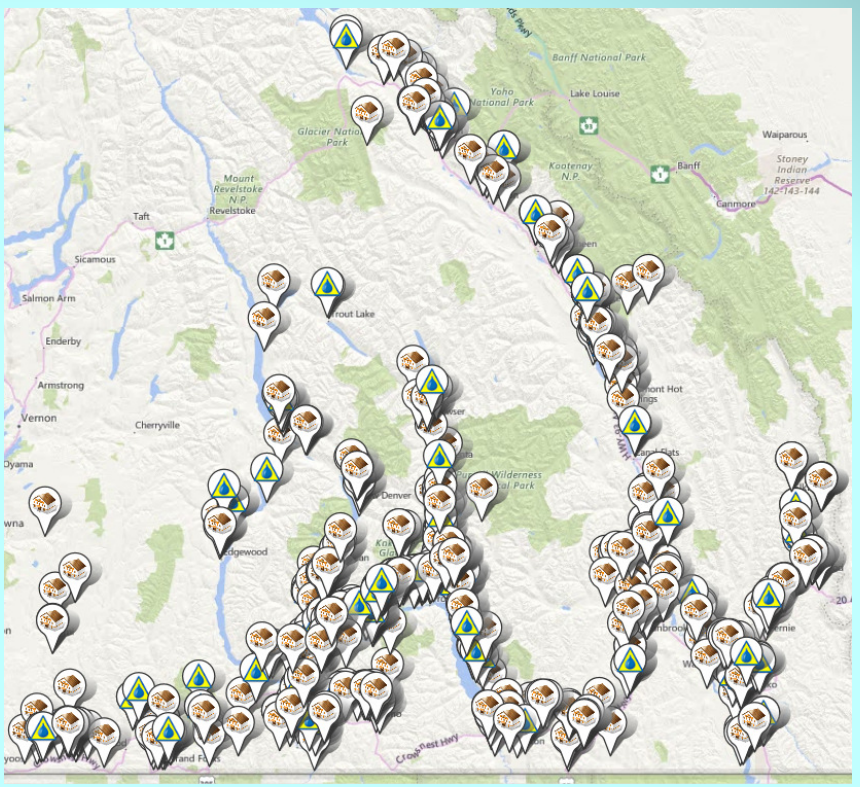
Source Water Assessment Tool Kit for Small Water Suppliers

Overview

- Back ground on the project. Why source assessments?
- Project overview.
- Materials produced.
- Next steps.

Statistically Speaking

- ~ 1950 water suppliers in the IHA region.
- ~730 water systems in the AKBLG boundaries
- ~ 670 small water systems in the Kootenay region.

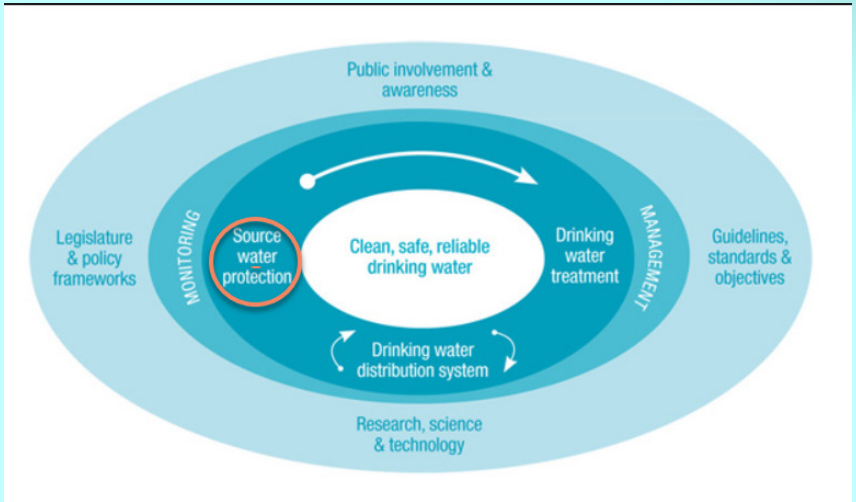


Understanding Water System Needs

- UBCO survey in 2014 – broad agreement that source protection is challenging.
  - Advocates are passionate about protecting water.
  - Broad agreement that source protection is important.

