5.51 Watson Lake Area - Upper Liard Firehall Water Supply System

The Upper Liard Firehall is supplied water from a well (Well 4962) located inside the Firehall washroom. The well supplies water to the domestic water supply for the Firehall as well as a 4,300 L steel water storage tank for firefighting use (Tetra Tech 2006). The 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 for human consumption.

5.51.1 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 Upper Liard 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.

5.51.2 Hydrogeology

There is no log available for Well 4962. Examination of other well logs in the Upper Liard area indicate alternating sand and gravel sediments with occasional silt and peat (Tetra Tech 2006). Most wells in the area are completed at depths of 10 m to 16.5 m within a sand and gravel aquifer, and no significant fine-grained material or confining layer is noted (Tetra Tech 2006); thus the vulnerability of the aquifer is considered to be high.

Well 4962 is located approximately 500 m west of the Liard River and 200 m south of Albert Creek. The direction of groundwater flow is likely east to north towards the Liard River and Albert Creek (Tetra Tech 2006).

5.51.3 Well Summary

The following table summarizes the known details for Well 4962.

Table 5-131: Upper Liard Firehall, Well 4962 Summary

Well Construction Parameters	Details	Source
Date of construction	Likely in 1987	p.c. Nick Barnett 2017
Total well depth	Unknown	
Casing	6” (152 mm) OD Steel Well Casing	Well log
Casing depth	Unknown	Tetra Tech 2006
Well screen	Unknown	
Static water level	Unknown	
Sanitary seal	No record of sanitary seal installation	

Table 5-131: Upper Liard Firehall, Well 4962 Summary		
Well Construction Parameters	**Details**	**Source**
Wellhead completion	The well is located inside the Firehall washroom	
Wellhead stickup	At grade (measured on June 22, 2005)	
Well rated capacity	Unknown	
Well GUDI status	Potentially GUDI	Based on well construction
Well Construction Comments:	Well was not constructed to meet Canadian Groundwater Association Well Construction Guidelines as there is likely no sanitary seal and the well stick-up does not extend 600 mm above grade.	

5.51.4 Source Water Quality

The most recent available water quality results from the system for this study were from September 13, 2004 and June 22, 2005. Water quality results include typical drinking water package as well as laboratory analysis of UV absorbance, tannins and lignin, turbidity, total and dissolved manganese, and TOC. The key observations and comments noted in the chemical water quality review for Well 3172 are summarized as follows (Tetra Tech 2006):

- The water was considered very hard (approximately 220 mg/L as $CaCO_3$) on the date sampled and the high hardness is considered poor for aesthetic purposes;
- The turbidity of the water ranges from 3.0 NTU to 49.9 NTU on the dates sampled. The severe increase in turbidity between the September 2004 and June 2005 samples, however, does indicate that the aquifer from which the Liard Firehall receives its water supply may be subject to seasonal fluctuations in water quality and as such may be under the direct influence of surface water (GUDI). Health Canada recommends that groundwater sources provide water with turbidity less than 1.0 NTU and that water from GUDI sources have appropriate filtration and disinfection. Filtration is expected to achieve a turbidity level of 1.0 NTU for slow sand or diatomaceous earth filtration, 0.3 NTU for conventional direct filtration and 0.1 NTU for membrane filtration in 95% of samples between filter changes or per month with no measurements exceeding 3.0 NTU;
- The water quality results indicated that the water from Well 4962 meets the GCDWQ for all the parameters analyzed with the exceptions of total iron *and* total and dissolved manganese:
  - The total iron concentration was reported to be 0.16 mg/L for the sample collected on September 13, 2004; however, the sample collected subsequently on June 22, 2005 had a total iron concentration of 1.4 mg/L, which exceeded the GCDWQ AO of 0.3 mg/L; and
  - The total manganese concentrations were reported to range from 0.0537 mg/L to 0.118 mg/L and the dissolved manganese concentration was reported to be 0.0573 mg/L on the dates sampled, signifying that the manganese content can be almost entirely attributed to dissolved particles. The total and dissolved manganese concentrations all exceed the GCDWQ AO of 0.05 mg/L.
- Review of chloride, nitrate and nitrite showed all three to be low and within the normal background ranges, suggesting that the aquifer was not under the influence of anthropogenic surface sources of nutrients or anions such as septic wastes at the time of sampling.

5.51.5 Water Treatment and Distribution

Table 5-132: Upper Liard Firehall Water Treatment and Distribution Details

Item	Details	Source
Owner/Operator	Government of Yukon	Tetra Tech 2006 p.c. Nick Barnett 2017
Water source	Groundwater	
Number of wells serving the system	Upper Liard Firehall well (Well 4962)	
Treatment type	None	
Water users	Users of the Firehall	
Delivery method	Direct piped connection to the Firehall	
Age of system/last known update	Unknown	

5.51.6 Source Water Protection Planning

There is no SWPP or AWPP in place for the Upper Liard Firehall water system. Tetra Tech was not able to obtain any record of a GUDI assessment for the system. During the 2005 SPDWSA, the following potential contaminant sources were identified within 30 m of the well (Tetra Tech 2006):

- A septic tank located approximately 8 m from the well;
- A septic field (if present) is less than 30 m from the well; and
- The well is located in the Firehall washroom.

During the SPDWSA conducted in 2005, it appeared that the septic system was not constructed in accordance with regulation. It is likely that the tank discharges effluent to a field located east of the tank and less than 30 m from the well; however, this should be confirmed (Tetra Tech 2006).

In addition, on May 9, 1996, it was reported that a fuel tank near the Upper Liard Wash House tipped over, spilling approximately 113 L of fuel oil (Tetra Tech 2006). The spill occurred a significant distance from the Firehall and there is no risk associated with this water system (Tetra Tech 2006).

It is unknown whether some of these PCOC have been relocated. The vulnerability of the aquifer in which this well is completed is considered to be high and a SWPP would provide a valuable tool for identifying, monitoring and managing risks to the wells and aquifer.

5.51.7 Water Supply Information Data Gaps

YG PMD has reviewed this summary and provided comments. To our knowledge, this system is accurate and up to date as of March 2017. Tetra Tech identified the following data gaps:

- Several upgrades including water treatment and disinfection were recommended by Tetra Tech in 2006; however, Tetra Tech understands there have not been major upgrades to the system since 2006; and
- No SWPP or GUDI assessment is in place for this groundwater resource.