

16.0 YUKON WILDLIFE PRESERVE

16.1 Description of Existing Water Supply System

The Yukon Wildlife Preserve Main Office (building YWP-A) is currently serviced by a water supply system that delivers water from a bedrock well. The wellhead is located in a pit immediately west of the main office. A site plan is provided as Figure YWP-A in Appendix A16. The coordinates of the wellhead, as measured by a hand held GPS device, were recorded as:

- UTM ZONE 8
- Northing: 6749184
- Easting: 481827

In addition to servicing the main office potable water system, there is a hydrant tree at the wellhead prior to the existing softener system that feeds irrigation and animal water tanks. The current wellhead configuration lacked proper freeze protection. The only treatment on the main office water system at the time of the assessment was an iron softener. A system schematic is provided as Figure YWP-A in Appendix A16.

The Yukon Wildlife Preserve Kestrel Cottage (YWP-B) is currently serviced by a water delivery system. Water from a 3000 L water storage tank supplies potable water to the building. A system schematic is provided as Figure YWP-B in Appendix A16. There is no treatment or disinfection system, but the delivered water is chlorinated at the source. Field chemistry with a Hach Colorimeter at the site taken at the time of water sampling indicated that the residual chlorine was at 0.38 mg/L, which is considered adequate according to the proposed regulations.

Additionally, there is an abandoned well located inside the Kestrel Cottage that is no longer in use due to poor water quality. The well is not connected to the existing water system. A site plan is provided as Figure YWP-A in Appendix A16. The coordinates of the wellhead, as measured by a hand held GPS device, were recorded as:

- UTM ZONE 8
- Northing: 6748465
- Easting: 481835

YWP Building C (Phalarope Lodge) has been condemned, does not have an operating water system, and was not investigated.

The Yukon Wildlife Preserve Building D, the Ptarmigan Tower, is currently serviced by a water delivery system. Truck delivered water stored in a 3000 L water storage tank that supplies water to the building. A system schematic is provided as Figure YWP-D in Appendix A16. There is no treatment or disinfection system anywhere on the water system, but since the water is delivered it has been previously chlorinated at the source.

16.2 Description of Existing Wastewater Systems

The septic tank for the Yukon Wildlife Preserve Main Office is located north of the main office building and approximately 20 m northwest from the wellhead. The septic tank discharges effluent to a field located greater than 40 m northwest of the tank. The septic tank and effluent field are located down slope from the well. A site plan showing the septic system is provided as Figure YWP-A in Appendix A16.

The septic tank for the Yukon Wildlife Preserve Kestrel Cottage (staff house) is located northwest of the building and approximately 15 m north of the well that is currently not in use. The septic tank discharges effluent to a field located 15 to 25 m northwest of the wellhead. The septic tank and effluent field are located at approximately the same elevation as the grade elevation at the well. A site plan showing the septic system is provided as Figure YWPB-A in Appendix A16. It was reported that the septic system is malfunctioning and the septic field is likely clogged.

16.3 Water Quality Results

16.3.1 Water Quality Results from Previous Sampling

Bacteriological

The Yukon Government only recently acquired the Yukon Wildlife Preserve, and as such there had not yet been routine testing of the water supply for bacteriological analysis at the time of the assessment. YTG Environmental Health and Social Services (EHSS) had one previous result on file for the main office. On March 2nd, 2005, the water sample submitted was absent of both *E.Coli* and Total Coliform bacteria.

Building B (Kestrel Cottage) and Building D (the Ptarmigan tower) are serviced by water delivery. There were no bacteriological results available for review for the Main office (Building A). Yukon Water Services, the truck delivery company supplying the Kestrel

Cottage and the Ptarmigan Tower, provided a bacteriological result for their most recent test. Results for this sample taken May 31, 2005 indicated that *E.Coli* and Total Coliform were not present on the date sampled.

Prior to finalization of this report, EBA was provided with routine bacteriological test results from June 2005 to February 2006. Reportedly, *E.Coli* and total coliform bacteria were present in a sample collected on July 5th, 2005. Given the location of the well in proximity to wild animal pens and a septic field, the positive *E. coli* result is a very significant concern. Total coliform bacteria were also found to be present on one other occasion. For all other sampling events total coliform and *E. coli* were reported to be absent.

Detailed Potability Analyses

The staff house and the Ptarmigan tower are both on water delivery from Yukon Water Services Limited, which receives its water from the City of Whitehorse water supply. Water quality analysis done by the City of Whitehorse at sample station WH-3 indicated no exceedences of CDWQG health based or aesthetic parameters. Analytical results are tabulated in Table YWP-2.

There were no water quality results available at the time of the assessment for the Main Office on which to base decisions regarding further analytical data needed to be collected.

16.3.2 Identification of Additional Analytical Testing Required

Additional analytical for the Yukon Wildlife Preserve 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 for the main office.
- Since there had been no previous samples taken from the main office, detailed potability analyses were recommended. This analysis includes identifying the physical characteristics of the water and determining the total concentrations of major metals and dissolved anions contained in the drinking water.
- Measurements in the field for total dissolved solids, conductivity, pH, and temperature were completed at the main office and the staff house, and tests for residual chlorine were completed at the Kestrel Cottage as well as the Ptarmigan tower.

A water sample was obtained from the main office during the water system assessment on May 19, 2005, and was submitted for analysis to ALS Environmental in Vancouver BC for UV absorbance, and detailed potability analyses. These results are summarized in Table YWPA-2 and the laboratory reports are included in Appendix B.

Additional Analytical Results

- The water quality for the sample obtained on May 19, 2005 indicated that the groundwater source is calcium-sulphate type water with extremely high hardness. The hardness (as CaCO_3) was found to be 688 mg/L, and is considered to be unacceptable for consumption by aesthetic standards (without treatment). Note that this is a raw water sample, and the softened water could not be sampled at the time of the assessment.
- The nitrate concentration was recorded as 2.61 mg/L, which although is not higher than the MAC of 10 mg/L, may be above the normal background concentrations for the Whitehorse area.
- The TDS concentration was 904 mg/L, which is above the CDWQG aesthetic objective of 500 mg/L.
- The water quality results indicated that all other health based and aesthetic objectives were met for the parameters analyzed.

16.3.3 Indicators of Potential Contamination

Chloride, nitrate and nitrite concentrations can indicate impacts from surfacewater sources or septic waste. The chloride concentration for the sample obtained on May 19, 2005 was reported to be 26.5 mg/L and is considered to be above the normal background range for groundwater in the Whitehorse area. Nitrite concentrations for this sample were also found at concentrations that can be considered to be higher than the expected normal background concentration for the Whitehorse area. These results suggest that the aquifer from which the groundwater is obtained for the Yukon Wildlife Preserve may be under the influence of surfacewater sources, septic or animal wastes. It is considered unlikely that high chloride and nitrate levels may be a regional anomaly for the water quality in this area. As mentioned previously, total coliform and E.coli were observed in a sample collected on July 5th 2005. These results, along with the elevated nutrients observed in the same time period provide significant concern that this well was being impacted at the time of sampling.

16.4 Conceptual Hydrogeology

The well log for the drilled well serving YWP-A was available for review. The log indicates that the well was drilled through silt, sand and gravel into bedrock, which was encountered at 3.7 m below grade. The casing was reportedly driven into the bedrock to a depth of approximately 4.3 m. It should be noted that the draft guidelines require that a continuous casing be installed to 6 m below grade. As well, there is no indication that the casing was grouted into the bedrock. The well was drilled to a total depth of 102 m. The static water level was reported as 26.8 m below grade. The crude well capacity based on development was estimated at 12 USgpm. The groundwater flow direction is unknown and difficult to infer based on the undulating topography of the area.

