26.0 BUILDINGS 4993 AND 4994: WATSON LAKE EMR FIRE CONTROL CENTRE AND TANKER BASE

26.1 Description of Existing Water system

The Watson Lake EMR Fire Control Centre (Buildings 4993) and the EMR Tanker Base (Building 4994) are supplied water from a well that is located approximately 53 m from the tanker base (building 4994). The well is connected with a commercial pitless unit. The well location and other site details are provided in Figure 4994-A, provided in Appendix A26. The coordinates of the wellhead, as measured by a handheld GPS device, were recorded as:

- UTM ZONE 9
- Northing: 6664425
- Easting: 510654

There is no treatment system present on this water system. In addition to servicing the two EMR buildings, the well also supplies a water storage tank and three fire retardant tanks to supply aircraft for forest fire fighting. A schematic detailing the water system is provided as Figure 4994-B in Appendix A26.

26.2 Description of Existing Wastewater Systems

The septic system for both the Watson Lake EMR Fire Control Centre and Tanker Base is located at a distance greater than 60 m west of the well.

26.3 Water Quality Results

26.3.1 Water Quality Results from Previous Sampling

Bacteriological

Four samples were collected from the EMR Fire Control Centre water system between November 2004 and March 2005, and two samples were also collected from the EMR Tanker Base between May 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 4994-1 in

Appendix A26. Coliform bacteria and *E. coli* were reported as absent in each of the four samples for which results were provided for the EMR Fire Control Centre. One sample from the EMR Tanker Base, however, tested positive for Total Coliform bacteria.

Potability

A water sample was collected from the Watson Lake EMR Fire Control Centre and Tanker Base water system on November 9, 2004. The sample was submitted to Northwest Labs in Surrey, BC for detailed potability analyses. Additional analytic results were also provided by YTG for baseline samples collected on June 22, 2005. The results of these analyses are summarized in Table 4994-2 in Appendix 26. 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 potential indicators of contamination.

- At 9.2 and 11.2 NTU, turbidity exceeded both the 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 0.58 and 2.78 mg/L, iron concentrations exceeded the CDWQG aesthetic objective of 0.3 mg/L;
- At 0.158 and 0.164 mg/L, manganese concentrations exceeded the CDWQG aesthetic objective of 0.05 mg/L; and,
- All other health based and aesthetic objectives were met for the parameters analyzed.
- The hardness (as $CaCO_3$) was approximately 120 mg/L and is considered moderately hard.

26.3.2 Identification of Additional Analytical Testing Required

Additional analytical for the Watson Lake EMR Fire Control Centre and Tanker Base that was included in the water system assessments is detailed below:

- UV absorbance, as well as tannins and lignin, to determine potential for UV treatment as a disinfection option for this water system;

- Previous sampling had shown very high turbidity, and as such, a sample was obtained to retest for turbidity;
- Analysis for total and dissolved iron and manganese to determine the amount of each associated with suspended compared to dissolved particles;
- Total Organic Carbon, to assist with selection of a treatment system;
- Analysis for EPH and PAH to determine if the water supply shows signs of hydrocarbon contamination;
- Analysis for OCP to determine if the water supply shows signs of contamination by DDT or other organochlorine pesticides; and,
- Measurements in the field for total dissolved solids, conductivity, pH, and temperature.

Additional Analytical Results

A water sample was obtained by EBA during the field program on June 23, 2005, and was submitted to ALS Environmental in Vancouver, BC for analysis. These results are summarized in Table 4994-2 in Appendix A26 and the laboratory reports are included in Appendix B. Results from the additional analytical are summarized below:

- At 13.8 NTU, turbidity was above the CDWQG MAC of 1.0 NTU;
- The total iron concentration, at 2.94 mg/L was higher that the 0.58 mg/L reported during previous sampling. The dissolved iron content was reportedly less than the detection limit of 0.030 mg/L, showing that the iron content can be almost entirely attributed to suspended solids;
- The total manganese concentration was 0.192 mg/L and the dissolved manganese content was reportedly 0.189 mg/L, signifying that the manganese content can be almost entirely attributed to dissolved particles;
- Results for EPH and PAH indicated that every parameter tested was below the analytical detection limit; and,
- Results for OCP reported every parameter tested w as below the laboratory detection limit.

