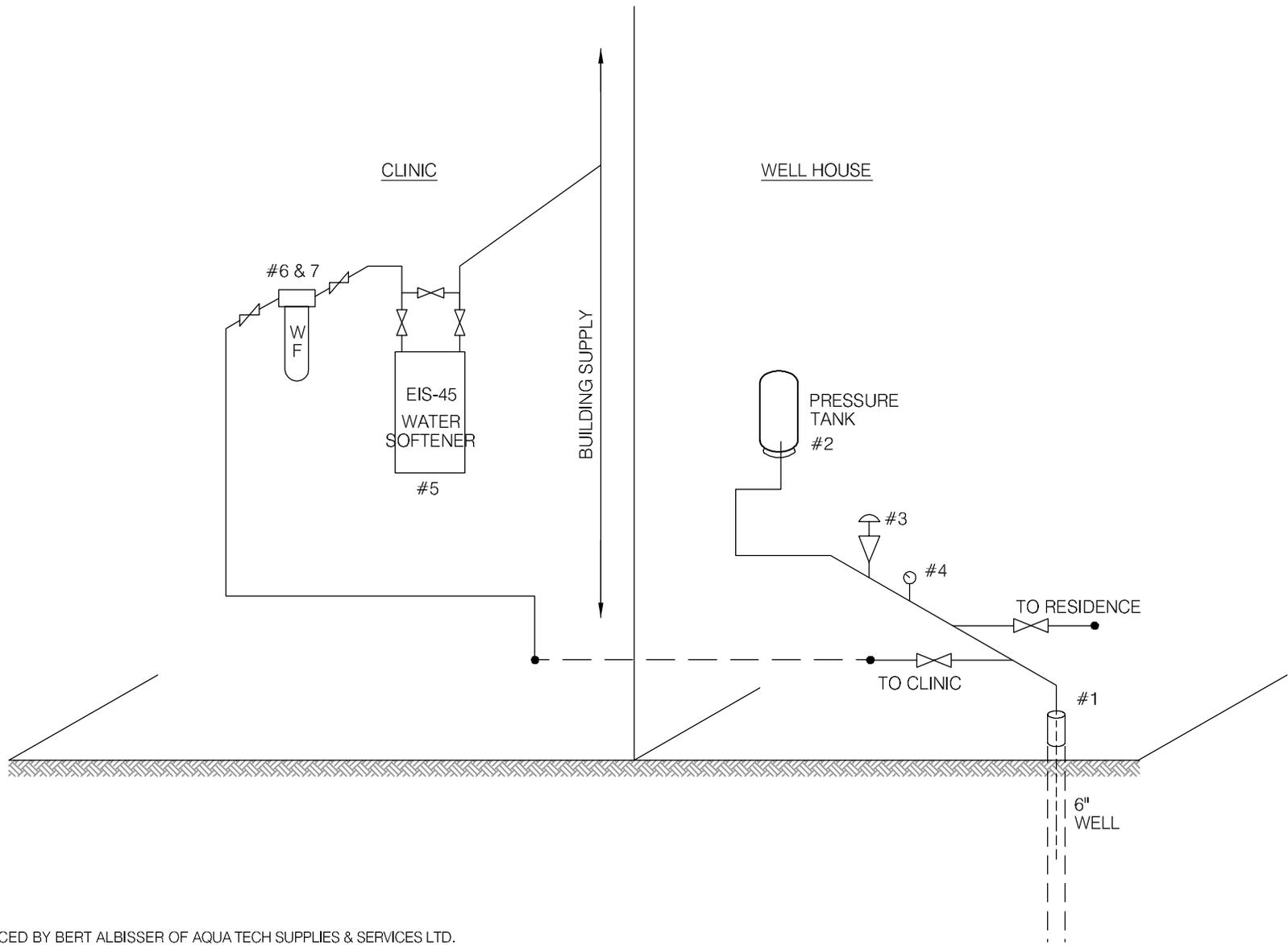
25.8 Cost Estimates for Mitigative Options

Engineering costs for pre-design and preparation of process diagrams and specifications for project tendering for water treatment systems are estimated to be 25% of construction costs. Engineering costs for other 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.