Our Goal

- Risk Reduction.
- National best management practice (AKA. Multi Barrier Approach).



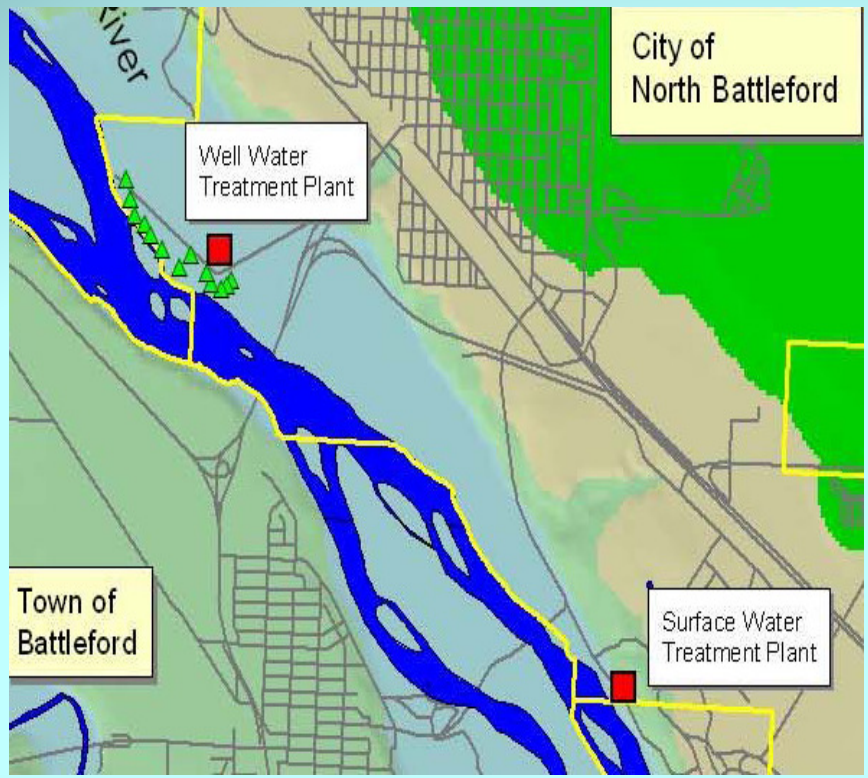
Our Observation:

- Source protection conflicts most likely arise when there is no plan.

