

5.10 Burwash Landing - KFN Daycare and Teacher’s Residence Water Supply System

The community of Burwash Landing is located on the Alaska Highway at km 1700, approximately 285 km northwest of Whitehorse, in an area known as the Shakwak trench between Kluane Lake and the steep slopes of the Kluane Range mountains. The area is gently but irregularly sloping to the northeast down towards Kluane Lake.

The KFN Daycare and Teacher’s residence in Burwash is served by a groundwater well (KFN G) located near the building. The water 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.

5.10.1 Hydrogeology

Burwash Landing is underlain by glaciofluvial sediments with a thin overlying veneer of silt (Rampton 1977). Water wells in the area are typically completed at depths ranging from 45 m bgs to 60 m bgs in a sub-permafrost aquifer.

The groundwater well currently serving the Burwash Daycare and Teacher’s Residence, Well KFN-G, is completed in a confined sand and gravel overburden aquifer below approximately 40 m of permanently frozen (permafrost) clay till. Groundwater flow direction in the area is north-northeast toward Kluane Lake (Tetra Tech 2007).

None of the wells in Burwash Landing encountered bedrock; thus, depth to bedrock in the area is unknown. It is anticipated that the depth to bedrock may be up to several hundreds of metres based on the completion depth of KFN-L, a deep geothermal exploration well completed in a sand aquifer approximately 385 m bgs.

Tetra Tech completed a semi-quantitative analysis of the aquifer vulnerability at KFN-G based on the methodology presented in the Technical Terms of Reference for Groundwater Studies (Ontario Ministry of Environment 2001). Aquifers with ISI values greater than 80 are considered to have low intrinsic susceptibility to surface sources of contamination (Ontario Ministry of Environment 2001). The ISI value for the aquifer at well KFN-G was 219 for the deep sub-permafrost aquifer, indicating that the aquifer underlying the site has a low vulnerability to potential surface-based contamination due to a highly impermeable layer of frozen, fine-grained materials overlying a deep confined aquifer.

5.10.2 Well Summary

The log for KFN-G well is included in the GIS map and database portion of this project. The following table summarizes available data for the water well.

Well Construction Parameters	Details	Source
Date of construction	Well was completed in 1976 by Midnight Sun Drilling Co.	Tetra Tech 2007
Total well depth	49.3 m bgs (total drilled depth)	
Casing	6" (152 mm) ID Steel Well Casing	
Casing depth	46.5 m bgs	Well Log

Well Construction Parameters	Details	Source
Well screen	40-slot (1.0 mm) stainless steel well screen welded to the bottom of the casing. Interval is unknown	
Static water level	3.874 m bgs (March 21, 2007)	Tetra Tech 2007
Sanitary seal	None installed at time of drilling	Well Log
Wellhead completion	Well house	p.c. Keith Dickson 2017
Wellhead stickup	~0.5 m ags	
Well rated capacity	0.16 L/s (2.1 IGPM)	Well Log –estimate by driller
Well GUDI status	Not assessed	
Well Construction Comments:	Well was not constructed to meet Canadian Groundwater Association Well Construction Guidelines as the well has no surface seal.	

5.10.3 Source Water Quality

Tetra Tech reviewed water quality information for KFN-G in 2004 (Tetra Tech 2004).

- Groundwater from KFN-G was characterized as calcium-magnesium-bicarbonate type, with a pH of approximately 8.3 and was considered to be hard with a measured hardness of 155 mg/L (as CaCO₃); and
- The water met all GCDWQ health-based criteria and aesthetic objectives for the parameters measured.

5.10.4 Water Treatment and Distribution

Item	Details	Source
Owner/Operator	Kluane First Nation	Tetra Tech 2007
Water source	Groundwater	
Wells serving the system	KFN-G	
Treatment type	Filtration and UV disinfection	KFN-G O&M Manual 2005 p.c. Keith Dickson 2017
Water users	Daycare workers, teacher and children	Tetra Tech 2007
Delivery method	Well is connected directly to daycare and teacher’s residence	KFN-G O&M Manual 2005**

Table 5-27: KFN Daycare and Teacher’s Residence Water Treatment and Distribution Details

Item	Details	Source
Age of system/last known update	Well was incorporated in AWPP in 2007 and will be included in the updated 2016 AWPP	Current projects with Tetra Tech

5.10.5 Source Water Protection Planning

KFN-G is likely completed in the same aerially extensive confined aquifer as other KNF wells, KFN-F, KFN-J, KFN-K, KFN-M and KFN-N. The aquifer is highly confined and artesian pressure is observed in some of the wells. KFN-G is included in the KFN AWPP from 2007. The KFN AWPP was based on Tetra Tech’s risk-based approach which is adapted from British Columbia’s Environment (BC MoE) Tool Kit. The well capture zones in the community were predicted using numerical modelling. Tetra Tech used Visual MODFLOW developed by Waterloo Hydrogeological Inc. based on the USGS MODFLOW code to create three dimensional models of the well capture zones for the Burwash KFN community water wells. The model was used to simulate 1-, 5- and 10-year capture zones for each well. Conservative assumptions were built into the groundwater flow model to create reasonable and realistic areas for wellhead protection planning.

Key conclusions and recommendations can be reviewed in the attached AWPP, included in the map and database portion of this project. The AWPP is currently under revision by Tetra Tech as several new community wells have been installed including two new community water supply wells intended to replace KFN-F.

5.10.6 Water Supply Information Data Gaps

Tetra Tech has reviewed available data from YG Community Services and Kluane First Nation and noted the following data gaps or areas where the protection of the water source could be improved:

- Tetra Tech has not completed work on the KFN-G well since the review for the AWPP in 2007. We are not aware of any work that has been completed on this well since 2007, but it is possible that water treatment has been added or wellhead improvements have been completed. If the well or treatment system has been amended since 2007, the database should be updated to reflect these changes.