25.8.1 Priority 1

Class D cost estimates for mitigative option to address the well deficiencies for this site are as follows:

- The cost for the proposed disinfection/treatment system would amount to a total installed cost of about **\$5,000**.
- To extend the well casing to 500 mm above the pump house floor level would cost approximately **\$500**, and a secondary containment tray underneath the generator and fuel lines in the pump house is estimated to cost approximately **\$1000**.
- Replacing the existing above ground fuel storage tank with a double walled secondary containment tank would likely cost approximately **\$3,800**.
- Placing the treatment system in the pump house should incur no more cost than placing it in the health centre.



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

 EBA Engineering Consultants Ltd.		PROJECT SMALL PUBLIC WATER SYSTEMS ASSESSMENT WHITEHORSE REGION	
CLIENT 		TITLE WATER SYSTEM DISTRIBUTION/TREATMENT SCHEMATIC SYSTEM ID.: 6975 CARMACKS HEALTH CENTRE	
DATE	APRIL 2006	DWN.	JSB
CHKD.	FMM	FILE NO.	1260002.001
		DWG.:	FIGURE 6975B

Whitehorse Region – Health Centre
 Building # ~~6975~~ 6975
 6975

DISTRIBUTION & TREATMENT SYSTEM DATA

Item	Description	Manufacturer	Model	Part No.	Serial No.	Size
1	SUB. PUMP	MONARCH	16CISEX		828	4" - 1/2 HP.
2	PRESSURE TANK	CHALLENGER	PC 244			307 l
3	PRESSURE SWITCH	SEQ. D	FSG-2			1/4 FIFT x 2 HP
4	PRESSURE GAUGE	MARSH	0-100			1/4" FIFT.
5	WATER SOFTENER	WATERTECH	E1545 MI			45000 GRAIN
6	PRE FILTER	AMETEK.	1" BIG BLUE			4" x 10"
7	FILTER CART	PLYMOUTH	51-BB			20 HICKON
8						
9						
10						

TABLE 6975 - 1: SUMMARY OF BACTERIOLOGICAL RESULTS

		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?
Building #	Building Name							
6975	Health Centre	2	Apr-05 to May-05	no	0/2	no	May 05	no



Table 6975-2: Water Quality Results

SOURCE:	Building 6975 A - Carmacks Health Centre		Building 6975 B - Carmacks Nursing Residence		GCDWQ Criteria		
	Location/ Resident	Carmacks		Carmacks			
Address	Lot 123		Lot 123				
Treatment	Filter and Softener		UV System				
Source of Water	On-Site Well (shares with 6975 B)		On-Site Well (shares with 6975 A)				
Purpose of Sampling	Baseline	Additional Sampling	Baseline	Additional Sampling			
Sample Location		Kitchen Tap		Laundry Sink Tap			
Date Sampled	5-Oct-04	12-May-05		12-May-05			
Physical Tests (ALS)					AO	MAC	AO
Colour (CU)	<3						15
Conductivity (uS/cm)	612						
Total Dissolved Solids	365						500
Hardness CaCO3	<1				AO >200 = poor, > 500 unacceptable ^A		
pH	8.1				6.5		8.5
Turbidity (NTU)	0.15					1	5
UV Absorbance		<0.0010		<0.0010			
Dissolved Anions (ALS)							
Alkalinity-Total CaCO3	231						
Chloride Cl	5						250
Fluoride F	0.2					1.5	
Sulphate SO4	24.8						500
Nitrate Nitrogen N	<0.1					10	
Nitrite Nitrogen N	<0.05					1	
Ammonia Nitrogen N							
Total Metals (ALS)							
Aluminum T-Al	<0.02					0.1	
Antimony T-Sb	0.0007					0.006	
Arsenic T-As	0.0031					0.025	
Barium T-Ba	0.0002					1	
Boron T-B	<0.02					5	
Cadmium T-Cd	<0.0002					0.005	
Calcium T-Ca	<0.5						
Chromium T-Cr	0.001					0.05	
Copper T-Cu	<0.001					1	
Iron T-Fe	0.009						0.3
Lead T-Pb	0.0002					0.01	
Magnesium T-Mg	<0.1						
Manganese T-Mn	0.001						0.05
Mercury T-Hg	<0.0002					0.001	
Potassium T-K	212						
Selenium T-Se	<0.0004					0.01	
Sodium T-Na	<1						200
Uranium T-U	0.001					0.02	
Zinc T-Zn	<0.004						5
Polycyclic Aromatic Hydrocarbons							
Acenaphthene		<0.000050					
Acenaphthylene		<0.000050					
Acridine		<0.000050					
Anthracene		<0.000050					
Benzo(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					
Field Chemistry (EBA)							
pH		8.05		7.90	6.5		8.5
TDS		291		225			500
EC (uS/cm)		571		444			
Temperature		15.0		8.5			
Free Available Chlorine							250