16.5 Potential Contaminant Sources

Potential contaminant sources from observations during the site investigation are compiled in Table YWP-A-4 for the main office and Table YWP-B-4 for the Kestrel Cottage in Appendix A16. Photos of potential contaminant sources are provided in Appendix A16.

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

- Muskox pens and other game enclosures are at 12 m and 25 m respectively, and
- Above ground fuel storage tank is 6 m from the well.

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

- Septic tank and effluent field are approximately 15 m away, and
- Above ground fuel storage tanks are 16 m and 30 m away from the well.

16.5.1 Spills Records and Contaminated Sites Search Results

The YTG Environmental Programs Branch did not report any concerns related to spills or known contaminant issues for any of the Yukon Wildlife Preserve sites.

16.6 Identified Water System Deficiencies and Associated Risk

16.6.1 High and Medium Risk Deficiencies

The following deficiencies were found to be high-risk for the Yukon Wildlife Preserve Main Office water system:

- Positive coliform and *E. coli* results.
- The well is located in a pit below grade, without a surface seal, and there was evidence of vermin presence inside the pit enclosure;
- 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 well is located in an enclosure that is not locked and may be accessible to animals and unauthorized personnel;
- The well it is located within 30 m of the office septic system, as well as within 30 m of muskox pens;
- There is an above ground fuel storage tank located 6 m away from the wellhead;
- There is no disinfection system;
- Nitrate and chloride levels may be higher than expected background concentrations for the Whitehorse area; and,
- There is no backflow preventer on the irrigation hydrant tree.

For the Yukon Wildlife Preserve Kestrel Cottage, the high-risk deficiencies for the water system observed during the site assessment included:

- There is no floor in the crawl space that leads to the water storage tank and there is evidence of biofouling in the tank.
- The tank was not sanitary and appeared that it had not been cleaned recently if ever.
- Due to the lack of flooring in the crawl space leading to the tank, any attempt to clean the tank would likely track in dirt and make the cleaning process particularly difficult.

The water storage tank installation for the Yukon Wildlife Preserve Ptarmigan Tower is sub-standard and likely not acceptable for potable water storage. The fill cap had holes in it. Fill caps should be properly sealed to prevent insect/vermin entry to the water system.

The Yukon Wildlife Preserve is a recent acquisition of the Government of Yukon and it is unknown if the water systems had ever been tested while it was privately owned. It should be noted that while the preserve was privately owned, the main office acted as a residential dwelling. Since the Government of Yukon acquired the preserve, the building was

converted into a publicly accessible building and as thus the water system should be upgraded accordingly from a residential water system to a small public drinking water system.

16.6.2 Low Risk Deficiencies

The following deficiencies were found to be low-risk for the Yukon Wildlife Preserve Main Office water system:

- The raw water quality is highly mineralized; water quality analysis reported total dissolved solids as 904 mg/L and hardness as 688 mg/L. This high level of mineralization would necessitate pre-treatment for a disinfection system. The existing softener was not operational at the time of our previous assessment, and therefore, post treatment water quality was not available. It is assumed for costing purposes that the existing duplexing system is adequate to remove hardness.
- There is a raw water tap in the kitchen sink providing untreated water. This is low-risk for the current system as the only treatment system at the present time is a water softener. Once a disinfection treatment system is installed, however, this would provide a source of untreated water unless the current plumbing layout was altered.

The following deficiencies were found to be low-risk for the Yukon Wildlife Preserve Kestrel Cottage water system:

- The abandoned well has not been properly decommissioned;
- The well is located within 30 m of the in ground septic disposal that is currently malfunctioning and needs to be replaced. If the well is re-commissioned and put back into use for potable water then this would be considered a high-risk deficiency; and,
- There was no vermin screen on the vent for the outside water storage tank.
- The water piping is ABS, which is not approved for potable water.

The piping for the Ptarmigan Tower fill pipe and overflow was also of ABS construction, which is not suitable for potable use.

16.7 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).

16.7.1 Priority 1

Additional assessment is suggested to determine if there is a high-risk situation that exists for the Main Office water system. It is recommended that close attention be paid to sampling results for nitrate, nitrite and ammonia parameters as well as bacteriological test results. Sample results from June 26th, 2005 indicated that nitrate and chloride concentrations were still elevated. It is not clear whether the treatment system was in place prior to this most recent sampling event. Follow-up sampling during the spring freshet, and following well upgrades is recommended, and should include chloride, nitrate, nitrite and ammonia as well as bacteriological parameters as a minimum.

Costs for this additional assessment have not been included at this time. For the purpose of estimating cost for the YWP-A Main Office system, two options were presented in the draft report:

YWP-A Option 1:

- 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 bedrock around the well casing. If possible, the casing should be extended to at least 6 m below grade by hanging a smaller diameter casing with a packer, and grouting the casing between the casing and the packer. We understand that Aqua Tech Supplies and Services have been retained by PMA to complete this work and it is in progress at the time of this final report.
- The ground surface around the wellhead should be graded to promote surface drainage away from the well;
- It was recommended that a NSF 61 certified commercial duplex filtration system (10 micron and 1 micron absolute) followed by a chlorine disinfection system be installed at the point of entry. The system should be equipped with a proportional feed digital dosing chlorine injection pump. Sodium hypochlorite dosing rates should be adjusted as necessary to maintain a residual chlorine concentration above 0.4 mg/L. We understand that a filtration and digital dosing chlorine injection pump with necessary appurtenances were installed in July 2005 shortly after the positive *E. coli* result and the publication of the draft report that preceded this report. The project team has not inspected the current system.
- A backflow preventer should be installed on the irrigation piping. This work should be completed by Aqua Tech in conjunction with the wellhead upgrades that are in progress.

The recommendations provided above are considered conceptual level based on the information available for planning and budgeting purposes. Engineering input will be required for final system specifications.

YWP –A Option 2:

Pending results of the additional assessment that has been suggested above, a new well may be required, with a deep casing and surface seal (into bedrock) and the existing well properly decommissioned.

For the Yukon Wildlife Preserve Kestrel Cottage, there are also two options for mitigative upgrades for high-risk deficiencies in the water supply system. The options provided include, repairing and upgrading the existing infrastructure for the bulk delivery system, or re-commissioning the existing abandoned well.

YWP-B Option 1:

The water storage tank at the Yukon Wildlife Preserve Kestrel Cottage can not be properly accessed for cleaning. To mitigate this, it is recommended that a concrete floor be installed in the building crawl space to properly house a water storage tank. The tank should be dismantled, and a section removed, so that the height of the tank would render it accessible for cleaning. Re-plumbing with PVC should be completed at this time.

YWP-B Option 2:

Re-commissioning the existing well would require that the current septic system be removed and relocated to a distance of 30 m from the existing well. The following upgrades would be required for the existing well to be re-commissioned:

- The well would have to be properly cleaned and redeveloped;
- 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 3 m depth around the well casing;
- A new wellhead enclosure that is inaccessible to animals and unauthorized personnel should replace the existing one and the ground surface should then be graded to promote surface drainage away from the well;
- A NSF-61 certified cartridge filter system (10 micron and 1 micron absolute) should be installed;
- A NSF/ANSI 55 certified UV disinfection system should be installed. Detailed potability analyses should be completed once the well is in working order, and this should include a sample to determine the UV absorbance of the water. Pretreatment to remove hardness, iron and manganese in order to facilitate proper operation of the UV would likely be required based on anecdotal information regarding the water quality from the well (hard and highly mineralized).

