10.0 BUILDING 1391: HOOTALINQUA FIRE HALL

10.1 Description of Existing Water Supply System

The Hootalinqua Fire Hall is serviced by a water supply system that delivers water from a 156 m deep well with static water level of approximately 30 m below grade. A site plan is included as Figure 1391-A in Appendix A10. The well was drilled in 2002 by Cathaway Resources using a cable tool drill rig and is equipped with a surface seal to prevent contamination from surface sources. The wellhead is located in a pit that is approximately 14 m away from the fire hall. The coordinates of the wellhead, as measured by a handheld GPS device, are:

- UTM ZONE 8
- Northing: 6747128
- Easting: 489242

From the wellhead, the water system splits to service the two water storage tanks for fire fighting use, and to service the domestic water supply for the fire hall. There is no treatment in the system for water delivered to the water storage tanks, but to reduce biofouling, chlorine “pool pucks” are added directly to the water tanks. The domestic system is equipped with a sand trap and an inline 5-micron filter, but there is no disinfection system anywhere on the domestic system. A system schematic is provided as Figure 1391-B in Appendix A10.

10.2 Description of Existing Wastewater Systems

The septic tank for the Hootalinqua Fire Hall is located on the east side (opposite the well) of the fire hall, approximately 36 m from the wellhead. The septic tank discharges effluent to a field located to the east of the tank. The septic tank and effluent field are at approximately the same surface elevation as the ground surface at the wellhead; however they are likely both downgradient from the wellhead based on the inferred hydrogeology.

10.3 Water Quality Results

10.3.1 Water Quality Results from Previous Sampling

Bacteriological

Contractors for the Property Management Agency have routinely completed bacteriological sampling of water from the Hootalinqua Fire Hall water systems. EBA was provided access to the YTG database in order to review the results. Eighteen samples were tested from this system between October 2004 and March 2006, using the presence/absence test method or Total Coliform and *E. coli* by Yukon Environmental Health Services. Results are tabulated in Table 1391-1 in Appendix A10.

According to the YTG database, *E. coli* bacteria was reported as absent in each of the eighteen samples for which results were provided. However, Total Coliform was reported as present three times. Results were negative for the most recent sampling event.

Detailed Potability Analyses

A water sample was previously collected from the Hootalinqua Fire Hall water system on October 5, 2004. The sample was submitted to ETL EnviroTest in Surrey BC for detailed potability analyses. The results of these analyses are summarized in Table 1391-2 and are included in Appendix B. EBA reviewed the analytical results to compare them with the Canadian Drinking Water Quality Guidelines (CDWQG) and to observe general water quality, identify and recommend additional sampling and analytical, and to identify potential indicators of contamination.

- The water quality for the sample obtained on October 5, 2004 indicated that the groundwater source was sodium-sulphate bicarbonate type water with moderate hardness and a pH of approximately 8.
- At 0.556 mg/L, the iron concentration exceeded the CDWQG aesthetic limit of 0.3 mg/L.
- Turbidity for the sample obtained on October 5, 2004 also exceeded the CDWQG MAC of 1 NTU. Results of a follow-up sampling event on June 26th 2005 reported turbidity at 2.6 NTU, which was also above the applicable MAC.
- The water quality results indicated that all other health based and aesthetic objectives were met for the parameters analyzed.

10.3.2 Identification of Additional Analytical Testing Required

Additional analytical for the Hootalinqua Fire Hall that was identified to be included during the water system assessments is detailed below:

- Since the total iron concentration had previously exceeded the CDWQG, an analysis for dissolved metals was recommended in order to assist in determining potential treatment or rehabilitation measures.
- UV absorbance was included to determine potential for UV treatment as a disinfection option.

Additional Analytical Results

A water sample was obtained during the water system assessment on May 19, 2005, and was submitted for analysis to ALS Environmental in Vancouver BC for dissolved metals analysis, as well as UV absorbance. These results are summarized in Table 1391-2 in Appendix A10 and the laboratory reports are included in Appendix B.

The additional analysis indicated that the dissolved iron concentration in the sample collected on May 19, 2005 was less than 0.030 mg/L, which, is much less than the current CDWQG aesthetic objectives of 0.03 mg/L. Therefore, the concentration found for total iron of 0.556 mg/L from previous testing can likely be attributed to suspended iron particles in the water. Well rehabilitation through additional well development, and/or additional filtration to remove iron associated with suspended particles would likely be a good measure to meet CDWQG aesthetic objectives.

10.3.3 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 October 4th 2004 is low and can be considered to be within the normal background ranges for groundwater in the Whitehorse area. Nitrate and nitrite concentrations for this sample are also low and within the normal background range for the Whitehorse area. Therefore, these water quality results do not suggest that the aquifer from which the groundwater is obtained for the Hootalinqua Fire Hall is under the influence of surfacewater sources or septic wastes.

The sample collected on May 19th, 2005 was also submitted for Polycyclic Aromatic Hydrocarbon (PAH) and extractable petroleum hydrocarbon analysis (EPH). Results were below analytical detection for all parameters analyzed.

10.4 Conceptual Hydrogeology

The aquifer in which well 1391 is completed is deep and confined under several sequences of silt and till. The aquifer is therefore considered to be well protected from surface sources of contamination so long as the well itself does not provide a pathway. Based on topography and proximity to surfacewater features, the groundwater flow direction is inferred to be in a northeasterly direction towards the Yukon River. The well at Hootalinqua Fire Hall is well protected from potential sources of contamination.