Notes:

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

Shading indicates exceedence of Proposed MAC guideline (arsenic).

Bold Underline with Yellow shading 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)



**Table 6975-3: Summary of Well Assessment Results
SMALL PUBLIC DRINKING WATER SYSTEMS**

Well Identification and Location					
Building #	Building Name	Location	Northing (+/- 10 m)	Easting (+/- 10 m)	Grade Elevation (+/- 10 m)
6975	Health Centre	Carmacks	6884848	433110	528

Well Details							
Well Casing Diameter (mm)	Year Well Installed	Well Log?	Well Depth (m bg)	Reported Low Permeabilty Protective Layer?	Pump Setting (m bg)	Well Capacity - Tested, or Reported by User	Static Water Level Below Ground (m-btwc)
150	?	Incomplete	17.68	No, shallow well	?	1 1/2hp submersible pump Size of pump meets needs	?

Well Construction Details				
Wellhead Above ground (m)	Well Cap	Well Screen	Surface Seal	Apron Grading
0.06 above grade	Split Cap Gasket	?	Unlikely	Inside building

**Table 6975-4: Potential Contaminant Sources
Building 6975 – Carmacks Health Centre**

Potential Contaminant Source	Potential Contaminants	Distance from Water Source	Northing	Easting
Dump or Landfill	<i>Organic</i> and inorganic chemicals.	1500 m		
Cemetery	<i>Biological</i> ¹ , inorganic ² and organic parameters.	600 m up-gradient		
Sewage lagoon	<i>Biological</i> , inorganic and organic parameters.	>300 m		
Sewage lines, tanks and lift stations	<i>Biological</i> , inorganic and organic parameters.	Unknown		
Septic fields	<i>Biological and Inorganic</i> parameters.	>150 m		
Gas stations	<i>Organic and Inorganic</i> parameters.	50 m		
Undergrounds Fuel Storage Tanks (USTs)	<i>Organic</i> parameters.	>30 m		
Above ground storage tanks (ASTs)	<i>Organic</i> parameters.	11 m and 50 m	6884883	433115
Naturally occurring sources of contamination	<i>Radionuclides, Bacteria and Viruses from surfacewater sources.</i>	50 m		

Notes: *Bold highlighting of distances indicates non-compliance with proposed guidelines*

1- Biological parameters include: bacteria, viruses, protozoa (parasitic organisms), helminthes (intestinal worms), and bio aerosols (inhalable moulds and fungi).

2 – Inorganic contaminants could include arsenic in embalming chemicals (prior to early 1900’s), and heavy metals in caskets.