The following recommendations should be carried out so that the water system at the Yukon Wildlife Preserve Ptarmigan Tower is brought up to standards:

- The current water tank is inaccessible for cleaning. The storage tank should be replaced with a smaller 5000 L storage tank and be installed in a location that is accessible for cleaning. The new tank should be properly cleaned annually;

The recommendations provided above are considered conceptual level based on the information available for planning and budgeting purposes. Engineering input will be required for final system specifications.

16.7.2 Priority 2

For the Yukon Wildlife Preserve Main Office, it is imperative that regular bacteriological testing for total and fecal coliform bacteria, as well as *E.coli* bacteria be completed. This testing should be done regularly and proper records must be maintained so that the safety and cleanliness of the water can be properly monitored.

ABS piping at the Yukon Wildlife Preserve Kestrel Cottage used in the water supply system should be replaced with PVC piping. This should be completed if **Option 1** from the high-risk mitigative options is chosen, or if there is a significant amount of time before **Option 2** is carried through.

ABS piping at the Yukon Wildlife Preserve Ptarmigan Tower should be replaced with PVC piping. Additionally, the cap for the water fill pipe should be replaced with one that will offer a proper watertight seal.

16.7.3 Priority 3

For the Yukon Wildlife Preserve Main Office, the following low-risk recommended changes should be carried out:

- Once the treatment system is installed, the raw water tap in the kitchen should be removed. For sampling purposes; however, it is recommended that there be a provision somewhere on the system for raw water sampling.

16.8 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.

16.8.1 Priority 1

For the Yukon Wildlife Preserve Main Office, cost estimates for high-risk mitigative upgrades to the water supply system are as follows:

YWP- A Option 1:

- The cost for standard wellhead upgrades is estimated at **\$5000**.
- The cost to install buried transfer pipe (with heat trace and insulation) to the boiler room would be about **\$1,000**.
- The estimated cost to install a liner hanger, packer and grout is **\$2000** if the work is completed at the same time as the standard upgrades presented above.
- A duplex filtration system would cost approximately **\$2500** installed.
- A chlorination system with retention tanks and other appurtenances would cost in the order of **\$5000**.
- A backflow preventer would cost approximately **\$300** installed.
- The cost to relocate the game enclosures fences so that they are at least 30 m away from the well is estimated at **\$5000**, and could likely be completed by YWP summer staff.
- Removing the existing raw water tap from the kitchen would likely cost **\$300**.

YWP – A Option 2:

- The cost to drill, test and install a new well to similar depths as the existing well would likely cost in the order of **\$40,000**.

For the Yukon Wildlife Preserve Kestrel Cottage, there are also two options for mitigative upgrades for high-risk deficiencies in the water supply system. Cost estimates for high-risk mitigative upgrades to the water supply system are as follows:

YWP – B Option 1:

- The cost of taking apart the existing tank and pouring a concrete base underneath, including reconstructing some of the existing building would likely cost in the order of **\$15,000** for all materials and labour.

YWP – B Option 2:

- To recommission the existing well and tear down and replace the existing wellhead enclosure would likely cost in the order of **\$10,000**. The cleaning and recommissioning of the old well would likely cost about **\$8,000**.
- The cost to relocate the septic system has not been included, as this would be required for any option since it is failing. The tank and field should be installed so that they are more than 30 m away from the well.
- The cost for a pre-treatment and NSF/ANSI 55 certified UV disinfection system is estimated to be about **\$7,000**.

Option 3:

The cost to drill a new well to similar depths, and located so it is 30 m from the septic system, and other potential contaminant sources is estimated at **\$30,000**.

For the Yukon Wildlife Preserve Ptarmigan Tower, cost estimates for high-risk mitigative upgrades to the water supply system are as follows:

- **\$1,300** for a new 5000 L water storage tank;
- **\$700** for a new jet pump;
- **\$1,800** for labour to remove and replace the existing tank and install the jet pump.

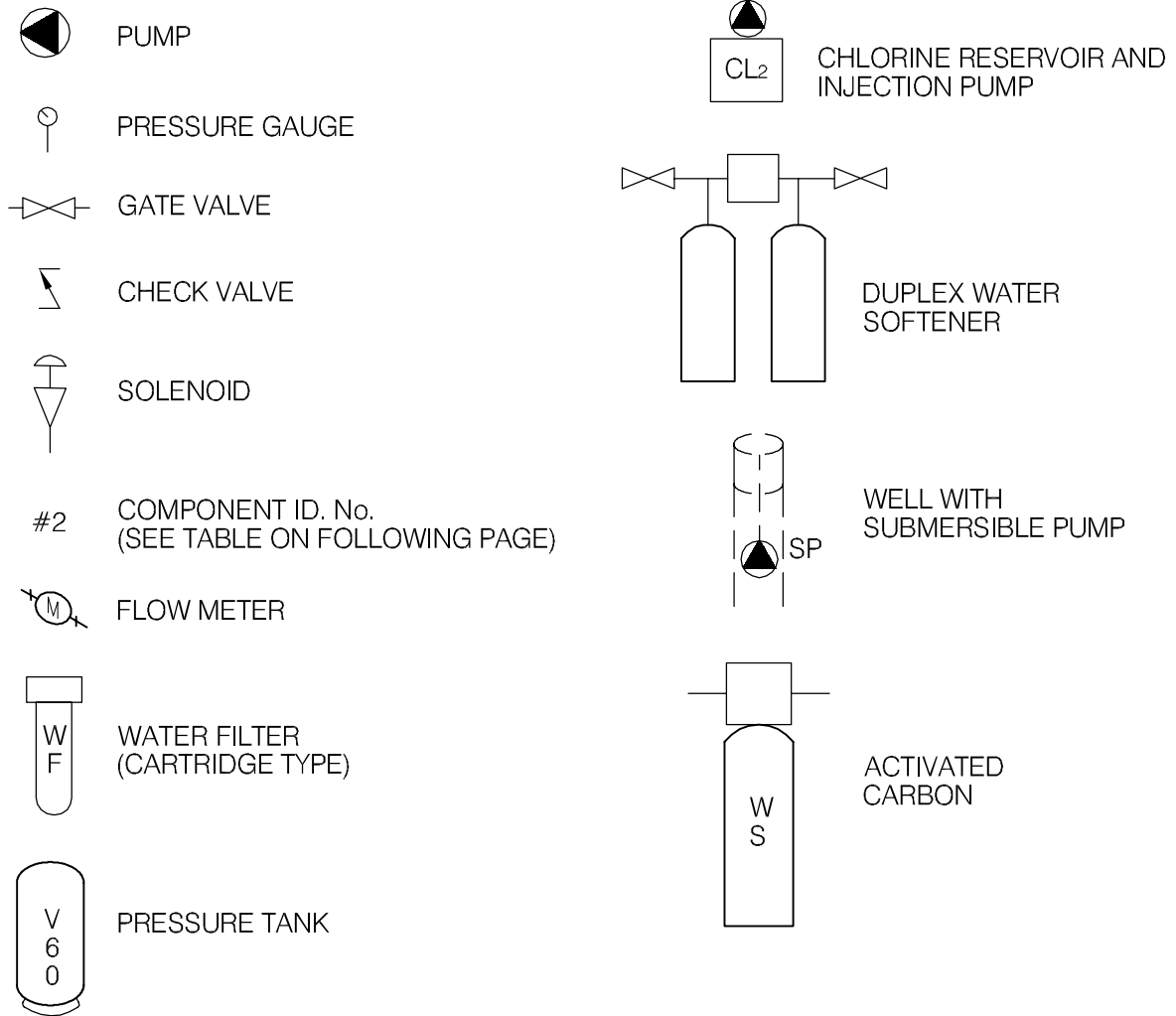
16.8.2 Priority 2

Regular bacteriological testing for the Yukon Wildlife Preserve Main Office would fall under normal Operation and Maintenance costs for the Property Management Agency.

