20.0 BUILDING 4840: WATSON LAKE ENVIRONMENTAL OFFICE

20.1 Description of Existing Water system

Building 4840, the Watson Lake Environmental Office, is served by a water system that delivers water from a 44.8 m deep well. The well is located in a wooden enclosure approximately 2 m from the storage building. The well location, as well as other site details, is shown in Figure 4840-A in Appendix A20. The coordinates of the wellhead, as measured by a handheld GPS device, were recorded as:

- UTM ZONE 9
- Northing: 6658241
- Easting: 515629

The water system is equipped with a sediment filter and a water softener, and there is also a reverse osmosis treatment system that supplies water to one tap in the office kitchen. A schematic detailing the well water system is available as Figure 4840-B in Appendix A20.

20.2 Description of Existing Wastewater Systems

The environmental office is served by a septic system located on the northwest side of the office building opposite from the well. The septic tank is approximately 30 m west of the well and likely discharges effluent to the west of the tank. There was, however, no evidence of clean-out pipes and it is possible that the system is on sewage eduction.

20.3 Water Quality Results

20.3.1 Water Quality Results from Previous Sampling

Bacteriological

Seven samples were collected from the Watson Lake Environmental Office water system between September 2004 and March 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 4840-1 in Appendix 20. Coliform bacteria and *E. coli* were reported as absent in each of the seven samples for which results were provided.

Potability

A water sample was collected by YTG representatives from the Watson Lake Environment Office water system on September 13, 2004. The sample was submitted to Northwest Labs in Surrey, BC for detailed potability analyses. The results of these analyses are summarized in Table 4840-2 in Appendix A20. EBA reviewed the analytical results to compare them with the Canadian Drinking Water Quality Guidelines (CDWQG) to observe general water quality, to identify and recommend additional sampling and analytical, and to identify potential indicators of contamination.

- The groundwater is a calcium bicarbonate type water with very high hardness;
- At 16.7 NTU, turbidity exceeded both CDWQG health based upper limit of 1.0 NTU and aesthetic objective of 5.0 NTU;
- At a level of greater than 60 CU, the colour exceeded the CDWQG aesthetic objective of 15 CU.
- At 1.82 mg/L, the iron concentration exceeded the CDWQG aesthetic objective of 0.3 mg/L;
- At 0.303 mg/L, the manganese concentration exceeded the CDWQG aesthetic objective of 0.05 mg/L; and,
- All other health based and aesthetic objectives were met for the parameters analyzed.

20.3.2 Identification of Additional Analytical Testing Required

Samples were taken from both the regular treated water at bathroom fixtures, as well as the reverse osmosis treated water at the point of use. Additional analytical for the Watson Lake Environmental Office that was included in the water system assessments is detailed below:

- The suite of parameters included in the ASL Environmental drinking water package in order to analyze for the physical parameters of the water, as well as for dissolved anions, nutrients, and total metals. The drinking water package was obtained from both the regular treated water, and the reverse osmosis treated water;
- Dissolved metals to provide the full suite of metals dissolved in the water from the treated water;

- Ammonia to give a more detailed assessment of nutrient concentrations in order to determine if the water is under the direct influence of septic sources. This was taken from the regular treated water;
- TOC in order to determine the total organic carbon concentration in the regular treated water; and,
- Measurements in the field for total dissolved solids, conductivity, pH, and temperature were completed at the time of sampling from both sample locations.

Additional Analytical Results

A water sample was obtained by EBA during the field program on June 21, 2005, and was submitted to ALS Environmental in Vancouver, BC for analysis. These results are summarized in Table 4840-2 in Appendix A20 and the laboratory reports are included in Appendix B.