Pacific Hydrology Consultants Ltd. (PHCL) completed a 24-hour pump test of the well in September 2003. PCHL reports that the theoretical capacity of the well is greater than the test-pumping rate of 1.44 Lps (19 Igpm). The practical capacity of the Hootalinqua Fire hall well is limited by the size of pump that can be obtained to pump from the 150 mm casing. PCHL reported that the aquifer transmissivity is low at 4 to 8 m^2/day.

A 200 mm casing was advanced for the first 140 m, and then 150 mm casing was advanced to approximately 160 m. The 150 mm casing extends to surface within the 200 mm casing. Apparently a steel plate is welded over the annulus between the two casings; however, there is no mention of a grout seal between the casings, nor is there mention of a 2 thick grout or bentonite sanitary seal outside of the 200 mm casing. Therefore, by definition of the draft Part III Small Water System Guidelines, the well should be considered to be under the direct influence of surfacewater even though it is extremely deep. Therefore, disinfection is required.

10.5 Potential Contaminant Sources

Potential contaminant sources from observations during the site investigation are compiled in Table 1391-4 in Appendix A10. Photos of potential contaminant sources are also provided in Appendix A10.

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

- Above ground fuel storage tank at 24m.

It should be noted that the above ground storage tank at the Hootalinqua Fire Hall has had the concrete supports oriented with respect to the supports on the tank that would make it susceptible to being knocked off the concrete supports in the event of contact with a vehicle, or an earthquake. This could potentially result in a piping to break or leak and cause a significant hydrocarbon spill.

With the exception of the above-mentioned AST, there were no other potential contaminant sources identified within 30 m of the wellhead. All parts of the sanitary sewer (discharge pipe, tank and absorption field) are greater than 30 m from the wellhead, downgradient from the well, and the hydrogeological conditions indicated a low risk of impact of the water source.

10.5.1 Spills Records and Contaminated Sites Search Results

The Government of Yukon Environment Branch did not identify any recorded spill events or contaminated sites on or near the property.

It was noted during our site inspection, by two different sources, that there had previously been a hydrocarbon spill resulting from a leak at the union for the transfer pipe in 2005 during the winter months. The UST is approximately 27 m from the well. The volume of fuel spilled is unknown, and it was unclear if the spill had not been properly cleaned up. Given the depth of the well, and the horizontal separation distance, it was considered unlikely that hydrocarbons from this spill would have impacted on deep groundwater quality. Nonetheless, hydrocarbon parameters (PAH and EPH) were included in the additional analytical testing. A noticeable diesel odour in the vicinity of the AST was obvious at the time of the assessment.

EBA included hydrocarbon parameters in the additonal water sampling program during this assessment. Extractable petroleum hydrocarbons and Polycyclic Aromatic Hydrocarbons were not dected in the sample analyzed. Additional investigation into the hydrocarbon concentrations in soil in the vicinity of the spill may be warranted.

10.6 Identified Water System Deficiencies and Associated Risk

10.6.1 High and Medium Risk Deficiencies

The following high and medium risk deficiencies were identified for the Hootalinqua Fire Hall water supply system:

- Turbidity exceeds 1 NTU, the MAC for turbidity for a public water supply within the CDWQG.
- The water system does not have disinfection treatment. This could be downgraded to a lower risk depending on the follow-up sampling results for turbidity, bacteriological analyses and the upgrade of well completion.
- The wellhead is completed in a pit, which is not considered acceptable according to the Guidelines for Water Well Construction. Well casings must extend at least 500 mm above the ground surface. This is only a medium risk deficiency because the well has a double casing, and is reported to have a steel plate welded over the annulus at surface and the well is very deep. At the time of the upgrade, a bentonite grout seal should be installed between the 150 mm and 200 mm casings, and a surface seal retrofitted in the upper 2 m of the well. It was noted during the field assessment and field chemistry testing that a gaseous substance (likely carbon dioxide) was off gassing from the water when it was exposed to the atmosphere. Off gassing of CO2 could potentially cause a risk of oxygen depletion in the well pit vault. All well pits should be considered as confined spaces, and the necessary precautions taken during wellhead upgrades.
- Based on anecdotal information, the well and/or the pumping system may not be sufficient to meet the peak demand flow. This would be a concern if the storage for fire fighting had been depleted, and the system was incapable of replenishing the fire supply at a sufficient rate.

10.6.2 Low Risk Deficiencies

The following low-risk deficiencies were identified for the Hootalinqua Fire Hall water supply system:

- Fire truck fill tanks do not appear to be cleaned regularly;
- High iron concentration in water source.
- Wellhead protection could be improved.
- AST fuel tank is within 30 m of well.

10.7 Mitigative Options for Deficiencies

Mitigative options were developed to address the deficiencies identified in the previous section. Deficiencies are prioritized by risk in the following sections.

10.7.1 Priority 1

- A commercial sized NSF 61 certified filter system should be installed prior to the split for the fire protection and domestic sides of the water system to decrease turbidity. A second filter canister filter (1 micron absolute) could then be installed on the domestic side. These are conceptual design recommendations based on the information available for the purpose of planning and budgeting. Engineering input will be required for final system specifications.

