

5.56 Whitehorse Area - Ibex Valley Firehall Water Supply System

Ibex Valley Firehall is located at km 1442 Alaska Highway, in Yukon. Ibex Valley Firehall (Building 1950) water system supplies water to the Firehall building and also to an outside tap located at the front of the Firehall that can be used by the public for water pick-up (Tetra Tech 2006). The system consists of a shallow drilled well (Well 1950-A) which Tetra Tech understands is used to supply the fire protection system and a deep Well 1950-B which Tetra Tech understands is used to supply the potable water supply system. This system is governed under the Sections 12.1 (a) and (b) and 17 of the Public Health and Safety Act and Section 5 of the Public Health Regulations (C.O. 1958/079, O.I.C. 2009/194), which require safety measures and inspection for water and water sources for systems that provide water for human consumption.

Well 1950-B was drilled in November 2005 into the underlying bedrock for better water quality; however, the yield of the replacement well was inadequate for the system demand and the well was subsequently deepened in November 2006 to increase the well yield.

5.56.1 Data Compilation Methodology

Tetra Tech approached stakeholders including water system operators and owners to let them know the project was in progress and to request their assistance in compiling the most complete data set possible. Through the process of compiling the data, Tetra Tech has had communication with the following water system owners, operators and proponents regarding the Ibex Valley Firehall Water Supply System:

- YG Property Management Division – YG PMD has been consulted and has provided review comments and data for the compilation.
- YG Community Services (the client) – YG CS provided data for systems where proponents contacted were not able to find the documents and/or YG CS had the data readily available.

5.56.2 Hydrogeology

There is no well log for Well 1950-A; however, the well is shallow and is likely completed in an unconfined aquifer. Groundwater quality suggests that the shallow aquifer may be under the direct influence of surface water. There was not enough information to determine the groundwater flow direction at the time of the SPDWSA in 2005, and is difficult to infer based on the available information (Tetra Tech 2006a).

Well 1950-B is completed in a bedrock aquifer. The bedrock is overlain by sand with some gravel to a depth of 8.8 m bgs. The bedrock encountered during the well deepening consisted of a fine-grained sedimentary rock with alterations from light brown to light green colour (Tetra Tech 2007). Bedrock geology mapping (YGS 2003) confirms that the primary bedrock unit in the area is the Aksala assemblage, which is described as a mixed clastic-carbonate assemblage divisible into three dominant facies including calcareous greywacke, locally thick carbonate and red-coloured clastics (Tetra Tech 2007). Clastic components consist of igneous or limestone-clast pebbles and rare feldspar-augite (Tetra Tech 2007). Potential fracture zones at Well 1950-B were previously identified at 43.3 and 63.1 m-bgs, and additional fracture zones were observed during the deepening of the well, at 67.1 m, 70.1 m and 85.4 m bgs (Tetra Tech 2007).

Pumping test results of test Well 1950-B indicate that a low aquifer transmissivity on the order of 1×10^{-2} m²/day and an equivalent hydraulic conductivity of 2×10^{-9} m/sec, using an equivalent aquifer thickness of 55.5 m (Tetra Tech 2006b).

5.56.3 Summary of Wells

There is no well log for the original Ibex Valley Firehall Well 1950-A. The well log for the new Well 1950-B is included in the GIS map and database portion of this project. The following tables summarize the completion characteristics of the wells.

Table 5-150: Ibex Valley Firehall, Well 1950-A Summary		
Well Construction Parameters	Details	Source
Date of construction	Unknown	Tetra Tech 2006a
Total well depth	11.8 m bgs	
Casing	6" (152 mm) ID PVC Well Casing	
Casing depth	11.5 m bgs	
Well screen	0.38 m well screen from 11.5 m bgs to 11.8 m bgs; slot size is unknown	
Static water level	10.4 m bgs (measured May 2005)	
Sanitary seal	No record that a bentonite sanitary seal has been installed	
Wellhead completion	The wellhead is located in an insulated pit	
Wellhead stickup	1.75 m bgs	
Well rated capacity	Unknown	
Well GUDI status	Potentially GUDI	
Well Construction Comments:	Based on the wellhead completion and the lack of a surface seal, the well was not constructed to meet the Canadian Groundwater Association Well Construction Guidelines.	