It was observed during the water system assessment that the treatment systems at this site had been recently installed. Results from previous sampling show that there was likely no treatment system at the time when baseline water quality analysis was taken, and this previous water sample likely represented raw water quality. Additional analytical results show a significant improvement of the water quality, as described below:

- At 0.44 NTU from the regular treated water and 0.18 NTU from the water subjected to reverse osmosis, turbidity had been lowered below both the CDWQG health based upper limit and aesthetic objective from the 16.7 NTU reported previously;
- The colour had been reduced from greater than 60 CU to less than 5.0 CU for both sample locations, and was below the CDWQG aesthetic objective;
- Both total and dissolved iron was reported at less than the detection limit of 0.030 mg/L for both sample locations;
- Although the total manganese concentration had lowered from 0.303 mg/L to 0.262 mg/L in the regular treated water, this water was still in exceedence of the CDWQG aesthetic objective. Additionally, the dissolved manganese content was reportedly 0.263 mg/L, signifying that the manganese content can be entirely attributed to dissolved particles. The reported manganese concentration from water subjected to reverse osmosis, however, was 0.0125 mg/L, which is lower than the CDWQG aesthetic objective; and,
- The hardness in the treated water at 212 mg/L (as $CaCO_3$), signifying that the water softener may not be functioning properly. The hardness in the water subjected to reverse osmosis had been reduced to 34.4 mg/L (as $CaCO_3$).

20.3.3 Indicators of Potential Contamination

Chloride, nitrate and nitrite concentrations can indicate impacts from surface water sources or septic waste. Chloride concentrations reported from baseline and additional analytical water quality results were found to be high relative to background (approximately 49 mg/L). Nitrate, nitrite, and ammonia concentrations reported from baseline and additional analytical water quality results were found to be low and were within the normal background range for the Watson Lake area. The Town of Watson Lake sewage lagoon is approximately 270 m upgradient from the Environmental Office, and it is considered probable this that is causing the high chlorides reported in this water system. Other wells in the area downgradient from the sewage lagoon also have elevated chloride concentrations.

Concentrations of total barium reported from baseline and additional analytical water quality results were found to be at 0.355 mg/L and 0.299 mg/L, respectively. Although these concentrations do not exceed the CDWQG MAC, they are considered to be elevated. It is possible that a barite plant located across the street from the environmental office causes the elevated barium in the region. It should be noted that other wells in the surrounding area also have elevated barium.

Considering the proximity of this well and surrounding wells to both a barite plant and a sewage lagoon, additional hydrogeological assessment and water quality analysis is recommended.

20.4 Conceptual Hydrogeology

There is no log available for this well. It is reported to be completed at a depth of 44.8 m; the depth to static water level is unknown. Lithology is available for the nearby grader station well, and indicates alternating fine and coarse material to 17.8 m depth. This well is deeper than most wells in the area, which are generally less than 30 m and completed within the surficial morainic and colluvial deposits. These deposits are described as gravel, sand and silt, with occurrences of silty till

sediments. The well is located on the north side of a groundwater divide. Groundwater flow direction in this vicinity is most likely northeasterly to easterly towards Wye Lake.

20.5 Potential Contaminant Sources

Potential contaminant sources observed during the site investigation are provided in field notes in Appendix A20. Photos of potential contaminant sources are provided in Appendix A20.

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

- Fuel drums 13 m.

Additionally, there is a barite plant located across the street from the environmental office and a sewage lagoon located approximately 270 m from the environmental office, and both are likely upgradient.

20.5.1 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 property or neighbouring properties. There was, however, absorb-all observed on the ground approximately 30 m from the well, adjacent to the building, that could potentially mark the location of a former fuel spill.

20.6 Identified Water System Deficiencies and Associated Risk

20.6.1 High and Medium Risk Deficiencies

The following deficiencies were identified as high or medium risk for the Watson Lake Environmental Office:

- The wellhead is located within 30 m of potential sources of contamination, including fuel drums at 13 m;
- The wellhead is located approximately 270 m downgradient (inferred) from a sewage lagoon, which is likely causing the high chlorides reported from water quality analysis. The chloride concentrations, however, were not in exceedence of CDWQG aesthetic objectives. As a conservative parameter, it may be indicative that other chemicals emanating from this same source could be impacting the drinking water supplied from this well;
- There is no 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;
- Poor surface completion of the wellhead (located in a wooden enclosure, the wellhead is only 0.25 m above grade);
- There is no disinfection system;
- The well is located downgradient from a barite plant, and high barium concentrations have been observed in water quality. The barium concentration, however, has not been found to be in exceedence of CDWQG MAC; and,
- Absorb-all was found on the ground at approximately 30 m from the well and may indicate a hydrocarbon spill.