10.7.2 Priority 2

The wellhead completion should be improved to decrease the susceptibility to surface contamination. This would involve welding an extension onto the existing casing to bring the well casing to a minimum of 500 mm above ground level. Two options are provided below:

- Option 1: An above grade completion with a culvert, blown in foam insulation, bentonite surface seal (above the existing surface seal) and a fiberglass cover.
- Option 2: Pitless unit with vented locking lid, and bentonite surface seal above the existing surface seal.
- For both options, the following upgrades should also be completed:
    - The annulus between the 150 mm and 200 mm casing should be sealed with a grout or bentonite grout mixture for either of the above options.
    - When work on the wellhead is conducted, the well should be re-developed, cleaned and shock chlorinated. Mechanical agitation during chemical cleaning will assist in reaching anaerobic zones within the aquifer. This would likely result in improved well quality and yield.
    - Depending upon the success of the redevelopment and cleaning, further investigation of the reported water quantity problems under peak demand may need to be evaluated. This would involve assessment of the actual demand versus the capabilities of the existing system. Modifications to the pump and/or tank sizes should be made as required, provided the well is capable of supplying water at the increased rate. The sustainable well yield may also have to be re-assessed.
    - Adequate disinfection/treatment should be installed.

10.7.3 Priority 3

- The fire truck fill tanks should be cleaned on a regular schedule; every 12 months is likely sufficient. Include this as a routine operation and maintenance task.
- In order to control iron concentrations and aesthetic water quality, the well should be shock chlorinated every 6 months. Include this as routine operation and maintenance task.
- Consideration should be given to placing a fence around the well to prevent access for animals and people.
- The AST should be moved to the northeast corner of the fire hall so that it is greater than 30 m away from the well. Concrete supports should be perpendicular to the bottom of the tank supports.
- Consideration should be given to reducing the level of iron and colour within the system. A softening system is likely to be sufficient to remove iron and reduce colour (if caused by iron oxidation). However, sodium levels in the raw water are already high and the softening system would increase these levels. An option is to provide a separate potable water system that would blend the soft water with the raw water to keep sodium levels at reasonable levels.

10.8 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.

10.8.1 Priority 1

- The cost to install a commercial inline filter system capable of reducing turbidity to less than 1 NTU is **$2500.**