26.3.3 Indicators of Potential Contamination

No elevated concentrations of indicator parameters were observed in the sample results reviewed.

26.4 Conceptual Hydrogeology

No log was available for this well. Lithology from the nearby Watson Lake Airport well (4851) indicates alternating fine and coarse material to a depth of 33.4m. The depth of this well is unknown; the static water level was measured to be 4.395 m below grade. This well is located approximately 700 m north of Watson Lake. The groundwater flow direction is southerly to southeasterly towards Watson Lake.

26.5 Potential Contaminant Sources

Potential contaminant sources observed during the site investigation are provided in field notes in Appendix A26. Photos of potential contaminant sources are provided in this appendix.

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

- Fire retartant tanks from 15 m to 25 m;
- Above ground aviation fuel storage tank at 30 m; and,
- Evaporation lagoon at 10 m.

26.5.1 Spills Records and Contaminated Sites Search Results

EBA has completed environmental site assessments for the Watson Lake Airport as a part of a separate contract between 2001 and 2004. The results of these investigations indicated that there is a former U.S. Military dump site dating from World War II located approximately 350 m upgradient from this well. Analytical testing for hydrocarbon parameters and metals concentrations in groundwater in the vicinity of the dump during the previous investigation did not indicate any parameters above the contaminated site regulations (CSR). Additional extractable petrolem hydrocarbons, polycyclic aromatic hydrocarbons, and organochlorine pesticide testing duiring the additional assessment did not identify any parameter above detection limits. It is unlikely, therefore, that this water source is being

impacted from leachate deriving from this former military dump site at the time of sampling.

26.6 Identified Water System Deficiencies and Associated Risk

26.6.1 High and Medium Risk Deficiencies

The following deficiencies were identified as high-risk for the Watson Lake EMR Fire Control Centre and Tanker Base water system:

- The wellhead is located within 30 m of potential sources of contamination, including an evaporation lagoon 10 m from the 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 the well completion depth is unknown and the well construction and does not meet the requirements of the Guidelines for Water Well Construction;
- There has been a consistent history of high turbidity reported at this water system. The most recent water quality analysis reported turbidity to be 13.8 NTU, well above the CDWQG MAC. Turbidity was previously reported as 9.2 and 11.2 NTU;
- There has been a positive total coliform count reported; and,
- This water system is not equipped with a treatment or disinfection system.

The water is used to supply fire retardant tanks in addition to supplying the EMR fire control centre and tanker base domestic systems. Although it is not a health-based deficiency for the water system, an additional high-risk deficiency with this water system is that the yield is reportedly too low to meet the peak firefighting water demand. Additionally, there is no backup well. This tanker base supplies planes that combat forest fires in the Southeast Yukon and Northern British Columbia, and the consequences of an undersized water supply could be great if a major fire threatens a community in these regions.

26.6.2 Low Risk Deficiencies

The following deficiencies were identified as low-risk for the Watson Lake EMR Fire Control Centre and Tanker Base water system:

- The total iron concentration was in exceedence of the CDWQG aesthetic objective;

- The total and dissolved manganese concentrations in the water were in exceedence of CDWQG aesthetic objectives;
- Previous water quality results indicated exceedences of CDWQG aesthetic objectives for colour.
- There are fire retardant tanks located between 15 m and 25 m from the well. They are, however, all double-walled Enviro Tanks equipped with secondary containment; and,
- There an above ground aviation fuel storage tank located approximately 30 m from the well. It is, however, a double-walled EnviroTank equipped with secondary containment.

26.7 Mitigative Options for Deficiencies

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

26.7.1 Priority 1

- It is recommended that NSF-61 certified filtration and a NSF/ANSI 55 certified UV disinfection system be installed in the tanker base. A duplex water softener would also be required for pretreatment. These are conceptual design recommendations based on the information available for planning and budgeting purposes. Engineering input will be required for final system specifications;
- A short-term constant rate high yield pump test should be conducted in order to determine the yield of this well; and,
- An investigation into the adequacy of the existing pump relative to the results of the pumping test, and the adequacy of the pump controls and electrical for the pump should be completed at the time of the pump test.

For the interim, it should not be necessary to install disinfection and treatment in both buildings. The treatment/disinfection system should be installed in the tanker base because it serves as a living quarters for staff. A sign should be posted in the fire control centre, however, that the water should not be used for potable purposes and drinking water be obtained from the tanker base.