To replace the ABS piping at the Yukon Wildlife Preserve Kestrel Cottage with PVC piping would likely cost in the order of **\$500** for materials and labour.

To replace the ABS piping at the Yukon Wildlife Preserve Ptarmigan Tower with PVC piping and to replace the cap on the water fill intake would likely cost in the order of **\$500** for materials and labour.

LEGEND



EBA Engineering Consultants Ltd.

CLIENT



PROJECT

SMALL PUBLIC WATER SYSTEMS ASSESSMENT
WHITEHORSE REGION

TITLE

SCHEMATIC SYSTEM
LEGEND

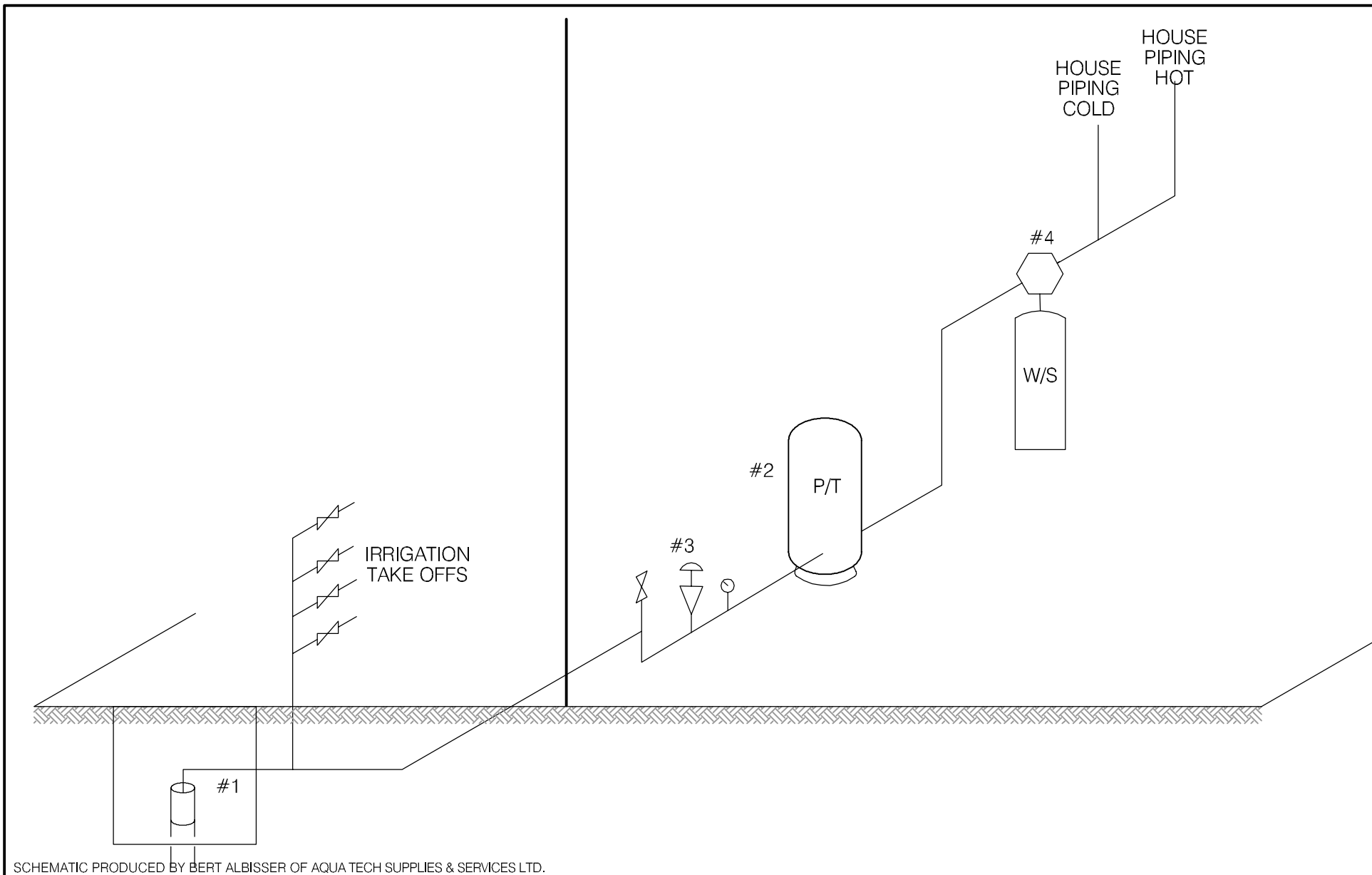
DATE APRIL 2006



DWN. JSB

CHKD. RMM

FILE NO. 1260002

DRWG. LEGEND



 EBA Engineering Consultants Ltd.		PROJECT SMALL PUBLIC WATER SYSTEMS ASSESSMENT WHITEHORSE REGION	
CLIENT  Yukon Highways and Public Works Property Management Branch		TITLE WATER SYSTEM DISTRIBUTION/TREATMENT SCHEMATIC SYSTEM ID.: YWP A YUKON WILDLIFE PRESERVE - MAIN WELL	
DATE	APRIL 2006	DWN.	JSB
CHKD.	RMM	FILE NO.	1260002.001
		DWG.:	FIGURE YWP-A

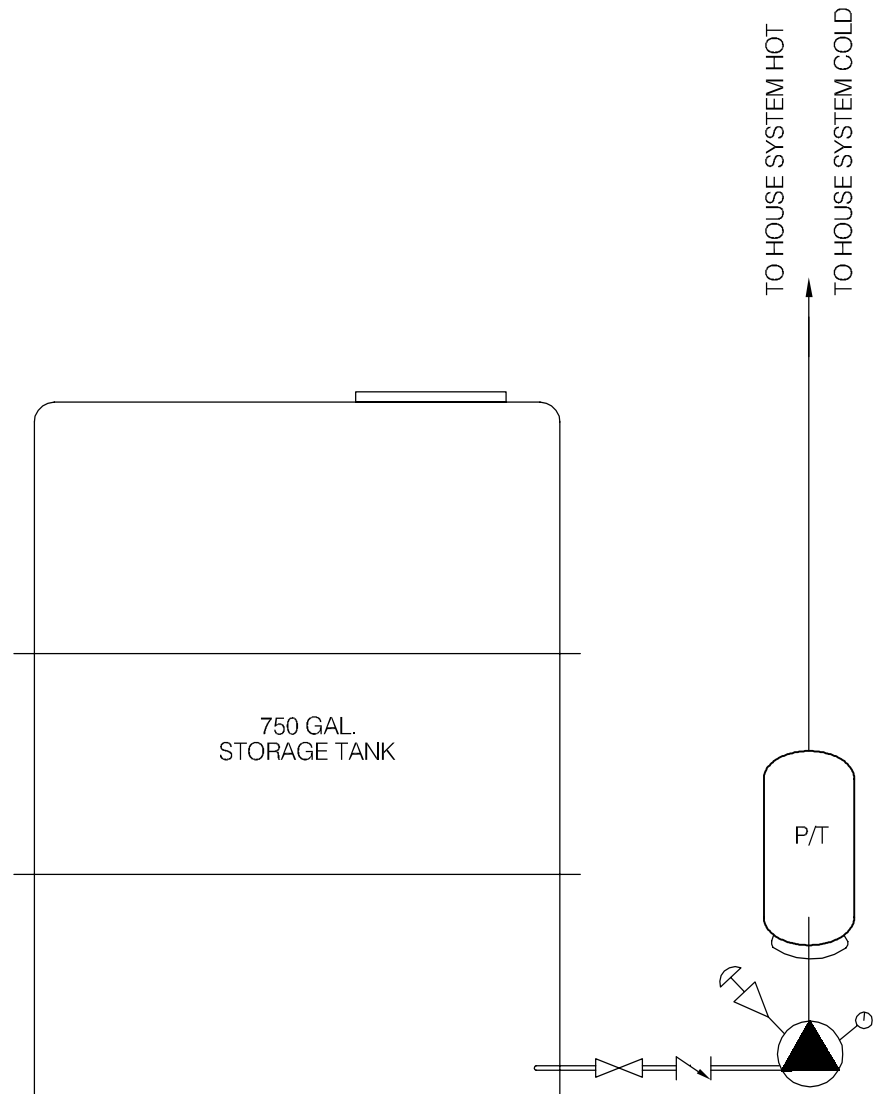
Whitehorse Region - ~~Carmacks Grader Station~~~~Building # 0512~~