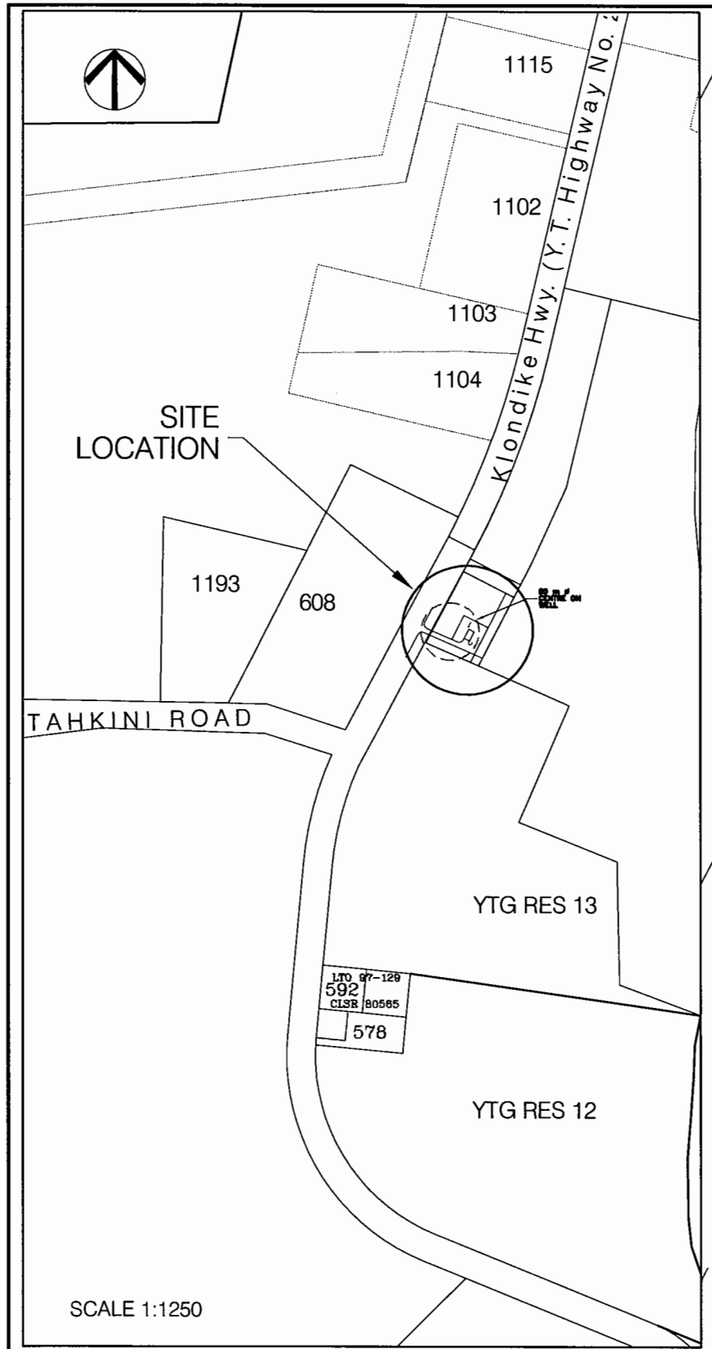
10.8.2 Priority 2

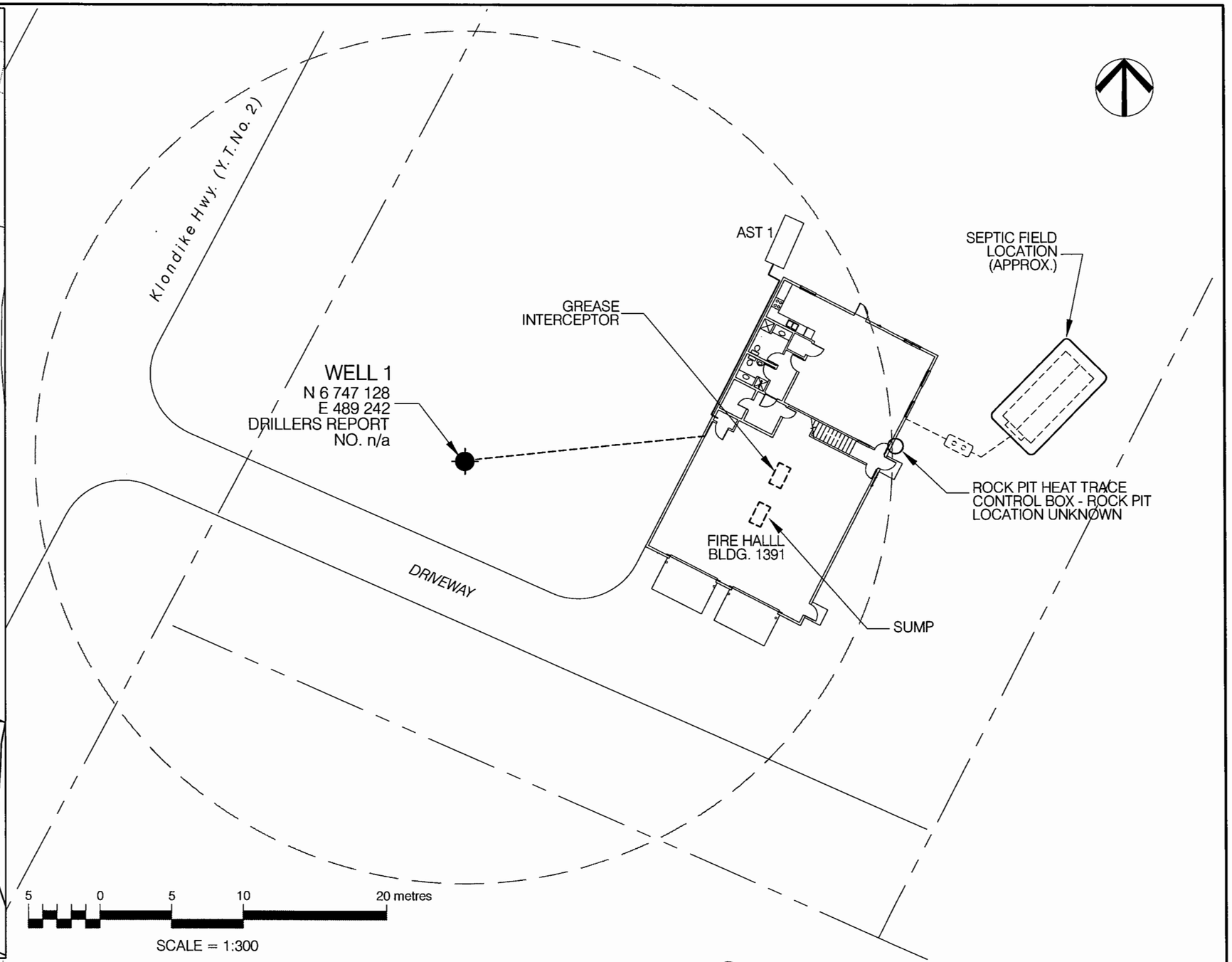
- The cost for the recommended wellhead improvements is estimated to be about **$4,000** for the above grade sanitary completion (option 1) or **$5,000** for the pitless unit (option 2).

- It is estimated that installation of a grout seal between the casings would cost approximately **$500**. This cost should be added to either option.
- Plumbing system effectiveness assessment is estimated at approximately **$500**, and if a pump test is required, it is estimated at **$2,000** assuming that the existing pump can be used for the test.
- Well redevelopment and chemical cleaning if required is estimated at **$7000.**
- NSF/ANSI 55 certified UV and chlorination could both be considered for the disinfection system. A suitable UV system would cost approximately $2500 installed, while proportional chlorination would cost in the order of $7000 with retention tanks.

10.8.3 Priority 3

- The estimated cost to install a chain link fence around the wellhead is approximately **$500.**
- The estimated cost for the relocation of the AST and associated relocation of transfer pipe is **$1000**.
- It is estimated that the softener and necessary plumbing to blend the water would cost **$4,000** installed.





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	DD/MM/YY	APPROVED
0	ISSUED FOR CLIENT REVIEW	DD/MM/YY	XXX

REVISION

EBA Engineering Consultants Ltd.