26.7.2 Priority 2

Due to the importance of a large water supply to meet peek demand for this facility, it is recommended that a new well be drilled and the current well be used as a backup well. This new well, pending water quality results, could then be used as the main source for the EMR fire control centre and tanker base. It is recommended that a new well be installed to meet the following conditions:

- The well should be equipped with a surface seal to at least 6 m and the casing should be extended above grade (500 mm) within a lockable enclosure that is inaccessible to animals and unauthorized personnel;
- The well must be located at a distance greater than 30 m from any potential source of contamination, including the above ground storage tanks, all parts of any septic system, and the evaporation lagoon; and,
- NSF/ANSI 55 certified UV disinfection system should be installed in the fire control centre, with a residential sized water softener for pretreatment. These are conceptual design recommendation based on the information available, and are intended to be used for planning and budgeting purposes. Engineering input will be required for final system specifications or design.

The existing well should then be properly disconnected from supplying the EMR fire control centre and tanker base's domestic water system, and be used exclusively as an auxiliary water supply source for forest fire fighting.

26.7.3 Priority 3

- There are no Priority 3 recommendations for this site.

26.8 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.

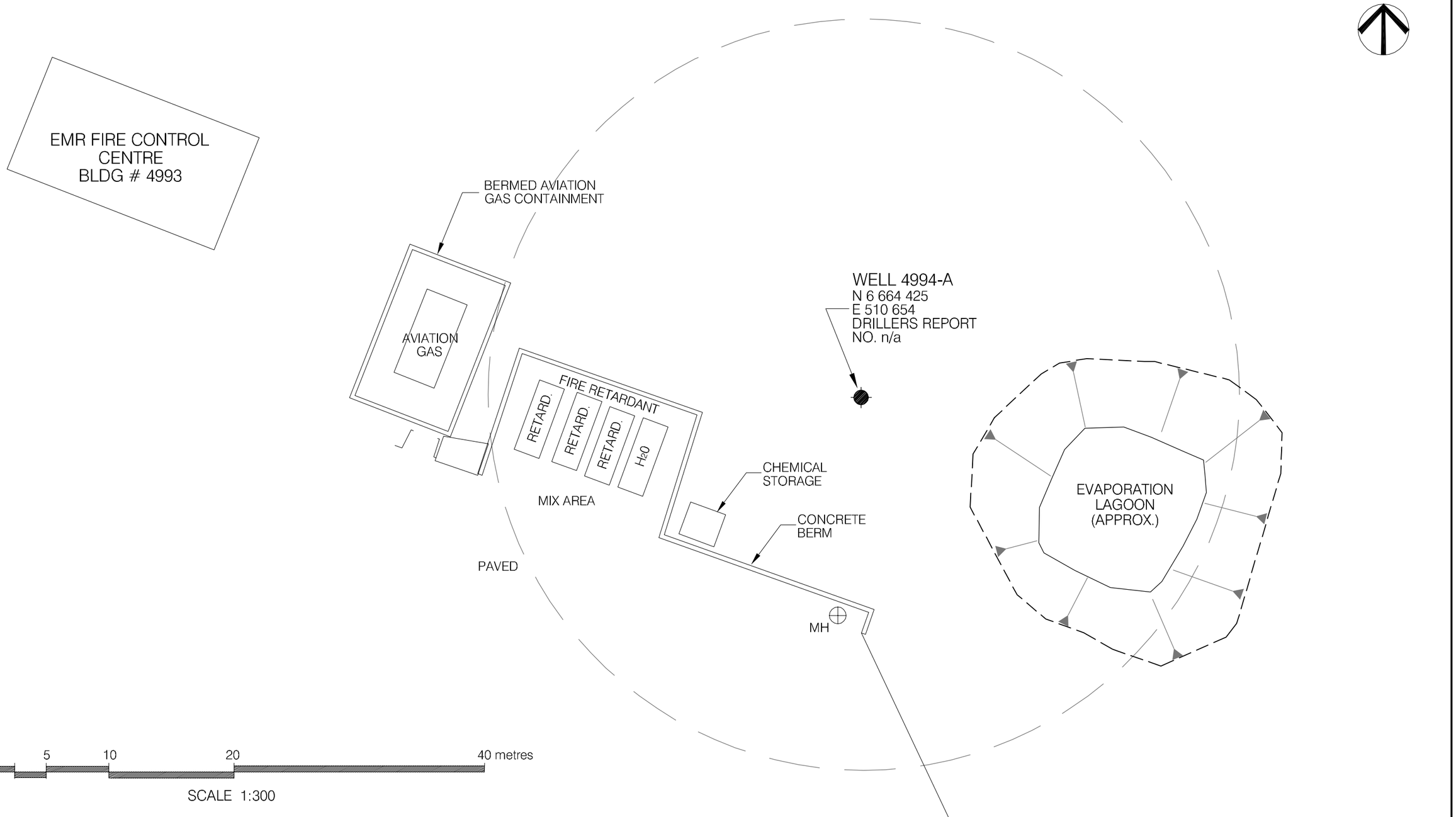
26.8.1 Priority 1

- The proposed treatment/disinfection system would cost in the order of **$6,700**;

- A short term, high yield pump test, and inspection of the existing pump and controls would cost approximately **$2,500**; and,
- A contingency in the amount of **$6,000** should be budgeted in the event that a new pump is required.

26.8.2 Priority 2

- The new well is to be installed with a proper surface seal and wellhead enclosure, assuming overburden to a depth of approximately 30 m, it is recommended that **$25,000** be budgeted for materials and labour to drill, test, complete and hook-up the well; and,
- The proposed treatment/disinfection system for the fire control centre would cost approximately **$4,500**.



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:	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 EMR FIRE CONTROL CENTRE (4993) &
EMR TANKER BASE (4994)
SITE LOCATION DIAGRAM
WELL ID: 4994-A

REVISION ISSUE: 0

FIGURE No.: 4994-A

Z:\020\Drawings\1260002 Water Assessment YTG\002 - Eastern Region\watson\1260002 EMR Tanker Base_4994.dwg, 7/25/2005 3:48:05 PM, Adobe PDF

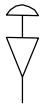
LEGEND


PUMP


PRESSURE GAUGE


GATE VALVE


CHECK VALVE

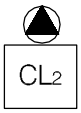

SOLENOID

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

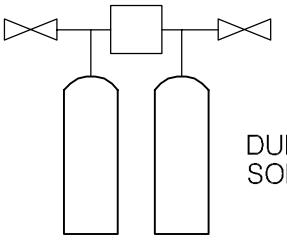
FLOW METER

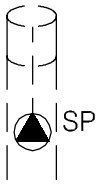
WATER FILTER
(CARTRIDGE TYPE)