WILDLIFE PRESERVE MAIN WELL

DISTRIBUTION & TREATMENT SYSTEM DATA

YWP A

Item	Description	Manufacturer	Model	Part No.	Serial No.	Size
1	4" SUBMERSIBLE					4" - 5 HP.
2	PRESSURE TANK	CHALLENGER	PC 366			
3	PRESSURE SWITCH	SCP D	FSG-2			2 HP 1/4" FIPT
4	IRON SOFTENER	ELITE	7836-1	EIS-45MI	228426	45000 GRAIN
5	PRESSURE GAUGE	MARCH	0-100 PSI			1/4" FIPT
6						
7						
8						
9						
10						



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



EBA Engineering Consultants Ltd.

CLIENT



PROJECT

SMALL PUBLIC WATER SYSTEMS ASSESSMENT
WHITEHORSE REGION

TITLE

WATER SYSTEM DISTRIBUTION/TREATMENT
SCHEMATIC SYSTEM ID.: YWP B
YUKON WILDLIFE PRESERVE - STAFF HOUSE

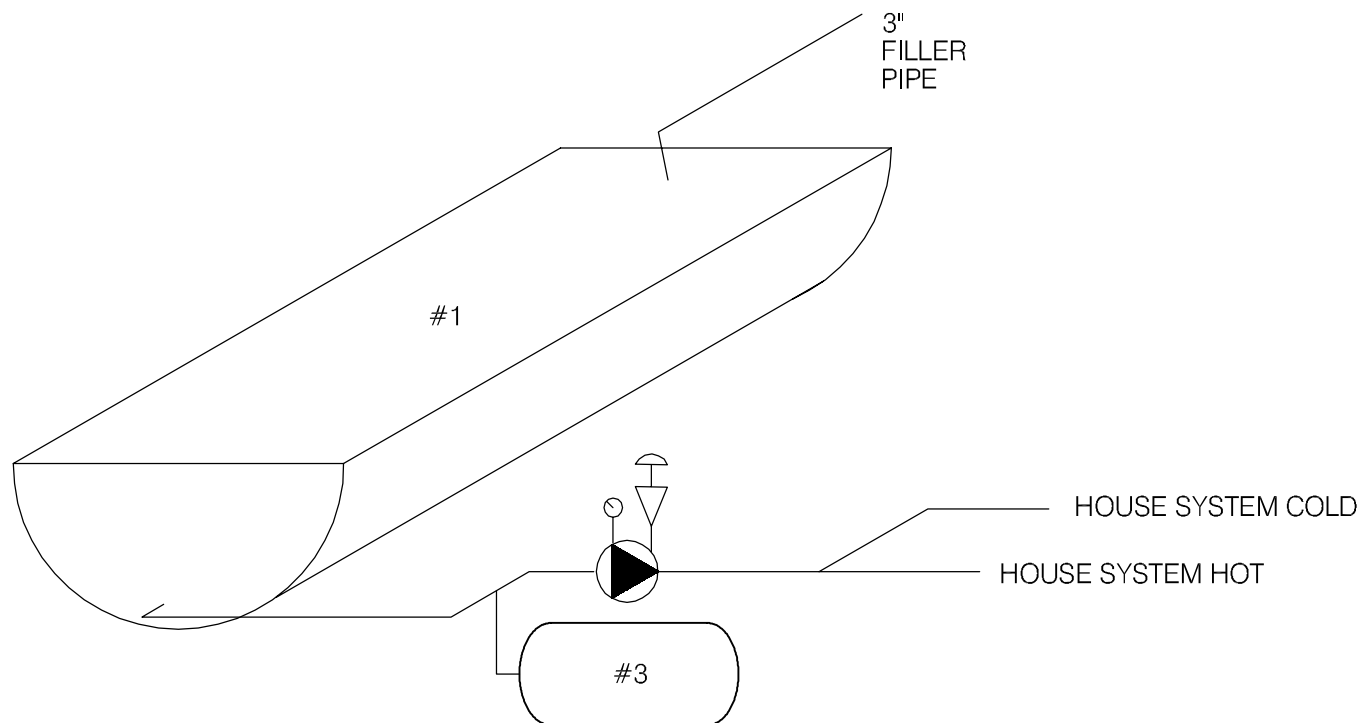
DATE APRIL 2006

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FILE NO. 1260002.001

DWG.: FIGURE YWP-B



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 EBA Engineering Consultants Ltd.				PROJECT SMALL PUBLIC WATER SYSTEMS ASSESSMENT WHITEHORSE REGION	
CLIENT  Yukon Highways and Public Works Property Management Branch				TITLE WATER SYSTEM DISTRIBUTION/TREATMENT SCHEMATIC SYSTEM ID.: YWP-D PTARMIGAN TOWERS RESIDENCE	
DATE APRIL 2006	DWN. JSB	CHKD. RMM	FILE NO. 1260002.001	DWG.: FIGURE YWP-E	

TABLE YWP - 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							
YWP-A	Yukon Wildlife Preserve Main Office	0	Jun-05 to Feb-06	yes	2/13	yes	28-Feb-06	no
YWP-B	Yukon Wildlife Preserve Kestrel Cottage	1	May-04	no	0/1	no	31-May-04	no