DESIGNED BY:	R. MARTIN
DRAWN BY:	J. BUYCK
DATE:	JUNE 2005
SCALE:	AS SHOWN
PROJECT No.:	1260002.001
ACAD FILENAME:	001-WHITEHORSE REGION

CLIENT: Yukon — Highways and Public Works, Property Management Branch

SMALL PUBLIC WATER SYSTEMS ASSESSMENT
WHITEHORSE REGION

GOVERNMENT OF YUKON
HIGHWAYS & PUBLIC WORKS

HOOTALINQUA FIRE HALL BUILDING 1391 SITE LOCATION DIAGRAM WELL ID: 1391

REVISION ISSUE: 0

DRAWING No.: FIGURE 1391A

Z:\0201Drawings\1260002 Water Assessment YTG\001 - Whitehorse Region\hootalinqua\1260002 hootalinqua Overall Plan.dwg, 6/10/2005 2:14:33 PM, \\whi-eb-dc001\WHI201COMMON

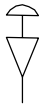
LEGEND


PUMP


PRESSURE GAUGE


GATE VALVE


CHECK VALVE

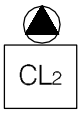

SOLENOID

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

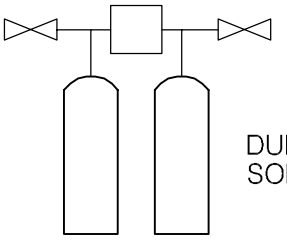
FLOW METER

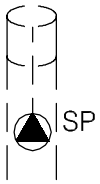
WATER FILTER
(CARTRIDGE TYPE)

PRESSURE TANK

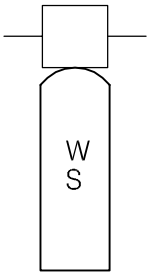


CHLORINE RESERVOIR AND
INJECTION PUMP


DUPLEX WATER
SOFTENER

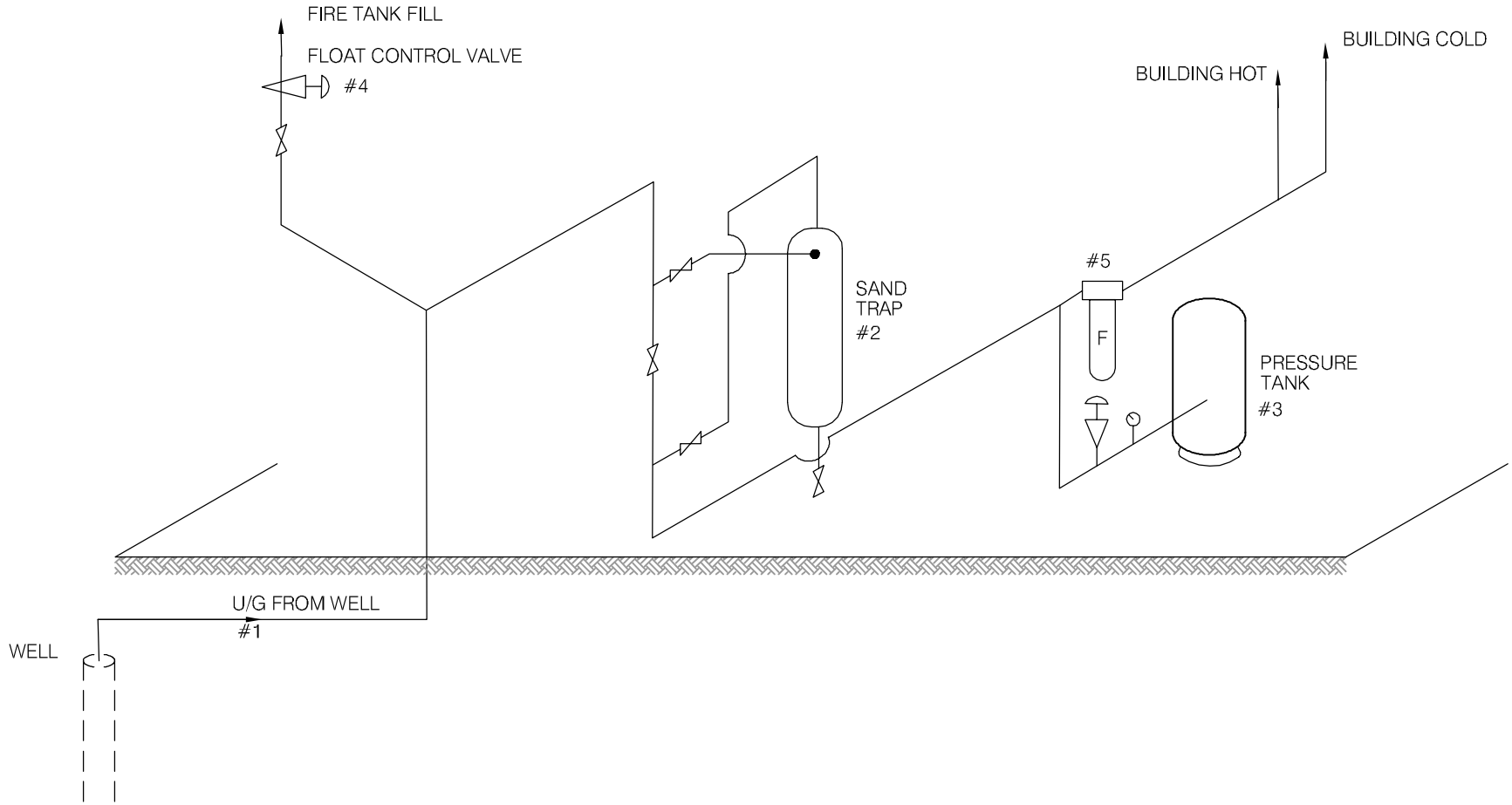


WELL WITH
SUBMERSIBLE PUMP



ACTIVATED
CARBON

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT WHITEHORSE 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 WHITEHORSE REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			TITLE	WATER SYSTEM DISTRIBUTION/TREATMENT SCHEMATIC SYSTEM ID.: 1391 HOOTALINQUA FIRE HALL	
DATE APRIL 2006	DWN. JSB	CHKD. RMM	FILE NO. 1260002.001		DWG.: FIGURE 1391B