Outside of BC
Source Related Issues

- A lack of source assessment and protection planning has led to many outbreaks

North Battleford, Saskatchewan



1907 cases identified, potentially 5800 - 7100 ill

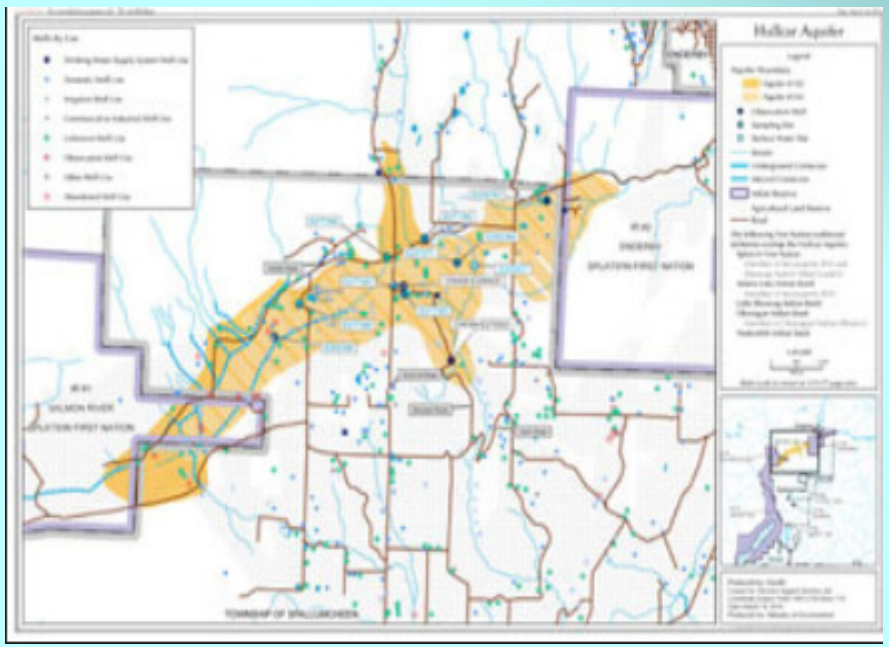
Cryptosporidium

Contributing causes

- Intake downstream of municipal waste water treatment plant outfall
- ineffective treatment due to poor operational procedures
- treated water turbidity > 0.5 NTU on 9 days

BC Source Water Conflict

- **Hullcar Aquifer**
  - **High Nitrates.**
-

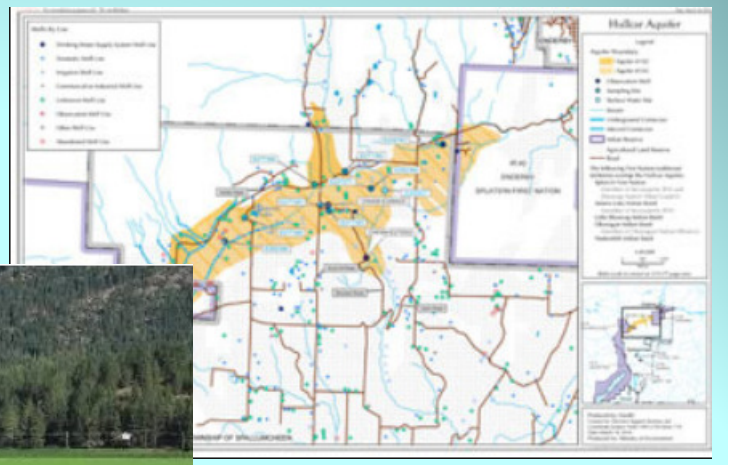


BC Source Water Conflict

- **Hullcar Aquifer – High Nitrates**

Local level
Case Studies to Consider

- **Hullcar Aquifer – High Nitrates**



SPALLUMCHEEN February 20, 2017 6:21 pm

Spallumcheen manure lagoon breach creates water worries

By Megan Turcato North Okanagan Reporter

The farm had previously been warned their storage capacity was inadequate, which has some concerned the province isn't doing enough to prevent spills and protect drinking water. Continue reading →

Locals in conflict with each other.

BC Source Water Conflict

- Source protection conflicts most likely arise when there is no plan.
- Eg. Peachland

*

- Source p… …se when there is
- Eg. Pe…

- So
- Eg.

The RDCK's chief administrative officer Stuart Horn and board chair Karen Hamling will be meeting with forestry and government representatives with concerns about the communication surrounding watershed logging in the Kootenays at the upcoming Union of BC Municipalities meeting in September. Photo: Will Johnson

RDCK entangled in watershed logging controversies

Chair Karen Hamling calls out companies for poor communication

Why ask for a source assessment?