Table YWP-2: Water Quality Results

SOURCE:		Building YWP-A Yukon Wildlife Preserve Main Office		Building YWP-B Yukon Wildlife Preserve Staff Building		GCDWQ Criteria		
Location/ Resident		Takhini Hot Springs Road		Takhini Hot Springs Road				
Address								
Treatment		No, Water Softener Only		No				
Source of Water		On-Site Well		Delivery				
Purpose of Sampling		Additional Sampling	Baseline	Baseline (City of Whitehorse)	Additional Sampling			
Sample Location		Raw Water Tap from Kitchen		City of Whitehorse Waterhouse 3	Kitchen Tap			
Date Sampled		19-May-05	26-Jun-05	1-Dec-04	19-May-05	Lower Limit	Upper Limit	
Physical Tests (ALS)						AO	MAC	AO
Colour (CU)		<5.0	<5	<5				15
Conductivity (uS/cm)		1270	1220	252				
Total Dissolved Solids		904	950	160				500
Hardness CaCO3		688	658	116		AO >200 = poor, > 500 unacceptable ^A		
pH		8.18	7.96	7.86		6.5		8.5
Turbidity (NTU)		0.69	0.14	<0.1			1	5
UV Absorbance		0.022						
Dissolved Anions (ALS)								
Alkalinity-Total CaCO3		286	292					
Chloride Cl		26.5	23.6					250
Fluoride F		0.185	0.12				1.5	
Sulphate SO4		35.9	394					500
Nitrate Nitrogen N		2.61	0.58				10	
Nitrite Nitrogen N		<0.10	0.50				1	
Ammonia Nitrogen N		-						
Total Metals (ALS)								
Aluminium T-Al		<0.020	<0.020					
Antimony T-Sb		<0.0010	<0.0010				0.006	
Arsenic T-As		0.00044	0.00048				0.025	
Barium T-Ba		<0.040	<0.040				1	
Boron T-B		<0.20	<0.20				5	
Cadmium T-Cd		<0.00040	<0.00040				0.005	
Calcium T-Ca		162	155					
Chromium T-Cr		<0.0040	<0.0040				0.05	
Copper T-Cu		0.0024	0.0032				1	
Iron T-Fe		<0.030	<0.030					0.3
Lead T-Pb		<0.0020	<0.0020				0.01	
Magnesium T-Mg		68.9	65.6					
Manganese T-Mn		<0.0040	0.0193					0.05
Mercury T-Hg		<0.00020	<0.00020				0.001	
Potassium T-K		2.83	2.51					
Selenium T-Se		<0.0020	<0.0020				0.01	
Sodium T-Na		51.5	39.8					200
Uranium T-U		0.00946	0.00854				0.02	
Zinc T-Zn		<0.10	<0.10					5
Trihalomethanes								
Bromodichloromethane								
Bromoform								
Chloroform								
Dibromochloromethane								
Total Trihalomethanes							0.1	
Haloacetic Acids								
Bromoacetic Acid								
Bromochloroacetic Acid								
Chloroacetic Acid								
Dibromoacetic Acid								
Dichloroacetic Acid								
Trichloroacetic Acid (TCA)								
Field Chemistry (EBA)								
pH		7.43				6.5		8.5
TDS		579						500
EC (uS/cm)		1134						
Temperature		9.2						
Free Available Chlorine								

Notes:

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

highlighting.

Shading indicates exceedence of Proposed MAC guideline (arsenic).

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 YWP-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)
?	Yukon Wildlife Preverve Main Office	Takhini Hotsprings Road	6749184	481827	747
?	Yukon Wildlife Preverve Kestrel Cottage	Takhini Hotsprings Road	6748465	481835	721

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	?	Yes	102.8	Bedrock - 4m to 103m	?	?	?
150	Early 1970's	No	55.8	?	53.910	?	41.725

Well Construction Details				
Wellhead Above ground (m)	Well Cap	Well Screen	Surface Seal	Apron Grading
1.4m below grade	Split Cap Gasket	Open Hole Screen from 4.3m to 102.8m	No	No, but slopes away from pit
Approximately at grade (within 0.2m)	Split Cap Gasket	?	No	Inside building

**Table YWPA-4: Potential Contaminant Sources
Building YWPA – Yukon Wildlife Preserve Main Office**

Potential Contaminant Source	Potential Contaminants	Distance from Water Source	Northing	Easting
Dump or Landfill	<i>Organic</i> and inorganic chemicals.	>120 m		
Cemetery	<i>Biological</i> ¹ , inorganic ² and organic parameters.	>120 m		
Sewage lagoon	<i>Biological</i> , inorganic and organic parameters.	>300 m		
Animal Pens	<i>Biological</i> parameters	12 m and 25 m		
Sewage lines, tanks and lift stations	<i>Biological</i> , inorganic and organic parameters.	Approx. 15 m		
Septic fields	<i>Biological and Inorganic</i> parameters.	Approx 40 m	6743231	481831
Gas stations	<i>Organic and Inorganic</i> parameters.	8 km		
Undergrounds Fuel Storage Tanks (USTs)	<i>Organic</i> parameters.	>>30 m		
Above ground storage tanks (ASTs)	<i>Organic</i> parameters.	6 m	6749183	481834
Naturally occurring sources of contamination	<i>Radionuclides, Bacteria and Viruses from surfacewater sources.</i>	>150 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

Table YWPB-4: Potential Contaminant Sources
Building YWPB –Yukon Wildlife Preserve Kestrel Cottage

Potential Contaminant Source	Potential Contaminants	Distance from Water Source	Northing	Easting
Dump or Landfill	Organic and inorganic chemicals.	>120 m		
Cemetery	Biological ¹ , inorganic ² and organic parameters.	>120 m		
Sewage lagoon	Biological , inorganic and organic parameters.	>300 m		
Animal Pens	Biological parameters	50 m		
Sewage lines, tanks and lift stations	Biological , inorganic and organic parameters.	Approx. 14 m		
Septic fields	Biological and Inorganic parameters.	15 m	6748482	481837
Gas stations	Organic and Inorganic parameters.	8 km		
Undergrounds Fuel Storage Tanks (USTs)	Organic parameters.	>>30 m		
Above ground storage tanks (ASTs)	Organic parameters.	16 m and 30 m		
Naturally occurring sources of contamination	Radionuclides, Bacteria and Viruses from surfacewater sources.	>150 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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SMALL PUBLIC WATER SYSTEM ASSESSMENT

PART A: EBA Site Inspection

Inspector: Ryan Martin
Luke Lebel

Date May 19, 2005

WELL ID #	Owner	Location Description
	YTG	Yukon Wildlife Preserve well A

1. Well Location and Potential Contaminant Sources

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

Takhini Hot Springs Road

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

Yukon Wildlife Preserve, km 8 Takhini Hot Springs Road

c. GPS location: 481827 Easting 6749184 Northing 747m elevation $\pm 8m$

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

Services main office, and a hydrant that can connect to animal water tanks

☐ 5 or more delivery sites on a trucked distribution system?

If so how many

f. Nearest building, specify Game Farm Main office

g. Distance from well to building ~1m

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

i. Distance from well to nearest point of known field: _____

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

Septic tank ~20m away, downslope, septic tank begins >40m away, downslope

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

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

- 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

unfastened wooden lid

Entrance by animals? ☐ Yes ☒ No

Few traces of animals, access possible

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

some evidence of dampness and water staining

- p. Is the well site well drained? ☒ Yes ☐ No

- q. Is there a buried fuel tank on the property? ☐ Yes ☒ No

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

Potential Source 1: AST; Distance from well to Potential Source 1: ~6m

Potential Source 2: Baby, Musko's pen; Distance from well to Potential Source 2: ~12m

Potential Source 3: Musko's pen; Distance from well to Potential Source 3: 25m

Potential Source 4: wildlife compound; Distance from well to Potential Source 4: ~26m

- s. Are there other wells on this property? ☒ Yes ☐ No

How many? WB ☐ in use ☒ abandoned ☐ require proper sealing

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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 _____ ☒ No

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

* g. Depth of well: _____ ☐ 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

m. Is the well head: ☐ in pumphouse ☒ in pit ☐ pitless adaptor ☐ in a building
wood-enclosed (hen-pwf) pit w/ styrofoam insulated walls