Table 5-151: Ibx Valley Firehall, Well 1950-B Summary

Well Construction Parameters	Details	
Date of construction	The well was originally constructed by Double D Drilling Ltd. in November 2005. Due to the very low well yield, the well was deepened by Double D Drilling Ltd. in November 2006.	
Total well depth	123.5 m bgs (deepened from 65.5 m bgs)	
Casing	6" (152 mm) steel casing	Tetra Tech 2007
Casing depth	12.5 m bgs	
Well screen	No well screen – open hole from 12.5 m to 123.5 m bgs	
Static water level	8.6 m bgs (measured November 21, 2006)	
Sanitary seal	Bentonite sanitary seal to 6.1 m bgs	
Wellhead completion	The wellhead is equipped with a lockable plate	Tetra Tech 2006b
Wellhead stickup	1.4 m ags	
Well rated capacity	0.05 L/s (0.7 IGPM)	Tetra Tech 2007
Well GUDI status	Non-GUDI	
Well Construction Comments:	Well was constructed to meet Canadian Groundwater Association Well Construction Guidelines.	

5.56.4 Source Water Quality

Well 1950-A

In general, the raw water from the Ibx Valley Firehall well (Well 1950-A) meets Health Canada's Guidelines for Canadian Drinking Water Quality (GCDWQ) for the parameters analyzed (Tetra Tech 2006a). The key observations and comments noted in 2006 are (Tetra Tech 2006a):

- The groundwater source was calcium-bicarbonate type water with very high hardness and a pH of approximately 8;
- The hardness (as CaCO₃) was reported to be 265 mg/L, was generally poor for aesthetic purpose;
- Although the nitrate concentration of 1.5 mg/L did not exceed the GCDWQ maximum acceptable concentration (MAC) of 10 mg/L, the results were generally higher than normal; and
- At 52 mg/L, chloride concentrations for the sample result provided were also in excess of background concentrations expected for the area; and

- The total iron concentration in the sample collected on May 19, 2005 was 0.852 mg/L, which was elevated compared to the previous sample collected in October 2005 (0.064 mg/L), and greater than the current GCDWQ aesthetic objectives (AO) of 0.3 mg/L.

Well 1950-B

The key observations and comments noted after well deepening in 2006 are (Tetra Tech 2007):

- Water from well 1950-B was calcium-bicarbonate type;
- Water from Well 1950-B met all current GCDWQ for health and aesthetics based parameters;
- Total iron and manganese concentrations were above GCDWQ AO. Elevated iron concentrations are likely due to interaction with stagnant water within the cased portion of the well;
- Laboratory results for water from 1950-B do not indicate any evidence of impacts from septic effluent;
- From an aesthetic perspective, water from 1950-B was of much better quality than water from 1950-A, with a lower hardness and total dissolved solids; *and*
- Radiological screening results indicate a gross alpha concentration of 0.13 ±0.05 Bq/L, which was slightly above the MAC of 0.1 Bq/L at the time, however current GCDWQ regulations indicate that gross-alpha measurements above 0.5 Bq/L should be a trigger for further analysis, and the lowest GCDWQ MAC for is 0.2 Bq/L for radiation from Lead-210. The result of the changes in regulations is that the gross alpha measurement from the Ibox Firehall screening was below all GCDWQ MACs.

5.56.5 Water Treatment and Distribution

Table 5-152: Ibox Valley Firehall Water Treatment and Distribution Details		
Item	Details	Source
Owner/Operator	Government of Yukon	Tetra Tech 2007 p.c. Nick Barnett 2017
Water source	Groundwater	
Well serving the system	Well 1950-A and Well 1950-B	
Treatment type	None	
Number of connections	Approximately 20 to 30 people	
Delivery method	Piped (to the Firehall and the water storage tank) and a water fill station outside the Firehall for public use	
Age of system/last known update	Well 1950-B was deepened in 2006.	

5.56.6 Source Water Protection Planning

No records were found indicating that a source water protection plan has been completed for the Ibex Valley Firehall well and the test well. Given that the water supply system is used to supply a public water fill point, implementation of a source water protection plan is considered important to increase security of the Firehall firefighting water supply and the drinking water supply.

5.56.7 Water Supply Information Data Gaps

Tetra Tech has obtained review comments from YG PMD regarding the current status of this system and to our knowledge this summary is complete and accurate to March 2017. The following data gaps have been identified:

- There is no SWPP in place to protect the groundwater aquifer here; and
- No information regarding the connection of 1950-B and installation of a potable water system separate from the firewater system was provided.