PRESSURE TANK

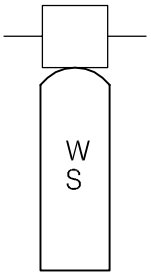


CHLORINE RESERVOIR AND
INJECTION PUMP


DUPLEX WATER
SOFTENER

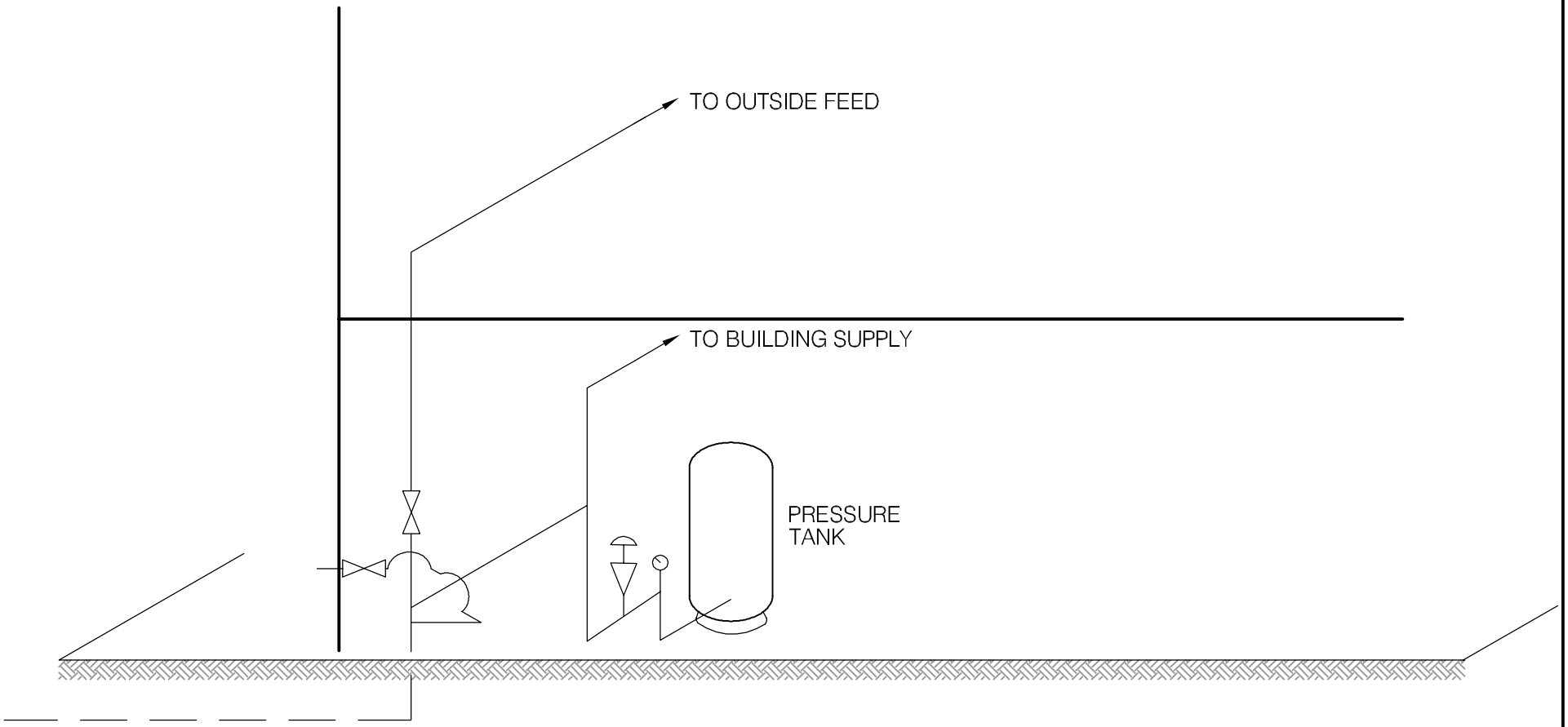


WELL WITH
SUBMERSIBLE PUMP



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.: 4993 WATSON LAKE FIRE CONTROL	
DATE JULY 2005	DWN. JSB	CHKD. RMM	FILE NO. 1260002.002		DWG.: FIGURE 4993-B

Z:\0201Drawings\1260002 Water Assessment YTG\002 - Eastern Region\watson\Schematics\1260002 Fire Control_4993 Schematic.dwg, 7/21/2005 4:39:08 PM, Adobe PDF

Eastern Region – EMR Fire Control Centre
Building # 4993

DISTRIBUTION & TREATMENT SYSTEM DATA

Item	Description	Manufacturer	Model	Part No.	Serial No.	Size
1	SUB PUMP					NO INFO
2	PRESSURE TANK	PERMA TANK	PAD 119		090924472	
3	PRESSURE SWITCH	SQ. D	FSG-2			2HP - 1/4" FIPT
4	PRESSURE GAUGE	MARSH	0-100			2" - 1/4" FIPT
5						
6						
7						
8						
9						
10						

TABLE 4994- 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?
4993	EMR Fire Control Centre	4	Nov-04 to Mar-06	no	0/4	no	5-Mar-05	no
4994	EMR Tanker Base	2	May -05 to Jun-05	**yes**	1/2	no	5-Jun-05	no