Required Setback Distances Draft Guidelines for Part III – Small Public Drinking Water Systems:

300 m (1,000 ft) from a sewage lagoon or pit and manure heaps

120 m (400 ft) from a solid waste dump or a cemetery

30 m (100 ft) from any other potential source of contamination

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*Incomplete Log

SMALL PUBLIC WATER SYSTEM ASSESSMENT

PART A: EBA Site Inspection

Inspector: Ryan Martin.
luke Label

Date May 12, 2005

WELL ID #	Owner	Location Description
<u>6975</u> <i>(possibly 6977)</i>	<u>YTB</u>	<u>Carmacks Health Center -</u>

1. Well Location and Potential Contaminant Sources

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

Carmacks

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

Carmacks Health Center

c. GPS location: 0433110 Easting 6884948 Northing 528m elevation ±8m

d. Is there electric power? Yes No

e. Does the well system have:

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

Health Center and nearby residence

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

f. Nearest building, specify Health Center

g. Distance from well to building ~4m

h. If there is an effluent disposal field, is its location known? Yes No no evidence

i. Distance from well to nearest point of known field: area of any septic field within local area - piped sewer system w/lines <30m

j. Well location relative to field: upslope downslope lateral

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k. 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

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

m. Is the well located within 120 m from a solid waste site or dump, cemetery? Yes No
Solid waste dump ~ 1 km away

n. 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
locked door; inside building

Entrance by animals? Yes No
no apparent evidence of any animals

o. Is well site subject to flooding? Yes No

p. Is the well site well drained? Yes No

q. Is there a buried fuel tank on the property? Yes No unlikely
There is, however, a buried fuel line that has leaked hydrocarbons and contaminated the soil ~ 6m from the well & see report - contaminated soil was relocated
If yes, is it in use abandoned
Is the location known? Yes No
Distance from the well to known buried tank _____

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

Yes No Describe _____

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

433115
688488
535m
Potential Source 1: AST 1; Distance from well to Potential Source 1: ~11m

Potential Source 2: AST 2 (large diesel fuel tank); Distance from well to Potential Source 2: ~50m

Potential Source 3: River; Distance from well to Potential Source 3: ~50m

Potential Source 4: hydrocarbon spill; Distance from well to Potential Source 4: ~6m
Electric generator ~ 2m within same building

s. Are there other wells on this property? Yes No unlikely

How many? _____ in use abandoned require proper sealing

There was a leak from the AST in the line running to the station. Some soil contamination

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2. Well and Wellhead information:

- *a. When was well installed? Year _____ 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 5m x 2.5m No
The well is located within a utility building
- f. Well casing: Diameter 15cm Material: steel plastic concrete
and rope (?) split casing, There is an open hole for heat trace
- *g. Depth of well: 17.68m measured (if possible) reported from log
- *h. Static water level below ground: _____
 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 _____ 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
Shares with pressure tank and backup electric generator. Utility building is heated and insulated
 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 no; it is 6cm above grade
- ii. Are there signs of ponding on the enclosure(e.g. water stains, etc.)? Yes No
well area seems very clean
- iii. Is the wellhead enclosed by fiberglass insulations? Yes No
The well head is within a heated, insulated building
- iv. Any evidence of rodents? Specify no evidence of rodents
- v. Does the well casing have a proper seal cap? Yes No

If no, describe condition _____

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.
There was a hydrocarbon spill ~ 6m away - has been remediate &
If yes is there treatment Yes No

Explain (filtration, disinfection etc...) water softener

4. Aquifer Supplying This Well:

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

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
Tap in building, on line to pressure tank

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

k. Is the pump and piping protected from freezing? Yes No
The well is located within a heated, insulated building. There is heat trace on all piping and down to pump
If yes, describe: _____

l. Comments on pump installation: _____

6. Conclusions

a. Comments on overall installation:

b. Recommendations:

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PART B: EBA Site Inspection

Inspector: _____

Date _____

WELL ID #	Owner	Location Description
6975	YTG	CALMACKS HEALTH CENTRE RESIDENCE

6. Water Treatment

a. Is well water treated? Yes No; Type of treatment: UV SYSTEM

chlorination iron and or manganese removal other UV

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 *UNKNOWN*
- f. Is there a chemical analysis? Yes No adequate incomplete *UNKNOWN*
- 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:

Where is it located?

