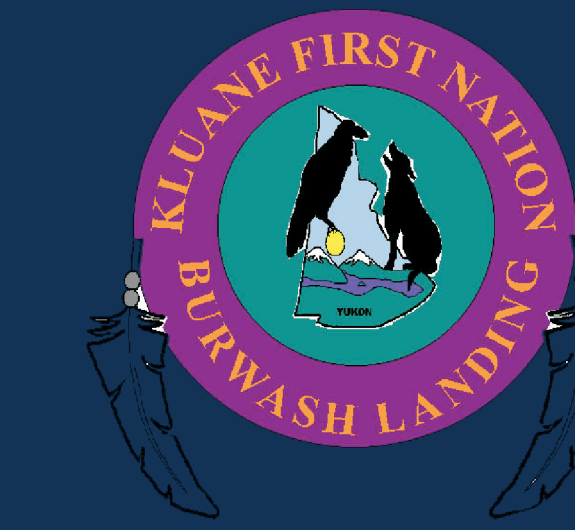
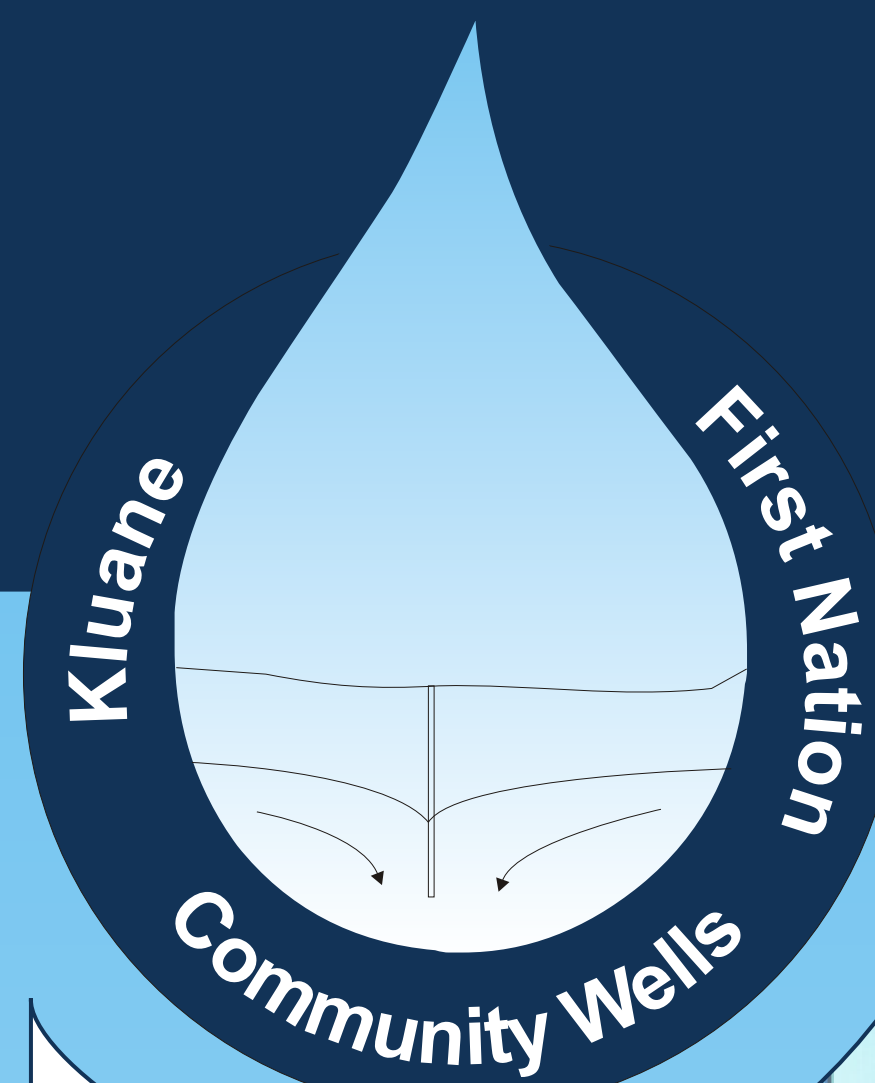


# Aquifer and Wellhead Protection Plan

Kluane First Nation Community Wells - Burwash Landing, YT



## Our Water Supply...

### ...Comes From Groundwater...

Our groundwater flows from the Kluane Mountain Range towards Kluane Lake and is recharged by melting glaciers, rain and melted snow that seeps down through the soils.