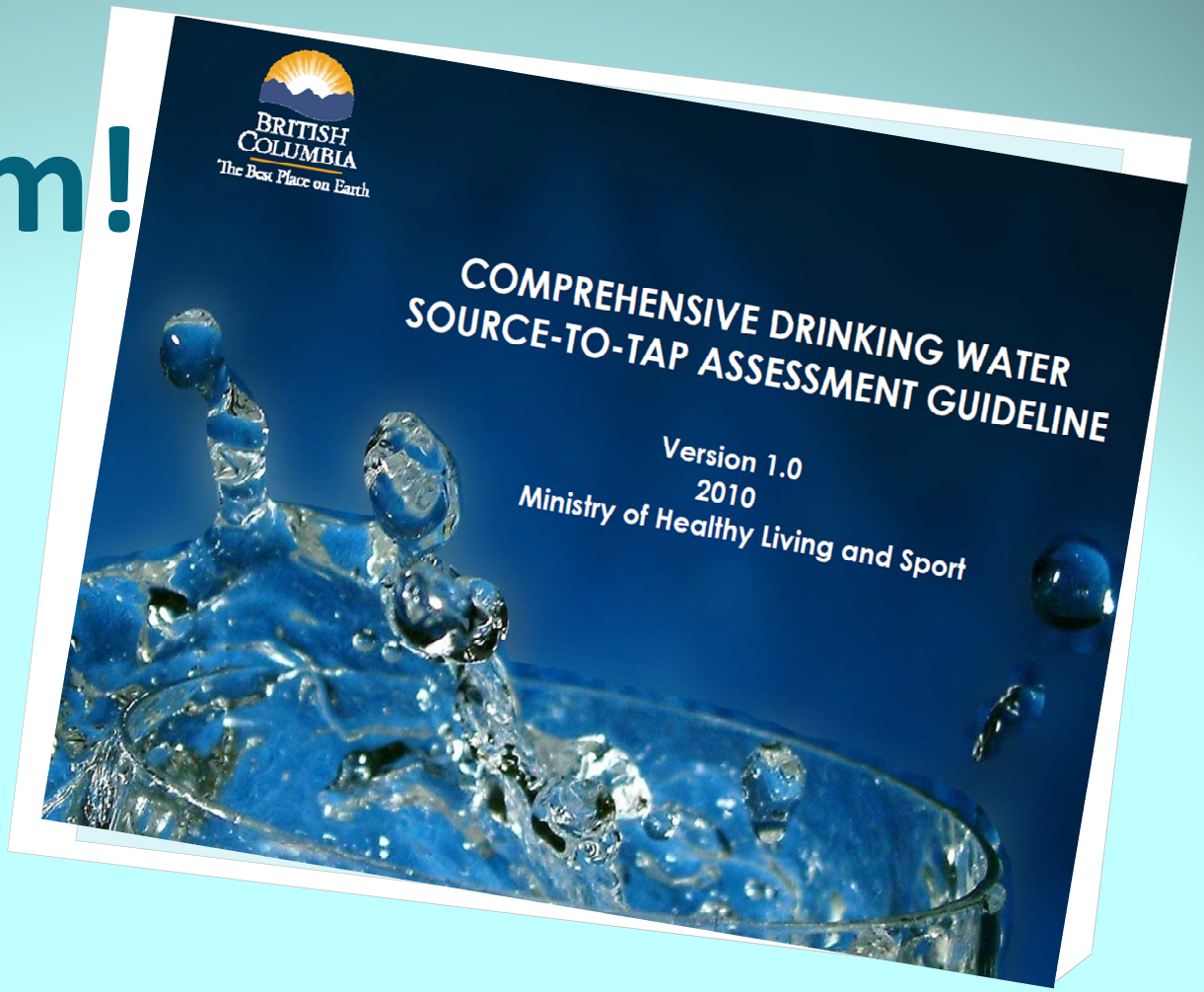
- Watershed issue galvanize Kootenay residents.
- Help to identify opportunities for preventative or remedial action
- Help to maintain source water quality.
- **Risk is a reality of multi-use watersheds**

Problem!

Money

Time

Expertise



Collaboration for Sustainable Water

urban matters

Interior Health

Solution

Cheap

Engages operators and community

Provides a basic framework

Tool Kit Contents

Overview:

- Simplified Source Mapping
- Hazard Inventory
- Risk Analysis
- Protection Planning
- Monitoring
- Surface/Ground Water

Table of Contents

Tool Kit

Source Water Assessment vs. Source Water Protection Plan

A source water protection plan (SWPP) is a document that outlines how to protect the quality and quantity of source water. The SWPP includes a source water assessment (SWA), which identifies and prioritizes potential contamination sources and the second part of the SWPP is the action plan, which outlines how the potential contamination sources will be mitigated.