Comments: _____

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: _____

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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:

UV SYSTEM INSTALLATION REQUIRES ATTENTION. THE TWO UV REACTORS DO NOT HAVE FLOW RESTRICTORS INSTALLED TO ASSURE FULL UV EXPOSURE, NO UV MONITOR IS PRESENT TO MEASURE UV STRENGTH. THE PIPING FEEDING THE REACTORS PROMOTES UNEVEN FLOW DISTRIBUTION AGGRAVATING THE ABOVE PROBLEM.

b. Recommendations:

RENEW THE PIPING SYSTEM. INSTALL ONE FILTER SYSTEM TO HANDLE THE FULL FLOW. INSTALL UV MONITORS ON BOTH REACTORS ALONG WITH THE APPROPRIATE FLOW RESTRICTORS.
INSTALL PRETREATMENT IF REQUIRED
THIS SYSTEM IS AN ACCIDENT WAITING TO HAPPEN.



Driller's Report 109010035

Location: Nursing Station Well Lot 124 CRMK

NAD 83 Zone 8 Easting 433111.13 Northing 6884897.0 Elevation ASL 1 m.

Location Accuracy: Horizontal 30-100 (topo) Purpose of well: Commercial - not fabrication or manufacturing
 Vertical unknown or unreliable

Permafrost encountered? No

LOG OF OVERBURDEN AND BEDROCK MATERIALS

Layer	From	To	General Colour	Most Common Material	Secondary Material	General Description
1	0	1.22 m.		SAND and gravel		
2	1.22	2.13 m.		fine SAND		
3	2.13	17.68 m.		TILL		

WELL CONSTRUCTION

Well No. 1090100351 Completion date [] Drilling method [] Well type []

Casing: OS Diameter [] mm. Material [] Wall thickness [] mm. Depth to [] m.

Comments []

Surface/Env'l seal: Material [] Diameter [] mm. Depth from [] to [] m. Volume [] cu. m.

Gravel Pack? Material [] Diameter [] mm. Depth from [] to []

Well Screen Information

OS Diameter	Material	Screen Type	Comments
[]	[]	[]	[]

Screen Sections

Section	From	to	Slot size/ perforation diameter
1	[]	[]	[]

WELL DEVELOPMENT AND STATUS

Well ID 1090100351 Developed by [] Wellhead completion [] Adapter depth [] m. Static water level [] m. Yield Estimate [] Lps Estimate method []

Final Status New, in use for intended purpose

No

GROUNDWATER QUALITY

Well No. 1090100351 Field Measurement Date 10-Dec-02

Electrical Conductivity 605 μ S
 pH 7.58
 Temperature 6.45 $^{\circ}$ C

Well disinfection
 Was the well disinfected on completion of pump installation?

Groundwater Type []
 Turbidity/sand content []

Bacterial testing done? Lab [] Date []
 Chemical testing done? Lab [] Date []



Photo 0137: 6975 Health Center (right), Wellhouse (center) and Nursing Residence (left)



Photo 0002: 6975 Wellhead



Photo 0138: 6975 Above Ground Fuel Storage Tank and Hydrocarbon Spill Site



Photo 0139: Substation and Above Ground Fuel Storage Tank (back)



Photo 0142: 6975 Health Center Water Treatment System



Photo 0143: 6975 Nursing Residence Water Treatment System



Photo 0141: 6975 Pressure Tank (right) and Backup Electrical Generator



Photo 0001: 6975 Pump Control Box