20.6.2 Low Risk Deficiencies

The following deficiencies were identified as low-risk for the Watson Lake Environmental Office:

- Manganese concentrations in the water are reported in exceedence of CDWQG aesthetic objectives and may impact on RO system longevity;
- Previous water quality results indicated exceedences in CDWQG health based parameters for turbidity, as well as CDWQG aesthetic objectives of colour and iron. It is likely that the raw ground water quality is very poor.

20.7 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).

20.7.1 Priority 1

- Confirm UV transmissivity post softening system.
- It is recommended that a NSF-61 certified filtration system (to 1 micron absolute) be installed, and a UV disinfection system be installed after other treatment. 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;
- Environment office staff should be informed to use the reverse osmosis tap as the main source of drinking water;
- Regular maintenance and upkeep should be done to ensure that the water treatment system is working; and,
- The purpose of the absorbol on the ground behind the building should be verified.

20.7.2 Priority 2

- The wellhead completion should be improved. This would involve raising the well casing to a minimum of 500 mm above ground level and retrofitting a proper surface-seal to at least 3 m below grade; and,
- A detailed hydrogeological and water quality assessment should be carried out in the region to determine the cause of the elevated chloride and barium.

20.8 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.

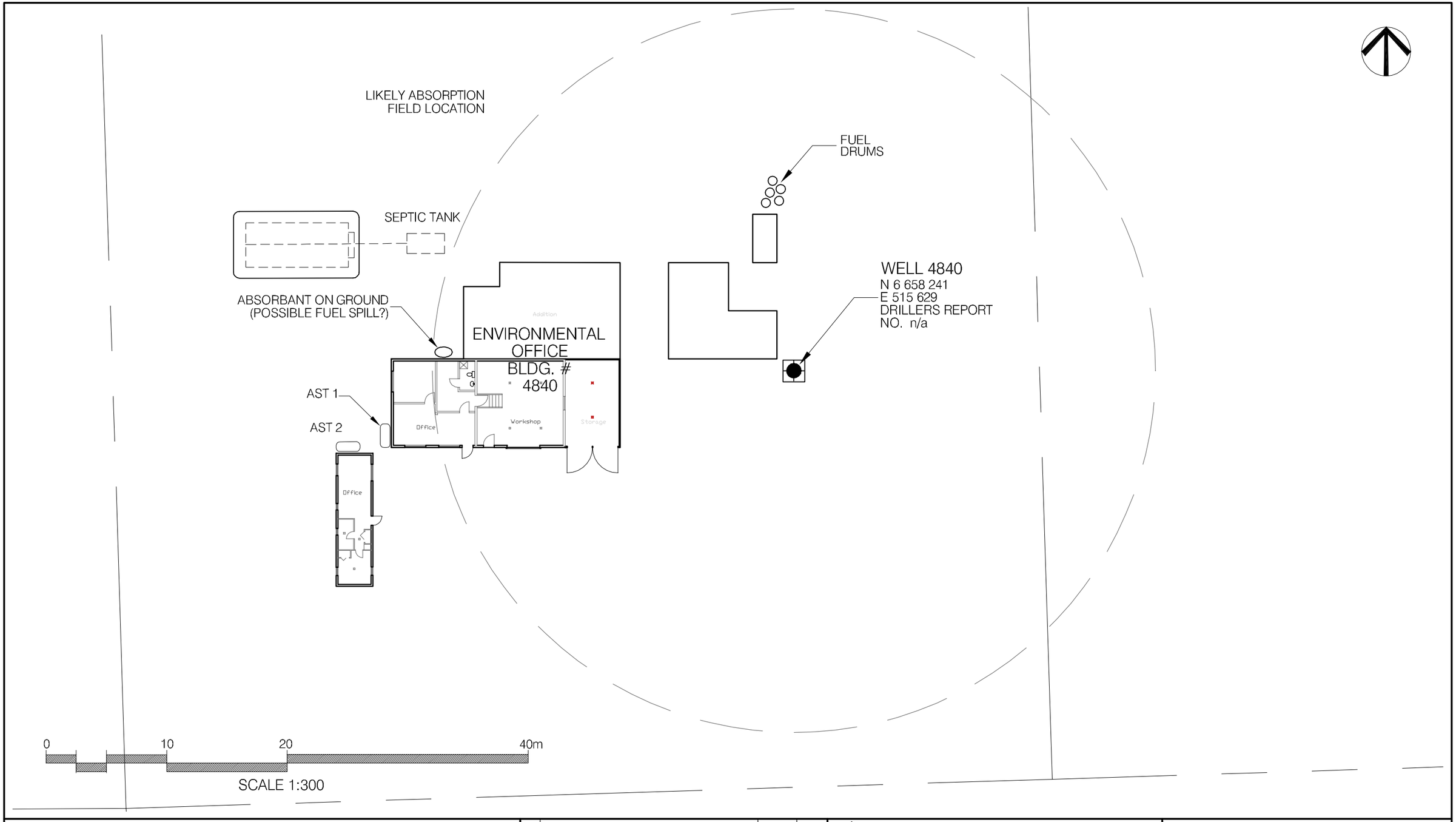
20.8.1 Priority 1

- Confirmation UV transmissivity post softening system would cost approximately **$100;**
- The cost for the proposed disinfection/treatment system would amount to a total installed cost of about **$3,700**;