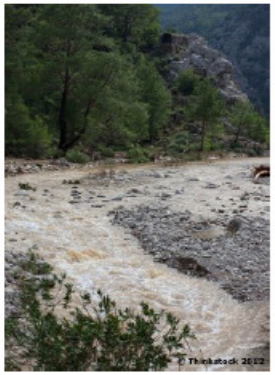
Multi-barrier Approach

The availability of clean, safe drinking water is an expectation of every Canadian. To provide this service the multi-barrier approach is used to ensure that safe drinking water is available now and into the future. The multi-barrier approach is a combination of procedures, processes, and tools that collectively prevent or reduce the contamination of drinking water from source-to-tap in order to reduce risks to public health (CCME, 2004). This is the foundation for the Source-to-Tap Assessment, there are six barriers included in the approach:

- Source Protection
- Treatment
- Water System Maintenance
- Water Quality Monitoring
- Operator Training
- Emergency Response Planning

This guide focuses on source assessment and source protection for small water. The guide has been simplified to make source assessments and protection planning manageable for small water suppliers. However, the source BC Source to Tap Guide (link) is useful for water suppliers who want a more in-depth review of their water sources. There are eight modules that guide the source-to-tap assessment. This workbook only focuses on Modules 1, 2, 7 and 8. See Figure on page 3.

The widely quoted "multiple barrier approach" is only as good as your ability to keep all the barriers functioning at their individual peak efficiency. Even though multiple elements usually must fail for a complete system failure to occur, if individual barriers are not adequately maintained, you may eventually find yourself with no functional barriers to prevent contamination from reaching your consumers.



Interior Health and Your Permit

Each of the five Health Authorities within BC employs Drinking Water Officers and Environmental Health Officers who are responsible for the implementation of most sections of the Drinking Water Act (DWPA). Drinking Water Officers and Environmental Health Officers are delegated powers under the DWPA and use the legislation and associated polices, guidelines and tools to make discretionary decisions. The purpose of the legislation and policies is to reduce public health threats.

Under the Drinking Water Protection Act the DWO may attach terms and condition that are more stringent that the DWPA. These conditions may include monitoring of source water(s), source assessments and protection plans.

Large water suppliers within Interior Health have condition attached to their permit that specifies that a source assessment and protection plan is a requirement. These assessments are posted on EcoCat (http://a100.gov.bc.ca/pub/acat/public/welcome.do).

Report Guide and Template

To assist a small water system in completing a source protection plan this template report has been compiled to facilitate the reporting process. This toolkit and the template report provides a small water system provider step-by-step guidance and tools to complete a source assessment. The method is a five-stage process identifies all hazards and assigns a risk rating to the water source, identified management actions for the risks and an implementation strategy for those actions. The sequential stages are summarized below:

Stage 1 – Form a Technical Advisory Committee

A technical advisory committee provides valuable input into source assessment. The technical advisory committee should be formed early in the assessment so their comment and expertise are reflected in the assessment. The committee should consist of the water supplier, public health engineer, drinking water officer, ministry of environment representative, local government representative and any group or agency that potentially affects the water source. The committee will provide guidance on the preparation, form, content, area of coverage, hazards identified and associated risk rating, and review the draft assessment report. The committee members may also participate in regular meetings, field inspection, review reports and inform community members.

Data Sheets

Administrative Info

Name of Watershed:

Health Authority /Name of DWO :

Water license number:

Community Watershed Code:

Delineation of Water Source Area Info

Source water body name:

Latitude & longitude or UTM coordinates of intake:

Intake Elevation:

Mapped location of intake:

Intake Location and Integrity Info

Describe intake location and depth:

Describe the accessibility for inspection and cleaning of intake:

Sediment Build-up? Yes / No

Comments:

How often do you clean out the build-up?

Do you have protection from animals and vandalism?

- Is the intake fenced?
- Is there signage?