### ...Up Through Wells...

Our community water comes mainly from one well located near the water treatment plant (KFN-F). A second Community Well (KFN-C) provides water for the Administration Building, the Laundry Facility and the Health and Social Services Building. A third Community Well (KFN-G) provides water for the teachers' residence and the daycare.

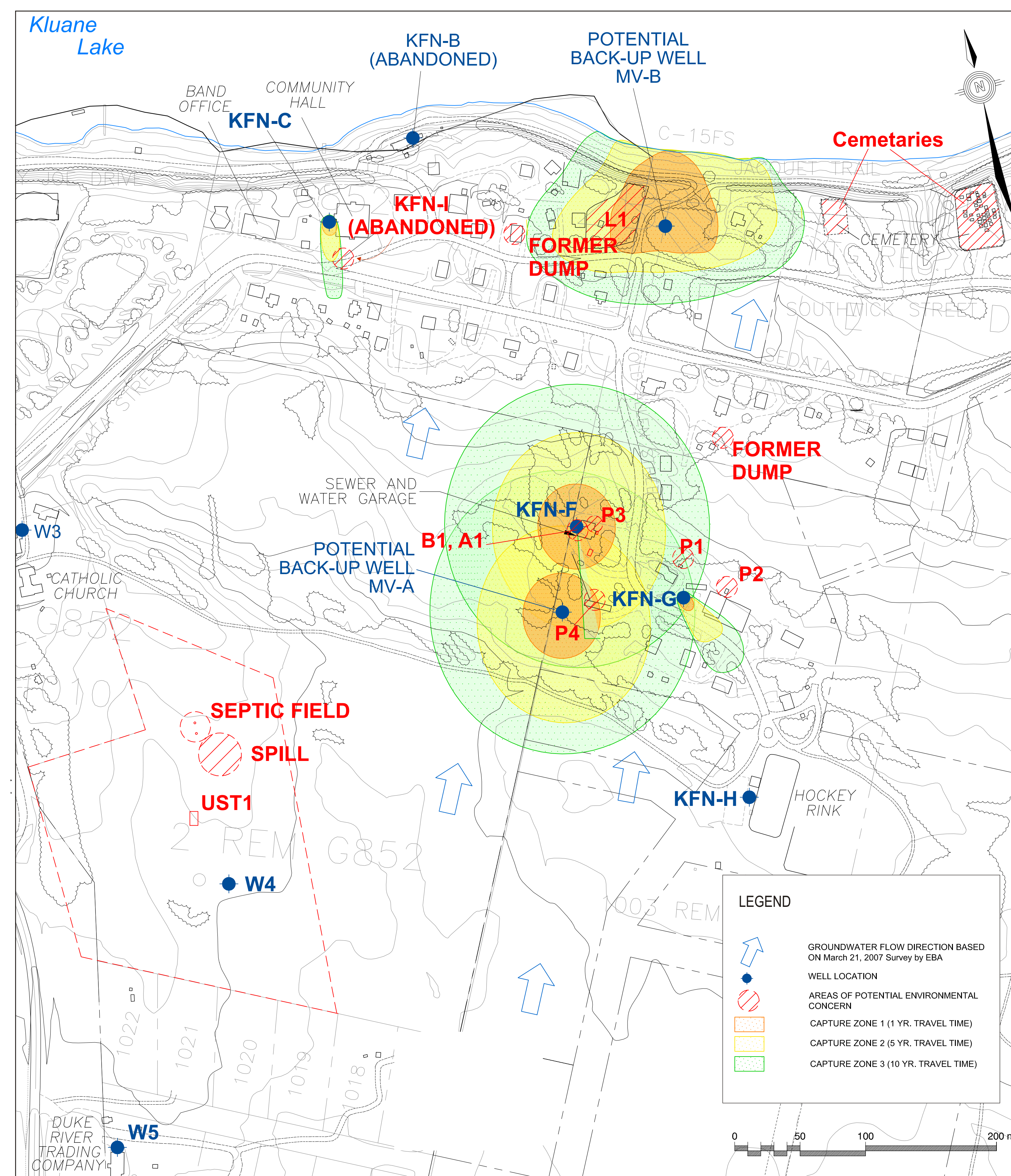
### ...Is Treated...