Z:\0201Drawings\1260002 Water Assessment YTG\001 - Whitehorse Region\hootalinqua\1260002 Hootalinqua 1391 Schematic .dwg, 4/6/2006 9:48:34 AM, Adobe PDF, jbuyck

Whitehorse Region – Hootalinqua
Building # 1391

DISTRIBUTION & TREATMENT SYSTEM DATA

Item	Description	Manufacturer	Model	Part No.	Serial No.	Size
1	4" Sub. Pump					4" - 1½ HP.
2	Sand Trap.	Lakos	Sand Master			3/4"
3	Pressure Tank.		PS220-T5R.		1099J	
4	Fill Control	Asco	1" Solenoid Valve			1" FIPT.
5	Inline Filter	N/A	3/4" x 10"			5 Micron
6						
7						
8						
9						
10						

TABLE 1391 - 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?
1391	Hootilingua Firehall	9	Sept-04 to Feb-06	**yes**	2/18	no	28-Feb-06	no

Table 1391-2: Water Quality Results

SOURCE:	Building 1391 - Hootalinqua Firehall			GCDWQ Criteria		
Location/ Resident	Mayo Road					
Address						
Treatment	Water Softener					
Source of Water	On-Site Well					
Purpose of Sampling	Baseline	Additional Sampling	Baseline			
Sample Location		Kitchen Tap				
Date Sampled	5-Oct-04	19-May-05	26-Jun-05	**Lower Limit**	**Upper Limit**	
Physical Tests *(ALS)*				**AO**	**MAC**	**AO**
Colour (CU)	10		<5			15
Conductivity (uS/cm)	447		423			
Total Dissolved Solids	259		271			500
Hardness CaCO3	92	131	90.2	AO >200 = poor, > 500 unacceptable[A]		
pH	8.0		8.23	6.5		8.5
Turbidity (NTU)	**1.5**		**2.6**		1	5
UV Absorbance		0.0103				
Dissolved Anions *(ALS)*						
Alkalinity-Total CaCO3	108		114			
Chloride Cl	2		1.50			250
Fluoride F	1.01		1.00		1.5	
Sulphate SO4	99.0		105			500
Nitrate Nitrogen N	<0.1		<0.10		10	
Nitrite Nitrogen N	<0.05		<0.10		1	
Ammonia Nitrogen N						
Total Metals *(ALS)*						
Aluminum T-Al	<0.02		<0.010			
Antimony T-Sb	0.0006		<0.0005		0.006	
Arsenic T-As	0.0022		0.00408		0.025	
Barium T-Ba	0.0244		0.025		1	
Boron T-B	0.03		<0.10		5	
Cadmium T-Cd	<0.0002		<0.0002		0.005	
Calcium T-Ca	24.1		24.9			
Chromium T-Cr	<0.0008		<0.0020		0.05	
Copper T-Cu	<0.001		<0.0010		1	
Iron T-Fe	**0.556**		**0.531**			0.3
Lead T-Pb	<0.0001		<0.0010		0.01	
Magnesium T-Mg	6.7		6.81			
Manganese T-Mn	0.033		0.0285			0.05
Mercury T-Hg	<0.0002		<0.0002		0.001	
Potassium T-K	1.7		1.64			
Selenium T-Se	<0.0004		<0.0010		0.01	
Sodium T-Na	60		62.1			200
Uranium T-U	0.0003		0.00078		0.02	
Vanadium T-V						
Zinc T-Zn	0.005		<0.050			5
Dissolved Metals *(ALS)*						
Aluminum D-Al		<0.020			0.1	
Antimony D-Sb		<0.0010			0.006	
Arsenic D-As		0.004			0.025	
Barium D-Ba		0.032			1.0	
Boron D-B		<0.10			5	
Cadmium D-Cd		<0.00010			0.005	
Calcium D-Ca		36.2				
Chromium D-Cr		<0.0010			0.05	
Cobalt D-Co		<0.0010				
Copper D-Cu		<0.0020				1.0
Iron D-Fe		<0.030				0.3
Lead D-Pb		<0.0020			0.01	
Lithium D-Li		<0.050				
Magnesium D-Mg		9.82				
Manganese D-Mn		0.039				0.05
Mercury D-Hg		<0.00020			0.001	
Molybdenum D-Mo		0.0213				
Nickel D-Ni		<0.010				
Potasium D-K						
Selenium D-Se		<0.0020			0.01	
Silver D-Ag		<0.00010				
Sodium D-Na		82.4				200
Uranium D-U		0.00126			0.02	
Zinc D-Zn		<0.0050				5.0
Trihalomethanes						
Bromodichloromethane						
Bromoform						
Chloroform						
Dibromochloromethane						
Total Trihalomethanes					0.1	
Organic Parameters						
Tannin and Lignin						
Total Organic Carbon C						
Polycyclic Aromatic Hydrocarbons						
Acenaphthene						
Acenaphthylene						
Acridine						
Anthracene						
Benz(a)anthracene						
Benzo(a)pyrene					0.00001	
Benzo(b)fluoranthene						
Benzo(g,h,i)perylene						
Benzo(k)fluoranthene						
Chrysene						
Dibenz(a,h)anthracene						
Fluoranthene						
Fluorene						
Indeno(1,2,3-c,d)pyrene						
Naphthalene						
Phenanthrene						
Pyrene						
Quinoline						
Extractable Hydrocarbons						
EPH10-19						
EPH19-32						
LEPH						
HEPH						
Haloacetic Acids						
Bromoacetic Acid						
Bromochloroacetic Acid						
Chloroacetic Acid						
Dibromoacetic Acid						
Dichloroacetic Acid						
Trichloroacetic Acid (TCA)						
Field Chemistry (EBA)						
pH		8.39		6.5		8.5
TDS (ppm)		200				500
EC (uS/cm)		395				
Temperature (deg C)		10.5				
Free Available Chlorine (mg/L)						

Notes:

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

Shading indicates exceedence of Proposed MAC guideline (arsenic).