- Posting a sign indicating that environment office staff must obtain drinking water from the reverse osmosis tap would incur minimal cost: and,
- Investigating the potential spill would incur minimal cost.

20.8.2 Priority 2

Class D cost estimates for medium-risk mitigative options to address the well deficiencies for this site are as follows:

- The cost for the wellhead upgrades, including raising the wellhead, installing a surface seal to at least 3 m below grade, and installing a 150 mm commercial pitless unit would likely cost in the order of **$5,000**.
- Conducting a detailed hydrogeological assessment and water quality study, including drilling a series of monitoring wells would cost in the order of **$20,000.** Since there are three YTG maintained buildings that show elevated chloride and barium in this region, the cost to this site would be approximately **$6,700** (one third of the total amount).



NOTES:

1. UTM COORDINATES OBTAINED WITH A HAND HELD GPS USING NAD83 SYSTEM AND ARE CONSIDERED TO BE ACCURATE TO 10.0 m, APPROXIMATELY.
2. LOCATION OF BUILDINGS AND STRUCTURES ARE APPROXIMATE ONLY.

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:	JULY 2005
SCALE:	AS SHOWN
PROJECT No.:	1260002.002
ACAD FILENAME:	002-EASTERN REGION

CLIENT: Yukon
Highways and Public Works
Property Management Branch

SMALL PUBLIC WATER SYSTEMS ASSESSMENT
EASTERN REGION

GOVERNMENT OF YUKON
HIGHWAYS & PUBLIC WORKS

WATSON LAKE ENVIRONMENTAL
BUILDING # 4840
SITE LOCATION DIAGRAM
WELL ID: 4840-A

REVISION ISSUE: 0

FIGURE No.: 4840-A

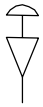
LEGEND

PUMP

PRESSURE GAUGE

GATE VALVE

CHECK VALVE



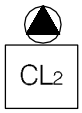
SOLENOID

#2 COMPONENT ID. No.
(SEE TABLE ON FOLLOWING PAGE)

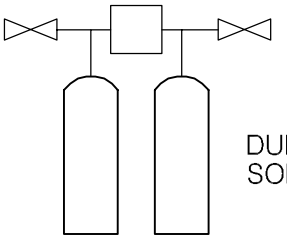
FLOW METER

WATER FILTER
(CARTRIDGE TYPE)