The main community well water from KFN-F is pumped into two tanks where chlorine is added to disinfect the water by inactivating any potential bacteria or viruses that may be in the water. The water systems for the Administration Building, the Laundry Facility and the Health and Social Services Building and for the Teachers' residence and Daycare are designed to be filtered, softened and disinfected with ultra-violet light (UV), although they are sometimes just filtered (not disinfected).

### ...And Delivered to Our Homes. ...

Safe drinking water from (KFN-F) is then delivered to our homes in our water delivery truck. Water is piped to the Administration Building, Laundry Facility, Health and Social Services Building, Teachers' residence, Daycare and one residence.

## Kluane First Nation Community Well Capture Zones



## Aquifer Zone Classification

### Capture Zones

- Zone 1** 1 Year Capture Zone (0-1 years for contaminant to travel to well) Highest Potential risk.
- Zone 2** 5 Year Capture Zone (1-5 years for contaminant to travel to well) Moderate Potential risk.
- Zone 3** 10 Year Capture Zone (5-10 years for contaminant to travel to well) Low Potential risk.

Areas of Potential Environmental Concern				
I.D.	Hazard Description	Exposure Likelihood*	Hazard Consequence	Risk Rank
<b>KFN-F (Main Well)</b>				
A1	Spills/Leaks from Heating Oil AST for Water Truck Garage	High	High	High
A	Spills/leaks from other ASTs, Vehicles, etc.	Medium	High	Medium
B1	Leak from Wood Fired Boiler System	High	Low	Medium
P1	Leach Pit near Day Care	Low	High	Medium
P3	Overflow or rupture of Septic Tank for Water Truck Garage	Medium	High	Medium
P4	Overflow or rupture of Septic Tank for Sharon Kabanak Residence	Medium	High	Medium
I2	Potential Development near Water Truck Garage	High	High	High
<b>MV-A (Potential Back-Up Well)</b>				
A	Spills/leaks from ASTs, Vehicles, etc.	High	High	High
B1	Leak from Wood Fired Boiler System	Low	Low	Low
P1	Leach Pit near Day Care	Low	High	Medium
P3	Overflow or rupture of Septic Tank for Water Truck Garage	Medium	High	Medium
P4	Overflow or rupture of Septic Tank for Sharon Kabanak Residence	High	High	High
I2	Potential Development near Water Truck Garage	High	High	High
<b>MV-B (Potential Back-Up Well)</b>				
A	Spills/leaks from ASTs, Vehicles, etc.	High	High	High
L1**	Horse manure associated with Arnolds Horse Pen located on Lot 17	High	High	High
<b>KFN-C Administration and Community Hall Well)</b>				
A	Spills/leaks from ASTs, Vehicles, etc.	Low	High	Medium
KFN-I	Potential short circuiting of bacteria/viruses/chemicals down improperly decommissioned well	High	High	High

Notes:  
 High = less than 1 year travel time, Medium = 1 to 5 year, Low = 5 to 10 year  
 \*Assumed that no degradation of chemical or biological parameter of concern occurs during groundwater transport  
 \*\* According to the National Resources Conservation Service (world wide web, <http://patriotrod.org/nrchorsepamphlet2002.pdf>), pathogens found in horse manure include viruses, parasites and bacteria such as C. Parvum, Giardia, and E. Coli.

## Despite the Thick, Confining Soils found in Burwash Landing...

A thick fine-grained layer of soil in Burwash Landing protects our aquifer and helps to reduce the risk of groundwater pollution. However, despite the protection that the soils provide to our confined aquifer, we still need to take precautions to ensure that the hazards within our well capture zones are mitigated through proper action and management. Protective and preventative management strategies are listed in the following table.