☒ 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 Yes, 1.4m below grade
- ii. Are there signs of ponding on the enclosure(e.g. water stains, etc.)? ☒ Yes ☐ No
water staining and dampness
- iii. Is the wellhead enclosed by fiberglass insulations? ☐ Yes ☒ No
There is styrofoam insulation in enclosure walls and
lid. No insulation directly inside enclosure
- iv. Any evidence of rodents? Specify No evidence, access is likely
- v. Does the well casing have a proper seal cap? ☒ Yes ☐ No

If no, describe condition only

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...) Water Softener only

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
hydrant for hoses to animal tanks

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

k. Is the pump and piping protected from freezing? ☐ Yes ☐ No
Heater in enclosure. No Heat trace. No insulation in pit. Pit walls
and lid have styrofoam insulation
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: BERT ALBISSE

Date May 20/05

WELL ID #	Owner	Location Description
W.L.P. MAIN WEL	YTC	KIKON WILDLIFE PRESERVE

6. Water Treatment

a. Is well water treated? ☒ Yes ☒ No; Type of treatment: IRON SOFTENER

☐ chlorination ☒ iron and or manganese removal ☐ other _____

b. Is water entering plumbing or piped distribution system treated with chlorine or another treatment that is as effective as chlorine used to achieve disinfection throughout the system?

☐ Yes ☒ No If so how _____

c. If treated with chlorine, is the free residual chlorine concentration less than 0.2 mg/L

☐ Yes ☐ No _____ reading.

Tested at _____ (location)

d. Is testing for chlorine residual concentration done at the tap (eg. Kitchen faucet) or from representative points in a piped distribution system, including a point from tap at the end line

☐ Yes ☐ No If yes how often? _____

e. If the drinking water is being transported by water delivery truck does it have a minimum chlorine free residual of 0.4 mg/L at the time of fill. ☐ Yes ☐ No

7. Water Quality (observations):

a. Does the water stain plumbing? ☐ yes ☒ No ☐ slight ☐ severe

Type of stain: ☐ brown ☐ red ☐ black

b. Does the water contain sediment? ☐ Yes ☒ No ☐ occasional ☐ constant

c. Is there an unpleasant odour? ☐ Yes ☒ No ☐ H₂S ☐ Other _____

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

TANK AND PIPING DETAILS

Tank Room

Is there a water tank? ☒ Yes ☐ No Details: PRESSURE TANK PC-360

Where is it located?

Comments: Basement

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

☒ YES ☐ NO

Comments: _____

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

☒ NO

Comments: _____

Are there other heat sources near the tank? YES ☒ NO

Comments: _____

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

Comments: YES

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Overall Tank No 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:

SYSTEM NEEDS TO BE COMPLETELY RE-PIPED FROM WELL TO HOUSE TIE IN. SOFTNER IS ONLY SIZED FOR 4 PEOPLE MAXIMUM. A LARGER SOFTNER WILL HAVE TO BE INSTALLED TO GET UNINTERRUPTED SOFT WATER SUPPLY.

b. Recommendations:

INSTALL SURFACE SEAL ON WELL, EXTEND CASING ACCORDINGLY. REPIPE THE COMPLETE SYSTEM. INSTALL SUITABLE DUPLEX WATER CONDITIONER OF APPROPRIATE SIZE FOR NEW DEMAND. INSTALL UV SYSTEM AFTER SOFTNER FOLLOWED BY AUXILIARY CHLORINATION SYSTEM FOR PROTECTION OF THE PIPING SYSTEM. INSTALL FREEFLOW PREVENTION OF APPROPRIATE SIZE.



Driller's Report 204140152

Page 1 of 1

Takhini Hot Springs Rd.

Location: Yukon Game Farm Well Lot 1353, Yukon Game Farm ~~Game~~

NAD 83 Zone 8 Easting 482482 Northing 6749732 Elevation ASL 2414.7 ft.

Location Accuracy: Horizontal
Vertical

100-300 (topo)
30.5 metres (100ft)

Purpose of well: Domestic - household needs

Permafrost encountered? No

LOG OF OVERBURDEN AND BEDROCK MATERIALS

Layer	From	To	General Colour	Most Common Material	Secondary Material	General Description
1	0	4	ft.	SAND with Silt and Gravel		
2	4	5	ft.	BEDROCK		
3	5	12	ft.	SAND with Gravel		
4	12	335	ft.	BEDROCK		

WELL CONSTRUCTION

Well No. 2041401521 Completion date Drilling method Well type

Casing: OS Diameter 6 in. Material Wall thickness in. Depth to ft.

Comments

Surface/Env'l seal: Material Diameter in. Depth from to ft. Volume cu. ft.

Gravel Pack ? Material Diameter in. Depth from to

Well Screen Information

OS Diameter	Material	Screen Type	Comments
	Open Hole	Open Hole	Open Hole

Screen Sections

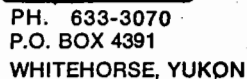
Section	From	to	Slot size/ perforation diameter
1	14	335	ft.

WELL DEVELOPMENT AND STATUS

Well ID	Developed by	Wellhead completion	Adapter depth	Static water level	Yield Estimate	Estimate method
2041401521			ft.	ft.	gpm	

Final Status New, in use for intended purpose

No



B-ID 204140152

Started.....MAY 16.....1983

Completed.....MAY 25.....19.83

FORMATION LOG			DESCRIPTION OF WORK	TIME			
FROM	TO	FORMATION		DATE	FROM	TO	HOURS
			MOVE LOAD AT SHOP	MAY 18	8:00	10:00	
			TRAVEL TO SITE	"	10:15	10:45	
			SET UP WELD ON SHIP	"	10:45	12:00	
			UNLOAD FLAT DECK				
0'	4'	Silty	SAND & GRAVEL	"	12:00	1:00	
4'	5'	B.R.					
5'	12'	SAND & Gravel					
12'	165'	B.R.		"	1:00	5:00	7 hrs.
			TRAVEL	MAY 19	8:00	8:30	
165'	250'	BR	2 G.A.M. AT 224	"	8:30	5:00	
			TRAVEL	"	5:00	5:30	
			TRAVEL	MAY 20	8:00	8:30	
250'	295'	BR	PULLOUT BIT	"	8:30	4:30	
			PULLOUT BIT		4:30	5:00	3.5
			TRAVEL	MAY 20	5:00	5:30	

Crd. of Casing & Pipe				Remarks:
Size	Type	Size	Type	
Feet	Inch	Feet	Inch	
				Static Level
				Ground Level
				Top Of Casing
				Total Rig Time
				Total Standby
				Drilling Mud

SIGNATURES

MIDNIGHT SUN.....

TITLE..... *Kirk*

CLIENT.....

TITLE.....



Completed... MAY 25 19.53

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SMALL PUBLIC WATER SYSTEM ASSESSMENT

PART A: EBA Site Inspection

Inspector: Ryan Martin
Luke Lebel

Date May 19, 2005

WELL ID #	Owner	Location Description
	YTG	Yukon Wildlife Preserve well B Kestrel Cottage

1. Well Location and Potential Contaminant Sources

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

Takhini Hot Springs Road

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

Staff House, Yukon Wildlife Preserve, Takhini Hot Springs Road

c. GPS location: 481835E 6748465N 721m elev. ± 14m

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 _____

The well has been abandoned due to water quality

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

f. Nearest building, specify Located inside the Yukon Wildlife Preserve staff building

g. Distance from well to building _____

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

i. Distance from well to nearest point of known field: ~15m

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

septic tank and field ~16m away. Field does not work, must be pumped out regularly.