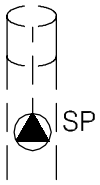
PRESSURE TANK



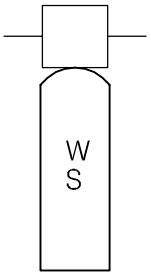
CHLORINE RESERVOIR AND
INJECTION PUMP



DUPLEX WATER
SOFTENER

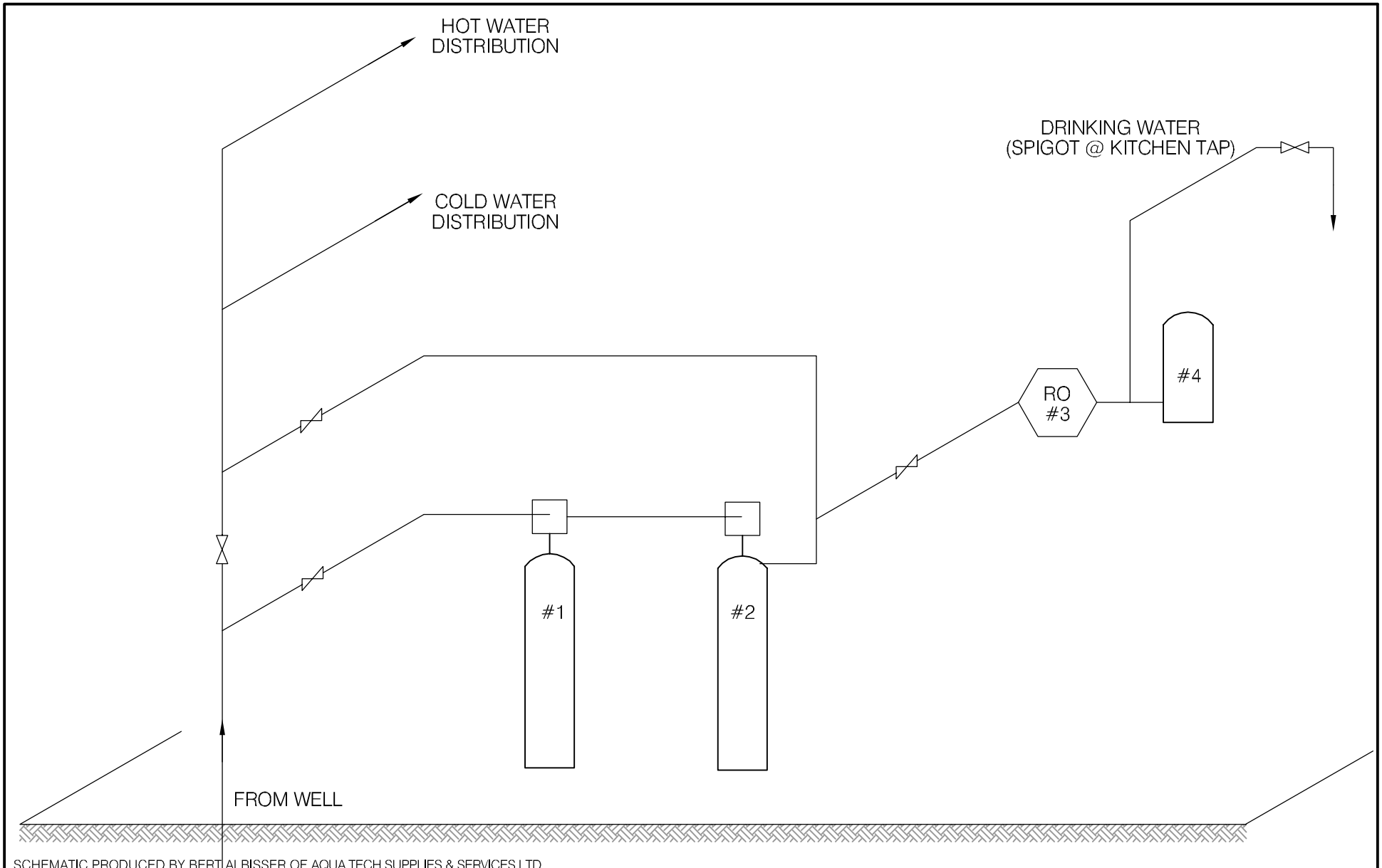


WELL WITH
SUBMERSIBLE PUMP



ACTIVATED
CARBON

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT EASTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			TITLE	SCHEMATIC SYSTEM LEGEND	
DATE APRIL 2006	DWN. JSB	CHKD. RMM	FILE NO. 1260002		DRWG. LEGEND



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

EBA Engineering Consultants Ltd.