## Areas of Potential Environmental Concern within the Well Capture Zones

- Potential Risks in All Zones**
- Tampering/sabotage of the wells;
  - Spills/leaks from the Heating Oil AST for the Water Truck Garage located near KFN-F;
  - Spills/leaks from Wood Fired Boiler System for the Water Truck Garage located near KFN-F;
  - Spills/leaks from other ASTs and vehicles;
  - Potential commercial and industrial development adjacent to west of Community Well KFN-F and potential Back-up Well location MV-A; and,
  - Infiltration of leachate from manure piles near potential Back-up Well location MV-B;
  - Spills/leaks from septic tanks located near KFN-F and MV-A; and,
  - Migration of biological and or chemical contaminants down an improperly decommissioned well (KFN- I, near KFN-C exact well location is unknown).
  - Improperly constructed septic systems (APECs P1 and P2) identified near Community Well KFN-F and potential Back-up Well location MV-A).

## PROTECTIVE AND PREVENTATIVE MANAGEMENT STRATEGIES

- Action**
- Relocate Water Truck Garage's AST to other side of building;
  - Relocate livestock pen in the event that site MV-B is selected;
  - Locate and properly decommission abandoned well KFN-I;
  - Replace improperly constructed septic systems with properly constructed septic tanks (APECs P1 and P2);
  - Implement a septic tank monitoring program for tanks in Zone 1; monitor levels, extra care on pump-outs; develop owner awareness programs of septic tanks;
  - Purchase or form a land development agreement with the owners of the land to the west of KFN-F and MV-A so as to protect and manage the wellhead and capture zones from commercial and industrial development to the west;
  - Consider replacing well enclosures for KFN-F and KFN-G;
  - Complete some re-grading around KFN-F to promote positive drainage away from well a swale between the water building and the well house should be constructed to divert flow away from the wellhead;
  - Initiate guidelines or by-laws to control and mitigate potential development activities;
  - Lock all wells and pump houses;
  - Fence around wellheads and pump houses;
  - Post signs around wellhead area; and,
  - Prepare and make readily available a spill contingency plan and contact list.

- Management**
- Educate maintenance staff and community members regarding risks;
  - Incorporate AWHPP into KFN Community Development Plan;

### WITHIN THE WELL CAPTURE ZONES

- NO septic fields;
- NO residential, commercial and industrial development;
- NO installation of USTs;
- NO livestock operations and manure pile storage;
- NO landfills or sewage lagoons;
- NO storage of commercial and industrial chemicals (fertilizers, pesticides, salt, cleaning products, fuels, lubricants, etc);
- NO storage of contaminated soils and/or water;
- Minimize commercial and industrial activity; and,
- Minimize or restrict pesticide and herbicide use.

## Our Groundwater Could Become Contaminated By...



**Solid Waste Disposal** - Current and former dump areas can be potential sources of organic and inorganic contaminants.



**Fuel Spills and Leaks** - Fuel spills/leaks from vehicles, above-ground storage tanks (ASTs) and underground storage tanks (USTs) are common sources of hydrocarbon contamination.



**Pipelines** - Spills and/or leaks from pipelines and defoliants/herbicides used formerly to keep the pipeline right of way clear of vegetation are sources of hydrocarbons and possible dioxins and 2,3,7,8-tetrachlorodibenzo-para-dioxin (TCDD).



**Septic Systems** - Septic tanks or leach pits are potential sources of biological, organic and inorganic contamination. Improperly constructed or failing septic systems can potentially contaminate groundwater with bacteria, viruses, nitrates, phosphorous, hazardous cleaning materials and other household chemicals.



**Service Stations** - Service stations are common sources of hydrocarbon contamination.



**Cemeteries** - Decomposing corpses potentially release a variety of pathogenic organisms. As well, arsenic was used as an historical embalming chemical until around 1910.



**Livestock** - Fecal matter from animals are sources of bacteria, viruses and protozoa.



**Generator Stations** - Generators and transformers are potential sources of PCBs and hydrocarbons.



KFN-C



KFN-F



KFN-G