Bold Underline with Yellow shading indicates exceedence of CDWQG MAC

Results are expressed as milligrams per litre except for pH and Colour (CU), Conductivity (umhos/cm),Temperature (°C) and Turbidity (NTU)

< = Less than the detection limit indicated.

AO = Aesthetic Objective

MAC = Maximum Acceptable Concentration (Health Based)

Table 1391-3: 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)**
1391	**Hootilingua Firehall**	**Mayo Road**	6747128	489242	660

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	2002	No	156	Silt and Clay - 30m to 156m	?	Complaints about the well capacity - too slow for fire hall	?

Well Construction Details				
Wellhead Above ground (m)	**Well Cap**	**Well Screen**	**Surface Seal**	**Apron Grading**
1.50m below grade	Split Cap Gasket	?	Yes	No, but slopes away from pit

Table 1391-4: Potential Contaminant Sources
Building 1391 – Hootalinqua Fire Hall

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		
Sewage lines, tanks or lift stations	***Biological,*** inorganic and organic parameters.	**Approx. 24 m**		
Septic fields	***Biological and Inorganic*** parameters.	36 m	6747135	489268
Rock Pit	***Organic and Inorganic*** parameters.	Approx 30 m to 40 m	6747132	489263
Gas stations	***Organic and Inorganic*** parameters.	Approx. 750 m		
Undergrounds Fuel Storage Tanks (USTs)	***Organic*** parameters.	>>150 m		
Above ground storage tanks (ASTs)	***Organic*** *parameters.*	**24 m**	6747140	489255
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

SMALL PUBLIC WATER SYSTEM ASSESSMENT

PART A: EBA Site Inspection

Inspector: Ryan Martin, Luke Lebell Date May 19, 2005

WELL ID #	Owner	Location Description
1391	YTG	Hootalinqua Firehall

1. Well Location and Potential Contaminant Sources

a. General location of well: (Community, Subdivision, etc.)
Five Mile, Mayo Road

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

c. GPS location: 489242 Easting 6747128 Northing 660m elevation ± 6m

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_____
Hootalinqua Firehall only

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

f. Nearest building, specify Hootalinqua Firehall

g. Distance from well to building 14m

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

i. Distance from well to nearest point of known field: >36m

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

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 ~36m away, field greater than that

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
There are no locks and neither the lid or the hatch are fastened on

Entrance by animals? ☐ Yes ☒ No
cobwebs, ants, evidence of mice

o. Is well site subject to flooding? ☐ Yes ☒ No
There appears to be no water standing or dampness but for the rust on the well head

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

q. 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 _____

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: ASY ; Distance from well to Potential Source 1: 24m

Potential Source 2: Rock Pit ; Distance from well to Potential Source 2: ~30-40m

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

2. Well and Wellhead information:

a. When was well installed? Year 2007 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: 515 ft ☐ 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
wellhead in pvc and insulated wooden enclosure

☒ 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 Yes, 1.6m below grade

ii. Are there signs of ponding on the enclosure(e.g. water stains, etc.)? ☐ Yes ☒ No

iii. Is the wellhead enclosed by fiberglass insulations? ☒ Yes ☐ No
Inside walls only. None directly protecting well head. There is an extra compartment above compartment enclosing wellhead

iv. Any evidence of rodents? Specify Mouse droppings present. Since wood is accessible

v. Does the well casing have a proper seal cap? ☒ Yes ☐ No
Split cap
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...) 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 likely, well pumps very slowly

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: 2002 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 (for fires) ☐ other

h. Are there automatic pump controls: ☒ Yes ☐ No

i. Is there provision for taking water samples before water reaches storage? ☒ Yes ☐ No
However near floor, nearly inaccessable

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

k. Is the pump and piping protected from freezing? ☒ Yes ☐ No
Heat trace. Insulated walls in enclosure and insulated piping.
Heat trace goes along entire line
If yes, describe: _____

l. Comments on pump installation: _____

6. Conclusions

a. Comments on overall installation:

b. Recommendations:

PART B: EBA Site Inspection

Inspector: BERT ALBASSER Date MAY 20/05

WELL ID #	Owner	Location Description
B/391	YTG	HOOTALINQUA FIREHALL

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?

2x AG 1750

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: _____

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) CHLORINATED WITH PUCKS

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:

PROFESSIONAL INSTALLATION. GOOD QUALITY & WORKMANSHIP.
SHOULD HAVE COMMERCIAL SIZE FILTER ON FILL LINE TO KEEP TANKS CLEAN (30 MICRON)

b. Recommendations:

INSTALL COMMERCIAL SIZE FILTER ON WATER LINE BETWEEN SAND TRAP & PRESSURE TANK. INSTALL CHLORINATOR AFTER INLINE FILTER.