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

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

- 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

well is located inside a locked building

Entrance by animals? ☐ Yes ☒ No

evidence of rodents and insects in well room

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

some evidence of water staining

- p. Is the well site well drained? ☒ Yes ☐ No

- q. Is there a buried fuel tank on the property? ☐ Yes ☐ No

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

Potential Source 1: AST 1; Distance from well to Potential Source 1: ~16m

Potential Source 2: AST 2; Distance from well to Potential Source 2: > 30m

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

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

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

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

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2. Well and Wellhead information:

early 1970's

- * 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: 7/ 55.8m ☒ measured (if possible) ☐ reported ☐ from log
- h. Static water level below ground: 41.729 - MAY 19, 2005
☒ 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
- m. Is the well head: ☐ in pumphouse ☐ in pit ☐ pitless adaptor ☒ in a building
in room off from main building
☐ in a wooden enclosure other, describe Add-on.
- 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 The well head is approximately at grade level
- ii. Are there signs of ponding on the enclosure(e.g. water stains, etc.)? ☒ Yes ☐ No
There is some dampness; heavy rust on the well head
- iii. Is the wellhead enclosed by fiberglass insulations? ☒ Yes ☐ No
In the walls of the enclosure
- iv. Any evidence of rodents? Specify There is some evidence of mouse droppings
- v. Does the well casing have a proper seal cap? ☒ Yes ☐ No
Split cap seal, but heavily rusted
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.

If yes is there treatment ☐ Yes ☒ No

Explain (filtration, disinfection etc...) well abandoned

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:

- 41.725
- a. Is the well equipped with a pump? ☒ yes ☐ No
NOT CURRENTLY USED - ELECTRICAL DISCONNECTED
- 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 53.910 m
- f. Drop pipe for submersible pump: ☒ steel ☐ plastic
- g. Pump delivers water to: ☐ pressure tank ☐ elevated tank ☐ other N/A - nowhere
- 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: inside a building/add-on, but still reported to have frozen, no heat when door is closed
- l. Comments on pump installation: _____

6. Conclusions

a. Comments on overall installation:

b. Recommendations: _____

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PART B: EBA Site Inspection

Inspector: BERT ALBISSEN

Date MAY 20/05

WELL ID #	Owner	Location Description
WLP STAFF	YTG	WILD LIFE PRESERVE

HOUSE (KESTREL COTTAGE)

6. Water Treatment

WELL NOT FUNCTIONAL

- a. Is well water treated? ☐ Yes ☒ No; Type of treatment:
STORAGE TANK (DELIVERED WATER)
☒ 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 .38 MG/L reading.
Tested at KITCHEN TAP (location)
- d. Is testing for chlorine residual concentration done at the tap (eg. Kitchen faucet) or from representative points in a piped distribution system, including a point from tap at the end line
☐ Yes ☐ No If yes how often? _____
- e. If the drinking water is being transported by water delivery truck does it have a minimum chlorine free residual of 0.4 mg/L at the time of fill. ☐ Yes ☐ No

7. Water Quality (observations):

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

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

TANK AND PIPING DETAILS

Tank Room

Is there a water tank? ☒ Yes ☐ No Details:

Where is it located?

Comments: BASEMENT

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

YES NO

Comments: _____

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

☒ NO

Comments: _____

Are there other heat sources near the tank? YES ☒ NO

Comments: _____

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

Comments: _____

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Overall Tank

What are the tank size and dimensions?

5' ~~Ø~~ x 6' H.

What material is the tank constructed of? FIBRE GLASS.

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 HEIGHT DOES NOT ALLOW CLEANING

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: SOME SEDIMENT

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 SYSTEM NEEDS TO BE REPLACED.
WELL S/B REDEVELOPED.

b. Recommendations:

REDEVELOP WATER WELL. BUILD NEW
ENCLOSURE FOR PUMP SYSTEM.
INSTALL APPROPRIATE TREATMENT.
DISINFECT THE COMPLETE HOUSE
SYSTEM & INSTALL UV IF POSSIBLE.

DISTRIBUTION & SYSTEM DATE

1. Pump System - MOWAT M75-33/JR 44H
JET PUMP SYSTEM.
2. WATER STORAGE TANK - 750 GALLON -
VERTICAL, SECTIONAL FIBRE GLASS TANK.

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PART B: EBA Site Inspection

Inspector: Brian Albers

Date MAY 20/05

WELL ID #	Owner	Location Description
WLP-UNIT D	YTG	WLP - PARMIGAN Tower

6. Water Treatment

DELIVERED WATER

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 ☐ H₂S ☐ Other _____

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

TANK AND PIPING DETAILS

Tank Room

Is there a water tank? ☒ Yes ☐ No Details:

Where is it located?

Comments: SITOP 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: YES

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Overall Tank

What are the tank size and dimensions?

6' ϕ HALF TANK X 14' L (APPROX 850 GALLONS)

What material is the tank constructed of? FIBRE GLASS.

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: TANK IS SEALED NO ACCESS.

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

Comments: NOT AVAILABLE

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:

NOT A SUITABLE WATER SYSTEM.

b. Recommendations:

REPLACE THE COMPLETE SYSTEM, INCLUDING THE STORAGE TANK. THERE IS ADEQUATE ROOM FOR A NEW SYSTEM IN THE SHOP AREA.



Photo 0174: YWP-A Main Office (left), Well Head Enclosure (center) and Baby Muskox Pen (back right)



Photo 0173: YWP-A Well Head



Photo 0175: YWP-A Septic Field (front) and Muskox Pen (Back)



Photo 0178: YWP-A Well Head Enclosure (front), Main Office (left) and Above ground Fuel Storage Tank (right)

**Photo 0176:** YWP-A Muskox Pen (back)**Photo 0177:** YWP-A Baby Muskox Pen (left), Animal Feed Storage Area (behind)**Photo 0004:** YWP-A Pressure Tank (left) and Water Softener (right)**Photo 0001:** YWP-A Piping in Building from Wellhead



Photo 0183: YWP-B Preserve Staff Building and Well House Addition



Photo 0006: YWP-B Trucked Water Storage Tank



Photo 0182: YWP-B Above Ground Fuel Storage Tank



Photo 0184: YWP-B Trucked Water Intake



Photo 0182: YWP-D Piping



Photo 0006: YWP-D Water Storage Tank



Photo 0184: YWP-D Jet Pump and Pressure Tank



Photo 0183: YWP-B Preserve Staff Building and Well House Addition



Photo 0006: YWP-B Trucked Water Storage Tank



Photo 0182: YWP-B Above Ground Fuel Storage Tank



Photo 0184: YWP-B Trucked Water Intake



Photo 0174: YWP-A Main Office (left), Well Head Enclosure (center) and Baby Muskox Pen (back right)



Photo 0173: YWP-A Well Head



Photo 0175: YWP-A Septic Field (front) and Muskox Pen (Back)



Photo 0178: YWP-A Well Head Enclosure (front), Main Office (left) and Above ground Fuel Storage Tank (right)

**Photo 0176:** YWP-A Muskox Pen (back)**Photo 0177:** YWP-A Baby Muskox Pen (left), Animal Feed Storage Area (behind)**Photo 0004:** YWP-A Pressure Tank (left) and Water Softener (right)**Photo 0001:** YWP-A Piping in Building from Wellhead



Photo 0182: YWP-D Piping



Photo 0006: YWP-D Water Storage Tank



Photo 0184: YWP-D Jet Pump and Pressure Tank