PROJECT: SMALL PUBLIC WATER SYSTEMS ASSESSMENT
EASTERN REGION

CLIENT: Yukon
Highways and Public Works
Property Management Branch

TITLE: WATER SYSTEM DISTRIBUTION/TREATMENT
SCHEMATIC SYSTEM ID.: 4840
WATSON LAKE ENVIRONMENTAL OFFICE

DATE	JULY 2005	DWN.	JSB	CHKD.	RMM	FILE NO.	1260002.002	DWG.:	FIGURE 4840-B

Z:\0201Drawings\1260002 Water Assessment YTG\002 - Eastern Region\watson\Schematics\1260002 Environmental Office_4840 Schematic.dwg, 7/21/2005 10:42:43 AM, Adobe PDF

Eastern Region – Environmental Office
Building # 4840

DISTRIBUTION & TREATMENT SYSTEM DATA

Item	Description	Manufacturer	Model	Part No.	Serial No.	Size
1	~~5MM~~ MM FILTER	PETWA.	02-150132		25240	10"x54"
2	SOFTENER	PETWA.	01-150132		25239	10"x54"
3	REVERSE OSMOSIS	PETWA.	?			
4	R.O. TANK	WELMATE	0075		02505738.	75L
5						
6						
7						
8						
9						
10						

TABLE 4840- 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?
4840	Environmental Office	7	Sept-04 to Mar-05	no	0/7	no	9-Mar-05	no

Table 4840-2: Water Quality Results

SOURCE:	Building 4840 - Environmental Office			GCDWQ Criteria		
Location/ Resident	Watson Lake					
Address						
Treatment		Sediment Filter, Water Softener	Reverse Osmosis			
Disinfection	No					
Source of Water	On-Site Well					
Purpose of Sampling	Baseline	Additional Sampling	Additional Sampling			
Sample Location		Kitchen Tap	Tap			
Date Sampled	13-Sep-04	21-Jun-05	21-Jun-05	Lower	Upper Limit	
Physical Tests *(ALS)*				**AO**	**MAC**	**AO**
Colour (CU)	**>60**	<5.0	<5.0			15
Conductivity (uS/cm)		439	132			
Total Dissolved Solids	242	342	76			500
Hardness CaCO3	228	212	34.4	AO >200 = poor, > 500 unacceptable[A]		
pH	8.03	8.00	7.13	6.5		8.5
Turbidity (NTU)	**16.7**	0.44	0.18		1	5
Dissolved Anions *(ALS)*						
Alkalinity-Total CaCO3	168	157	47.8			
Chloride Cl	48.9	49.8	19.4			250
Fluoride F	0.06	0.056	<0.020		1.5	
Sulphate SO4	5.69	5.27	0.65			500
Nitrate Nitrogen N	<0.1	<0.10	<0.10		10	
Nitrite Nitrogen N	<0.05	<0.10	<0.10		1	
Ammonia Nitrogen N		0.022				
Total Metals *(ALS)*						
Aluminum T-Al	<0.005	<0.010	<0.010			
Antimony T-Sb	<0.0002	<0.00050	0.00119		0.006	
Arsenic T-As	<0.0002	0.00025	0.0005		0.025	
Barium T-Ba	0.355	0.299	0.052		1	
Boron T-B	0.006	<0.10	<0.10		5	
Cadmium T-Cd	<0.00001	<0.00020	<0.00020		0.005	
Calcium T-Ca		64.6	9.17			
Chromium T-Cr	0.0006	<0.0020	<0.0020		0.05	
Copper T-Cu	0.002	0.0014	0.0018		1	
Iron T-Fe	**1.82**	<0.030	<0.030			0.3
Lead T-Pb	0.0018	<0.0010	<0.0010		0.01	
Magnesium T-Mg		12.4	2.78			
Manganese T-Mn	**0.303**	**0.262**	0.0125			0.05
Mercury T-Hg		<0.00020	<0.00020		0.001	
Potassium T-K		1.33	1.12			
Selenium T-Se		<0.0010	<0.0010		0.01	
Sodium T-Na	2.7	2.6	15			200
Uranium T-U	<0.0005	0.00045	<0.00010		0.02	
Zinc T-Zn	0.328	0.11	<0.050			5
Dissolved Metals *(ALS)*						
Aluminum D-Al		<0.010			0.1	
Antimony D-Sb		<0.00050			0.006	
Arsenic D-As		0.0003			0.025	
Barium D-Ba		0.306			1.0	
Boron D-B		<0.10			5	
Cadmium D-Cd		<0.00020			0.005	
Calcium D-Ca		64.3				
Chromium D-Cr		<0.0020			0.05	
Copper D-Cu		0.0016				1.0
Iron D-Fe		<0.030				0.3
Lead D-Pb		<0.0010			0.01	
Magnesium D-Mg		12.5				
Manganese D-Mn		**0.263**				0.05
Mercury D-Hg		<0.00020			0.001	
Potasium D-K		1.24				
Selenium D-Se		<0.0010			0.01	
Sodium D-Na		2.7				200
Uranium D-U		0.00044			0.02	
Zinc D-Zn		0.104				5.0
Organic Parameters						
Total Organic Carbon C		<0.50				
Field Chemistry (EBA)						
pH		7.71	7.89	6.5		8.5
TDS (ppm)		217	86			500
EC (uS/cm)		431	171			
Temperature (°C)		21.4	16.1			

