

5.18 Carmacks - Forest District Office Water Supply System

The Village of Carmacks is located on the North Klondike Highway approximately 180 km north of Whitehorse, in Yukon. The Carmacks Forest District Office (FDO) is located in central Carmacks Village on the shores of the Yukon River. Carmacks FDO water supply system, which is served by a groundwater well located in the building basement, supplies water to workers in the office and members of the public who visit the office.

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.

5.18.1 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 YG PMD regarding all water systems they operate and/or maintain. YG PMD has provided review comments review comments and data for the compilation.

5.18.2 Hydrogeology

The aquifer underlying the central Carmacks Village area is a permeable, unconfined sand and gravel aquifer comprised of glaciofluvial and recent alluvial deposits. The regional groundwater flow direction in the vicinity of the Village core is inferred from topography to be northeast towards the Yukon River.

5.18.3 Well Summary

The lithology and well completion log for the Carmacks FDO well is included in the GIS map and database portion of this project. The following table summarizes available data for the well.

Well Construction Parameters	Details	Source
Date of construction	The well was completed in August 1973	Well Log
Total well depth	12.2 m bgs	
Casing	6" (152 mm) Steel Well Casing	Tetra Tech 2006
Casing depth	Approximately 7.6 m bgs	Well Log
Well screen	1.5 m well screen from 7.6 m bgs to 9.1 m bgs; the slot size is unknown	
Static water level	1.5 m bgs (August 1973)	
Sanitary seal	Likely no surface seal	Tetra Tech 2006 p.c. Nick Barnett 2017
Wellhead completion	Split gasket cap, wellhead located in basement of district office	
Wellhead stickup	1.2 m bgs	
Well rated capacity	3.2 L/s (42 IGPM) (estimated by the driller)	Well Log

Table 5-43: Carmacks Forest District Office Well Summary

Well Construction Parameters	Details	Source
Well GUDI status	Potentially GUDI	Based on well construction
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.	

5.18.4 Source Water Quality

As part of the SPDWSA review conducted in 2005, Tetra Tech reviewed available groundwater chemistry data and collected an additional sample to test for identified parameters of concern. The observations made in 2005 are summarized below:

- The water was calcium-bicarbonate type, had a pH of approximately 8.1, and was considered very hard with a measured hardness of approximately 198 mg/L (as CaCO₃);
- Turbidity was measured at 1.2 NTU. 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;
- Water quality met all other GCDWQ health-based criteria and aesthetic objectives for the parameters analyzed; and
- 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.

5.18.5 Water Treatment and Distribution

Table 5-44: Carmacks Forest District Office Water Treatment and Distribution Details

Item	Details	Source
Owner/Operator	Government of Yukon	Tetra Tech 2006 p.c. Nick Barnett 2017
Water source	Groundwater	
Wells serving the system	Carmacks FDO well	
Treatment type	Well is equipped with a sediment filter	
Water users	YG employees	
Delivery method	Directly connected to the Forest District Office via a buried piped connection	
Age of system/last known update	Unknown	

5.18.6 Source Water Protection Planning

There is no SWPP in place for the Carmacks FDO Well 6542. Given the shallow depth of the well and the likely unconfined nature of the aquifer, a SWPP would provide a valuable tool for identifying, monitoring and managing risks to the wells and aquifer. Source water protection planning here could be incorporated with planning for the Carmacks Village centre to create a comprehensive SWPP.

Potential sources of contamination in the vicinity of the wellhead that were identified as part of the 2005 SPDWSA site review, included:

- Two ASTs located at 5 m and 24 m from the well; and
- An improperly constructed sewer manhole located 24 m from the well.

5.18.7 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 source water protection planning for this groundwater resource. Source water protection planning here could be incorporated with planning for other locations in the central Carmacks Village to create a comprehensive Carmacks SWPP; and,
- It was recommended at the time of the system review in 2005 that the FDO be either connected to the new school well or to a new Carmacks municipal water distribution system. Tetra Tech understands the building has not been connected to the new school well, and there is no municipal piped distributions system at this time (p.c. Nick Barnett 2017).