Does ice form at the intake? Yes / No

Comments:

Describe intake integrity and sanitary features:

- Do you have a fish-bearing stream? Yes / No
- Do you have a screen on the intake? Yes / No
- What material is your piping? (PVC, ABS , Copper, Concrete) Yes / No
- Do you use a diversion ? (Include a photo) Yes / No
- Is your intake on private or crown land? Yes / No

Intrinsic Vulnerabilities of Source Area Info

Watershed area

Terrain stability:

- Have there been landslides? Years? Frequency?
- Have there been mudslides? Years? Frequency?
- Have there been avalanches? Years? Frequency?

Runoff direction (map?)

Vegetation type and cover: Circle any applicable types of forests found in watershed

Interior cedar-hemlock / Englemann spruce-subalpine fir / Montaine Spruce / Interior Douglas fir

Wildlife:

Are there any beaver dams or log jams present in your stream/river? Yes / No
If yes, where are they located? (Mark on map)

% crown land _____ % privately owned land _____

Source Water Quality and Volume Info

Water Quality (physical, biological and chemical)

- Do you test your water? Yes / No
- What do you test for?
- How is your sampling preformed? Inline / manual
- Frequency of testing? weekly / monthly / annually

License quantity and type of use: Residential / Commercial / Agriculture / Other

Do you track your water use? i.e –metered used at intake or individual users: Yes / No

Contaminant Inventory

Module 2 – Inventorying Contaminant Sources

Circle any applicable hazards in your watershed and mark on the map in the appendix with an associated number:

Natural Hazards

1. Landslides
2. Wildfires
3. Low Flows/Drought
4. Wildlife
5. Algae Blooms
6. Avalanches
7. Sediment / Coarse material
8. Floods

Human Caused Hazards

9. Mines
10. Major Roads (highways)
11. Logging/Forestry
12. Culverts/bridges
13. Agriculture (herbicides/ pesticides)
14. Forest Service Roads
15. Recreation (hiking, ATV, camping,horseback, mountain biking, etc.)
16. Septic Fields
17. Gasoline/Diesel Storage
18. Range Animals (cattle/horses)

Note: Please refer to Appendix B for information on the above hazards and the potential contaminants associated with them. Keep in mind that this is not a complete list, just a starting point for some typical hazards.

All source waters are vulnerable to contamination. Microbial pathogens are the most pervasive (widespread) contaminants and definitely the most certain to cause human illness if they are allowed to breach your water treatment processes.

Hazard Identification Tables

	Drinking Water Hazard	Possible Effects	Distance from source	Description of existing barrier *	Owner	Map Number
	e.g. Coarse material	e.g. Plug intake	e.g. Directly upstream	e.g. Screen on intake	e.g. water supplier	#??
Physical						
Chemical						
Biological						

Risk Characterization

Table 2: Likelihood Table

Likelihood is an estimate of the probability the event, condition, action or inaction will occur and that negative impacts would result.

Level	Descriptor	Description	Probability in Next 10 Years
A	Almost Certain	Is expected to occur in most circumstances	>90%
B	Likely	Will probably occur in most circumstances	71-90%
C	Possible	Will probably occur at some time	31-70%
D	Unlikely	Could occur at some time	10-30%
E	Rare	May only occur in exceptional circumstances	<10%

Table 3: Consequence Table.

Consequence is the nature and degree of impacts if a hazard does occur.

Level	Descriptor	Description
1	Insignificant	Insignificant impact, no illness, little disruption to normal operation, little or no increase in normal operating costs
2	Minor	Minor impact for small population, mild illness moderately likely, some manageable operation disruption, small increase in operating costs
3	Moderate	Minor impact for large population, mild to moderate illness probable, significant modification to normal operation but manageable, operating costs increase, increased monitoring
4	Major	Major impact for small population, severe illness probable, systems significantly compromised and abnormal operation if at all, high level monitoring required
5	Catastrophic	Major impact for large population, severe illness probable, complete failure of systems

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Risk Characterization

Table 4. Risk Analysis Matrix = Likelihood x Consequence

Likelihood	Consequence				
	1 Significant	2 Minor	3 Moderate	4 Major	5 Catastrophic
A (Almost Certain)	Moderate	High	Very High	Very High	Very High
B (Likely)	Moderate	High	High	Very High	Very High
C (Possible)	Low	Moderate	High	Very High	Very High
D (Unlikely)	Low	Low	Moderate	High	Very High
E (Rare)	Low	Low	Moderate	High	High