Table 4994-2: Water Quality Results

SOURCE:	Buildings 4993 and 4994 - EMR Fire Control Centre and Tanker Base			GCDWQ Criteria		
Location/ Resident	Watson Lake Airport					
Address						
Treatment	No					
Disinfection	No					
Source of Water	On-Site Well 4994					
Purpose of Sampling	Baseline	Baseline	Additional Assesment			
Sample Location						
Date Sampled	14-Sep-05	22-Jun-05	23-Jun-05	**Lower**	**Upper Limit**	
Physical Tests *(ALS)*				**AO**	**MAC**	**AO**
Colour (CU)	>60	<5				15
Conductivity (uS/cm)		225				
Total Dissolved Solids	123	136				500
Hardness CaCO3	118	120		AO >200 = poor, > 500 unacceptable[A]		
pH	7.83	7.86		6.5		8.5
Turbidity (NTU)	**9.2**	**11.2**	**13.8**		1	5
UV Absorbance			0.048			
% Transmittance						
Dissolved Anions *(ALS)*						
Alkalinity-Total CaCO3	126	135				
Chloride Cl	<0.5	<0.50				250
Fluoride F	<0.05	0.056			1.5	
Silicate SiO4						
Sulphate SO4	1.95	1.16				500
Nitrate Nitrogen N	<0.01	<0.10			10	
Nitrite Nitrogen N	<0.005	<0.10			1	
Ammonia Nitrogen N						
Total Phosphate PO4						
Total Metals *(ALS)*						
Aluminum T-Al	<0.005	<0.010				
Antimony T-Sb	<0.0002	<0.0005			0.006	
Arsenic T-As	0.0004	0.00042			0.025	
Barium T-Ba	0.109	0.1			1	
Boron T-B	0.002	<0.10			5	
Cadmium T-Cd	<0.00001	<0.0002			0.005	
Calcium T-Ca		38.3				
Chromium T-Cr	0.0008	<0.0020			0.05	
Copper T-Cu	<0.001	0.0014			1	
Iron T-Fe	**0.58**	**2.78**	**2.94**			0.3
Lead T-Pb	0.0005	<0.0010			0.01	
Magnesium T-Mg		5.82				
Manganese T-Mn	**0.158**	**0.164**	**0.192**			0.05
Mercury T-Hg		<0.0002			0.001	
Potassium T-K		0.53				
Selenium T-Se		<0.0010			0.01	
Sodium T-Na	1.7	<2.0				200
Uranium T-U	<0.0005	<0.0001			0.02	
Vanadium T-V						
Zinc T-Zn	0.281	0.197				5
Dissolved Metals *(ALS)*						
Aluminum D-Al					0.1	
Antimony D-Sb					0.006	
Arsenic D-As					0.025	
Barium D-Ba					1.0	
Boron D-B					5	
Cadmium D-Cd					0.005	
Calcium D-Ca						
Chromium D-Cr					0.05	
Copper D-Cu						1.0
Iron D-Fe			<0.030			0.3
Lead D-Pb					0.01	
Magnesium D-Mg						
Manganese D-Mn			**0.189**			0.05
Mercury D-Hg					0.001	
Potasium D-K						
Selenium D-Se					0.01	
Sodium D-Na						200
Uranium D-U					0.02	
Vanadium D-V						
Zinc D-Zn						5.0
Trihalomethanes						
Bromodichloromethane						
Bromoform						
Chloroform						
Dibromochloromethane						
Total Trihalomethanes					0.1	
Organic Parameters						
Tannin and Lignin						
Total Organic Carbon C			0.29			
			2.31			
Haloacetic Acids						
Bromoacetic Acid						
Bromochloroacetic Acid						
Chloroacetic Acid						
Dibromoacetic Acid						
Dichloroacetic Acid						
Trichloroacetic Acid (TCA)						
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		0.00001	
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			
Organochlorine Pesticides						
Aldrin			<0.000050			8.5
alpha-BHC			<0.000050			500
beta-BHC			<0.00010			
delta-BHC			<0.000050			
cis-Chlordane (alpha)			<0.000050			
trans-Chlordane (gamma)			<0.000050			
2,4'-DDD			<0.00010			
4,4'-DDD			<0.000050			
2,4'-DDE			<0.00010			
4,4'-DDE			<0.000050			
2,4'-DDT			<0.00010			
4,4'-DDT			<0.00010			
Dieldrin			<0.000050			
Endosulfan I			<0.000050			
Endosulfan II			<0.000050			
Endosulfan Sulfate			<0.000050			
Endrin			<0.00020			
Heptachlor			<0.00010			
Heptachlor Epoxide			<0.000050			
Lindane (gamma - BHC)			<0.000050			
Methoxychlor			<0.00020			
Mirex			<0.000050			
cis-Nonachlor			<0.000050			
trans-Nonachlor			<0.000050			
Oxychlordane			<0.000050			
Field Chemistry (EBA)						
pH			8.07			8.5
TDS (ppm)			158			500
EC (uS/cm)			315			
Temperature (°C)			9.4			
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)