Add/Edit Buildings Water Systems

Find Building | Buildings Pick List: 1391 | Already Entered Wells or Tanks:

Hootalinqua Firehall & Com. Hall

Water Source

Well	Delivere	More Information
☑	☐	19-gpm

Recommendation:

Well

Year Drilled	Well Size	Well Depth	Deep	Shallow	More Information
2002	6-inch	515-feet	☑	☐	19 gpm

Treatment (Softner and Filter Type)

Sodium	Potassium	Iron	UV Treatment	Reverse Osmosi	Filter Type	Chlorination	More Information
☑	☐	☐	☐	☐	Sediment		

Tanks

Year Installed	Size	Construction Material	Year Cleaned	Cleaned By
2002	1200-gallons	fiberglass		

Add/Edit Buildings Water Systems

Find Building | Buildings Pick List: 1391 | Already Entered Wells or Tanks:

Hootalinqua Firehall & Com. Hall

From	To	Formation	Description of Work
0'	100'	SAND/CLAY	
100'	144'	silt compact	
144'	190	sand	
190'	198'	sand/silt	
198'	296'	sand/silt/clay	
296'	304'	sand/gravel	
304'	309'	sand/gravel	
309'	350'	gravel/sand silt	
350'	461	sand/siit/gravel	
461'	471'	sand/silt/gravel	
471'	492'	sand/sily/gravel	
492'	515'	sand/gravel/clay	8-inch casing down to 471' and 6-inch rest of the way/19 gpm

WELLS_DRILLED_BY_SubForm

PROJECT: YTG - Hootalinqua Firehall Well	CASING STICKUP: 0.6 m (2 ft)	**WELL NO: 1-02**
PHCL PROJECT NO: C730101	STATIC WATER LEVEL: 33.0 m (108.23 ft) bgs	PUMPING TEST: Yes
LOCATION: North of Whitehorse	COMPLETION DEPTH: 156.7 m (514 ft)	WATER ANALYSIS: Yes

DEPTH (ft / m)	DESCRIPTION	ELEVATION (m)	SYMBOL	WELL DATA	REMARKS
-5	Ground Surface	0.0			Note that the 150 mm (6") diameter well casing was cut off 1.2 m (4 ft) below ground, with the 200 mm (8") diameter outer casing cut off 1.5 m (5 ft) below ground. A steel plate is welded over the opening between the casings.
20	**Sand, Clay and Sandy Clay** 0.0 to 30.5 m (0 to 100 ft) - with 0.15 m (0.5 ft) thick gravel bed at 24.4 to 24.5 m (80 to 80.5 ft)				
45					
70 / 24					
95		-30.5			Static water level of 33.60 m (110.23 ft) below the 0.6 m (2 ft) casing stickup corresponds to a level of 31.77 m (104.23 ft) below the casing of the permanent installation, which is enclosed in an underground chamber.
120	**Sand** 30.5 to 37.8 m (100 to 146.6 ft) - containing a hard cemented layer from 37.8 to 39.6 m (124 to 130 ft)				
145		-44.1			
170 / 49	**Silt** 44.1 to 57.9 m (144.6 to 190 ft) - compact				
195		-57.9			
	Sand 57.9 to 60.4 m (190 to 198 ft) - water-bearing	-60.4			
220	**Sand, Silt and Clay** 60.4 to 90.2 m (198 to 296 ft) - sand, silt and sandy silty clay				
245 / 74					
270					
295		-90.2			
	Sand and Gravel 90.2 to 92.7 m (296 to 309 ft) - silty, cleaner below 92.7 m (304 ft)	-94.2			Note that the 200 mm (8") casing shoe is at 143.0 m (469 ft); for well screen details, see below.
320 / 99	**Gravel, Sand and Silt** 94.2 to 103.0 m (309 to 350 ft) - interbedded; thin water-bearing layers; cleaner sand and gravel layer from 96.0 to 97.5 m (315 to 320 ft)				
345		-106.7			
370	**Clay** 103.0 to 140.5 m (350 to 461 ft) - silty interbeds throughout				
395 / 124					
420					
445					
470		-140.5			
	Sand 140.5 to 150.9 m (461 to 471 ft) - silty and gravelly; water-bearing	-143.6			
495 / 149		-150.0			
	Gravel, Sand and Silt 143.6 to 150.0 m (471 to 492 ft) - interbedded, thin water-bearing layers	-157.0			
520	**Sand** 150.0 to 157.0 m (492 to 515 ft) - coarse, trace of gravel and silt; cleaner water-bearing; clay at 157.0 m				
545				For well screen details, see "Remarks".	

Top of well screen assembly = 151.5 m (497 ft). Total length of K-type packer and riser pipe = 0.7 m (2.3 ft).

3.7 m (12 ft) of 1.0 mm (0.040") screen, with a total length of 3.8 m (12.5 ft). The screen is exposed between 153.0 and 156.0 m (502 and 512 ft). Nominal diameter of 150 mm screen is 124 mm (4.875").

0.6 m (2 ft) of 125 mm (5") solid pipe, closed with a threaded steel plate at the bottom at at 156.7 m (514 ft).

CONTRACTOR: Cathway Water Resources	DATE: Mar-Aug/2002	**PACIFIC HYDROLOGY CONSULTANTS LTD.** Consulting Hydrogeologists Suite 201, 1537 West 8th Avenue VANCOUVER, B.C. Canada V6J 1T5 Telephone: (604) 730-6990
DRILLING METHOD: Cable Tool	BY: rt	
PAGE: 1 of 2	FIGURE: 3	

Photo 0188: 1391 Well Head Enclosure (front), Hootalinqua Firehall and Above Ground Fuel Storage Tank (back)

Photo 0189: 1391 Septic Field

Photo 0190: 1391 Well Head

Photo 0013: 1391 Water Storage Tanks