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 (oC) and Turbidity (NTU)

< = Less than the detection limit indicated.

AO = Aesthetic Objective

MAC = Maximum Acceptable Concentration (Health Based)

eba

Table 4840-3: Summary of Well Assessment Results
SMALL PUBLIC DRINKING WATER SYSTEMS

Well Identification			GPS Coordinates		
Building #	**Building Name**	**Location**	**Northing (+/- 10 m)**	**Easting (+/- 10 m)**	**Grade Elevation (+/- 10 m)**
4840	**Watson Lake Environmental Office**	**Watson Lake**	6658241	515629	712

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		No	44.8				

Potential Contaminant Sources					
Distance from well to nearest point of septic field (m)	**Distance from well to nearest building (m)**	**Distance to surface water body (m)**	**AST present on property?**	**Distance from well to AST (m)**	**Other potential sources of contamination observed on property, and distance to well**
32	2	Greater than 60 m	AST 1	35	Hydrocarbon spill area at 30 m
			AST 2	40	Fuel Drums at 13 m

Well Construction Details					
Wellhead Above ground (m)	**Well Cap**	**Well Screen**	**Surface Seal**	**Apron Grading**	**Comments**
0.23 m above grade	Split seal gasket cap		Unlikely	Yes	The well is likely downgradient from a barite plant area and sewage lagoon.

EBA Engineering Consultants Ltd.
Creating and Delivering Better Solutions

SMALL PUBLIC WATER SYSTEM ASSESSMENT

PART A: EBA Site Inspection

Inspector: Ryan Martin, Luke Lebel Date June 21

WELL ID #	Owner	Location Description
4940	YTG	Watson Lake Environmental office

1. Well Location and Potential Contaminant Sources

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

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

c. GPS location: N 6658241 E 515629 elv 712m ± 7m

d Is there electric power? ☒ Yes ☐ No

e Is there outside water access? ☒ Yes ☐ No
unlikely accessable to public

f. Does the well system have:

☐ 15 or more service connections to a piped distribution system ? If so how many
3 (or 2) buildings in environmental office complex