Table 4994-3: 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)**
4993 and 4994	**Watson Lake EMR Fire Control and Tanker Base**	**Watson Lake Airport**	6664425	510654	688

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)**
Unknown, likely 150 mm and 200 mm. Surface casing is 250 mm		No					5.3

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**
Greater than 60 m	53 m	Greater than 60 m	Av gas AST	30 m	Fire retardant tanks from 15 m to 25 m Chemical storage at 40 m Evaporation lagoon that likely contains fire retardant and other run-off from the tarmac at 10 m

Well Construction Details					
Wellhead Above ground (m)	**Well Cap**	**Well Screen**	**Surface Seal**	**Apron Grading**	**Comments**
0.95 m above grade (top of surface casing on pitless unit), piping from pitless unit at 3.25 m below grade	Pitless unit with proper cap - gasket in cap is missing		No	No, well is at a low point on the property	The well services the EMR Fire Control Centre and Tanker Base. The well is located outside and the wellhead is a commercial pitless unit.

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 23, 2005

WELL ID #	Owner	Location Description
4994	YTG	Watson Lake EMR Tanker Base

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,
Watson Lake Airport

c. GPS location: N 6664425 E 510654 elv 688m ± 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
Tanker base (4994), Fire control centre (4993), fire retardant tanks and holding tanks

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

g. Nearest building, specify Tanker base

h. Distance from well to building 53m

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

j. Distance from well to nearest point of known field: >60m

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
Run off from runway (w/retardant in it likely) goes into nearby evaporation lagoon

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 Entrance by animals? ☒ Yes ☐ No
commercial pitless unit

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

q. Is the well site well drained? ☐ Yes ☒ No
located at low point

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: Fire retard tanks Distance from well to Potential Source 1: ~15m-25m
Potential Source 2: Avgas ; Distance from well to Potential Source 2: ~30m
Potential Source 3: chem storage ; Distance from well to Potential Source 3: ~40m
Potential Source 4: evap lagoon ; Distance from well to Potential Source 4: ~10m

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

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 25 cm ☐ No
to pitless unit @ 4.17m bsc

f. Well casing: Diameter unknown Material: ☒ steel ☐ plastic ☐ concrete
likely

g. Depth of well: _____ ☐ measured (if possible) ☐ reported ☐ from log

h. Static water level below ground: 5.345 m bsc

☐ 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 unknown

m. Is the well head: ☐ in pumphouse ☐ in pit ☒ pitless adaptor ☐ in a building
commercial 25cm to 4.17m bsc

☐ 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 0.95m above grade to top of surface casing

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 No

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

If no, describe condition Missing Gasket on pitless unit lid

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…)_____

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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 unknown, facility is seasonal

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 unknown

g. Pump delivers water to: ☒ pressure tank (domestic) ☒ elevated tank (fire storage tanks) ☐ other (fire retardant)

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: pitless unit below frost line

l. Comments on pump installation: _____

6. Conclusions

a. Comments on overall installation:

Pump is apparently too small to meet demand - likely malfunctioning

b. Recommendations: _____

PART B: EBA Site Inspection

Inspector: BERT ALMOSEN. Date JUNE 23/05

WELL ID #	Owner	Location Description
4993	YTG.	FIRE CONTROL CENTER

6. **Water Treatment**

a. Is well water treated? ☐ Yes ☑ No; Type of treatment:

☐ 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:

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: _____

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:

THIS IS A PROFESSIONAL INSTALLATION. IT HAS NO TREATMENT AT ALL. THE WATER CAUSES SEVERE STAINING (RUST STAINS).

b. Recommendations:

INSTALL TREATMENT SYSTEM FOR WATER QUALITY AT POINT OF ENTRY INTO BUILDING, FOLLOWED BY CHLORINATION WITH APPROPRIATE RETENTION FACILITY.

Photo 0319: 4993/4994 Pitless unit (front centre), EMR Fire Control Centre (4993, back right), EMR Tanker Base (4994, back centre), above ground fuel storage and fire retardant tanks (left)

Photo 0318: 4993/4994 Pitless unit (front centre), above ground fuel storage tank (back right), fire retardant tanks (back right centre), chemical storage (back centre), and airport tarmac (behind)

Photo 0317: 4993/4994 Pitless unit (front right), evaporation lagoon (left)

Photo 0048: 4993 pressure tank