Table 5 – Risk Characterization Table

Drinking Water Hazard	Likelihood Level	Consequence Level	Risk Level	Assumption/ Comments

Risk Characterization

Table 4. Risk Analysis Matrix = Likelihood x Consequence

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Table 5 – Risk Characterization Table

Drinking Water Hazard	Likelihood Level	Consequence Level	Risk Level	Assumption/ Comments

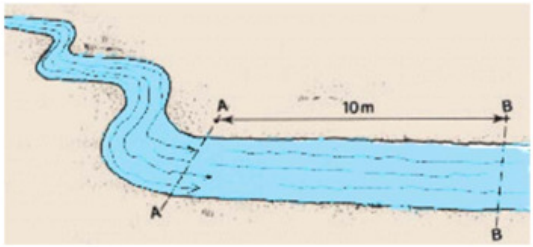
Tool Kit

- Flowing surface monitoring data sheets / instructions.
- Information on how on hire a consultant
- Lake source monitoring data sheet and instructions.
- Ground Water monitoring data sheets / instructions
- Information on how to determine water quantity
- Reference and links to resources

Measuring Stream Width, Depth and Velocity

Preparation:

- Find a relatively straight section of stream, upstream from your intake.
- Mark off a point A and a point B that's at least 10m apart on the stream bank.
    - If possible, make these points a permanent fixture at the high water level for future measurements which will help with consistency.



Stream Width:

- Between points A and B measure the stream width (in meters) at least 3 times and take the average of these measurements as the Average Stream Width (m).
- $W_1+W_2+W_3/3$ = Avg. Width
    - Note if more/less measurements are taken then the '3' in the equation above then the equation needs to reflect that change.

Stream Depth:

- Pick a location between points A and B and measure at least 3 depths along the width of the stream (in meters), using a rigid meter stick.

Well Monitoring Data

General Information **Date:** _____

Utility Name: _____ Telephone # _____
Date of Last Monitoring: _____
Well Name: _____ Well Tag/Well Plate ID# _____
Nearest Town: _____ Postal Code of Nearest Town: _____

Well Coordinates
Longitude: _____ Degrees _____ Minutes _____ Seconds
Latitude: _____ Degrees _____ Minutes _____ Seconds

Well & Well Site Information

Well Condition: _____
Time of Observation: _____ am / pm
Weather During Sampling (circle): sunny cloudy overcast rain other _____
Weather Yesterday (circle): sunny cloudy overcast rain other _____
Type of Well (circle): Drilled Dug Other _____
Well Depth: _____ m Diameter: _____ m
Static Water Level (non-pumping): _____ m

Sampling:
Before collecting a sample, 3x times the volume that is static in the well needs to be purged. Also preferably pH, temperature and conductivity should be monitored and samples shouldn't be taken until all three parameters have stable readings.

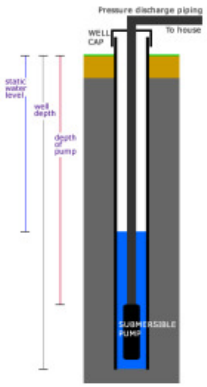
Height of Static Water (h): _____ m
(Well Depth - Static Water Level)

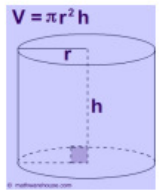
Radius of Well (r): _____ m
(1/2 the diameter of well)

Volume of Static Water: _____ m^3
(pi=3.14, Vol = $\pi r^2 h$)

Note: $1m^3$=1000L

Purge Volume Required: _____ L
(3xVolume)





Next Steps:

- Pilot
- Review
- Implementation

Questions for you:

- What has been the feedback from residents in the Kootenay on the need to protect drinking water sources?
- As local government representatives have you heard from water suppliers or local watershed groups on the need to protect water quality?

Questions:

Contact Information

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