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

g. Nearest building, specify Environmental office storage building

h. Distance from well to building ~2m

i. If there is an effluent disposal field, is its location known? ☒ Yes ☐ No
N 6658252
E 515597

j. Distance from well to nearest point of known field: ~32m

k. Well location relative to field: ☐ upslope ☐ downslope ☒ lateral

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
Sewage lines likely begin @ 30m approximately

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

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

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 wooden enclosure
Entrance by animals? ☐ Yes ☒ No Access possible

p. Is well site subject to flooding? ☐ Yes ☒ No

q. Is the well site well drained? ☒ Yes ☐ No
Apron grading around enclosure

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: AST 1 ; Distance from well to Potential Source 1: 35 m
Potential Source 2: AST 2 ; Distance from well to Potential Source 2: 40 m
Potential Source 3: Spill area ; Distance from well to Potential Source 3: 30m
Potential Source 4: Fuel drums ; Distance from well to Potential Source 4: 13 m

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

How many? _____ ☐ in use ☐ abandoned ☐ require proper sealing

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 _____ ☒ No

f. Well casing: Diameter 15cm Material: ☒ steel ☐ plastic ☐ concrete

g. Depth of well: 146ft ☐ 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 unknown

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 unknown

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,

i. Is the well head below grade? describe in detail No

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 In walls of enclosure, not directly

iv. Any evidence of rodents? Specify no signs, access is possible

v. Does the well casing have a proper seal cap? ☒ Yes ☐ No

If no, describe condition split gasked cap - may not be making proper seal around the rope

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 ☒ Yes ☐ No

Explain (filtration, disinfection etc...) filtration and softening - one RO tap

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4. Aquifer Supplying This Well:

a. The aquifer is: ☐ bedrock ☒ granular sediment likely ☐ unknown

b. Does water level and/or well capacity show seasonal fluctuation? ☐ Yes ☐ No possible - low yield well

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 _____

d. Date installed: _____ By: _____

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

f. Drop pipe for submersible pump: ☐ steel ☒ plastic likely

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 unknown

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

If yes, describe: heater inside insulated enclosure

l. Comments on pump installation: _____

6. Conclusions

a. Comments on overall installation:

wellhead is rusty and inaccessable for inspection

b.Recommendations: _____

PART B: EBA Site Inspection

Inspector: BERT [redacted] Date [redacted]

WELL ID #	Owner	Location Description
4840	YTG	[redacted] LAKE - ENVIRONMENT OFFICE

6. **Water Treatment**

a. Is well water treated? ☑ Yes ☐ No; Type of treatment: SEDIMENT FILTER + 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 ☐ H_2S ☐ Other _____

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 FOR R.O. WATER

Where is it located?
Comments: SHOP AREA

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:

THE EQUIPMENT IS OF GOOD QUALITY. THE INSTALLATION IS OF ACCEPTABLE QUALITY WORKMANSHIP WITH THE EXCEPTION OF THE AUTOMATIC FILTER DRAINS - THEY MUST HAVE A AIR GAP.

b. Recommendations:

INSTALL PROPER AIR GAP AND UV DISINFECTION AFTER SOFTENER SUPERCHLORINATE THE WELL BI ANNUALLY. SUPER CHLORINATE THE COMPLETE PIPING SYSTEM AFTER UV INSTALLATION AND RETURN TO SERVICE.

Photo 0261: 4840 Wellhead enclosure (centre), and storage building (back left)

Photo 0260: 4840 Wellhead (centre), and pressure tank (left) in enclosure

Photo 0263: 4840 Septic field

Photo 0262: 4799 Fuel drums (centre) around storage building

Photo 0264: 4840 Absorb-all on ground behind office building – likely site of hydrocarbon contamination

Photo 0265: 4840 Above ground fuel storage tanks

Photo 0266: Barite ore storage lot south and likely up gradient from 4840 well

Photo 0003: 4840 Sediment filter (left) and water softener (right)

Photo 0004: 4840 Reverse osmosis system

Photo 0007: 4840 Reverse osmosis tap in kitchen