Well Owners Workshop

Agenda

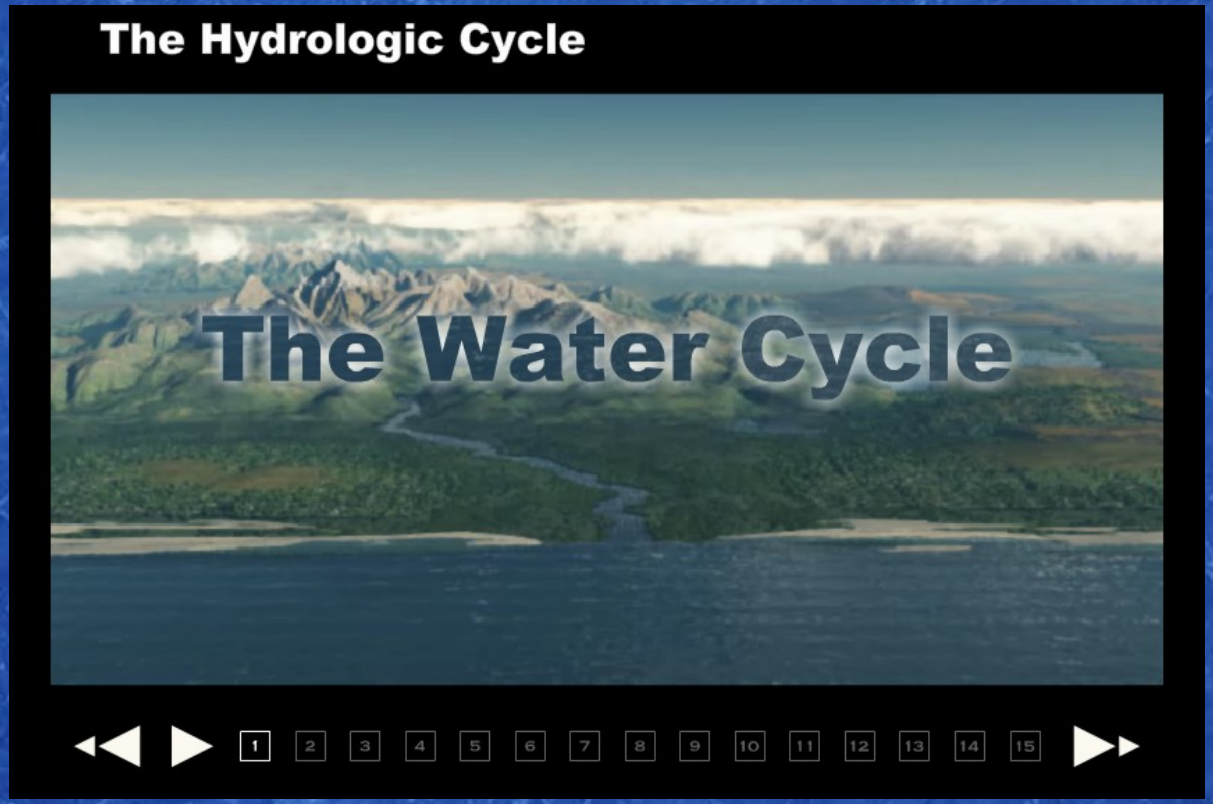
1. Introduction
2. Understanding groundwater
3. Understanding how your well works
4. Common well problems
5. Water quality enemies
6. Water Quality and Disinfection
7. Take home messages
8. Acknowledgements
9. Panel discussion

Introduction

- The key to ensuring your groundwater supply is safe and secure is understanding your well and how to properly maintain it.
- As a landowner, you are responsible for looking after the water well(s) on your property.

Understanding Groundwater

The Hydrologic Cycle



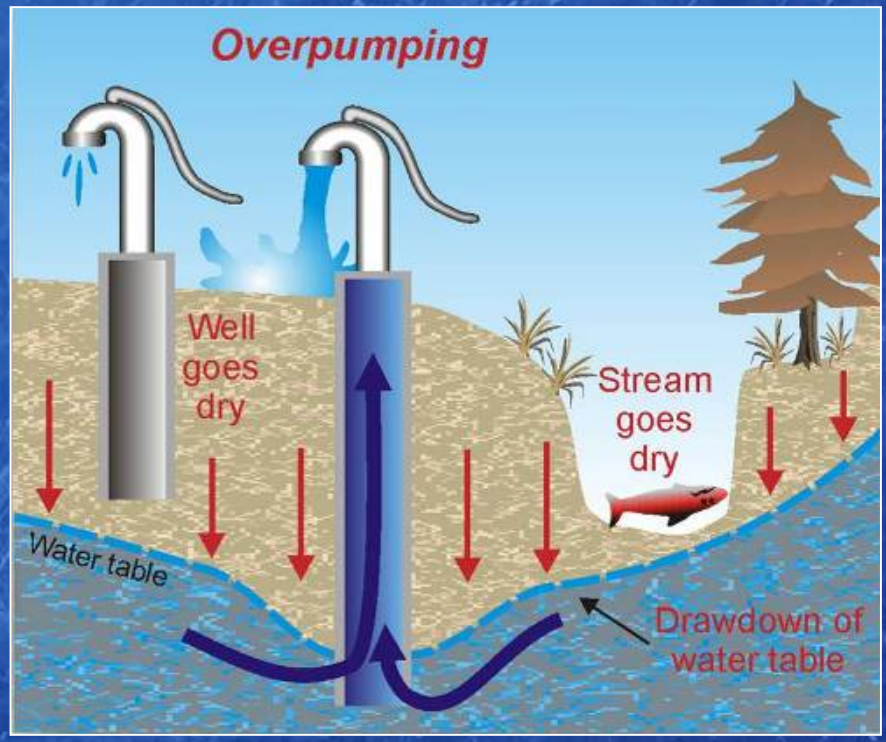
PLAY
"The Hydrologic Cycle" Video
Full Screen

PLAY
"The Hydrologic Cycle" Video
800 x 600

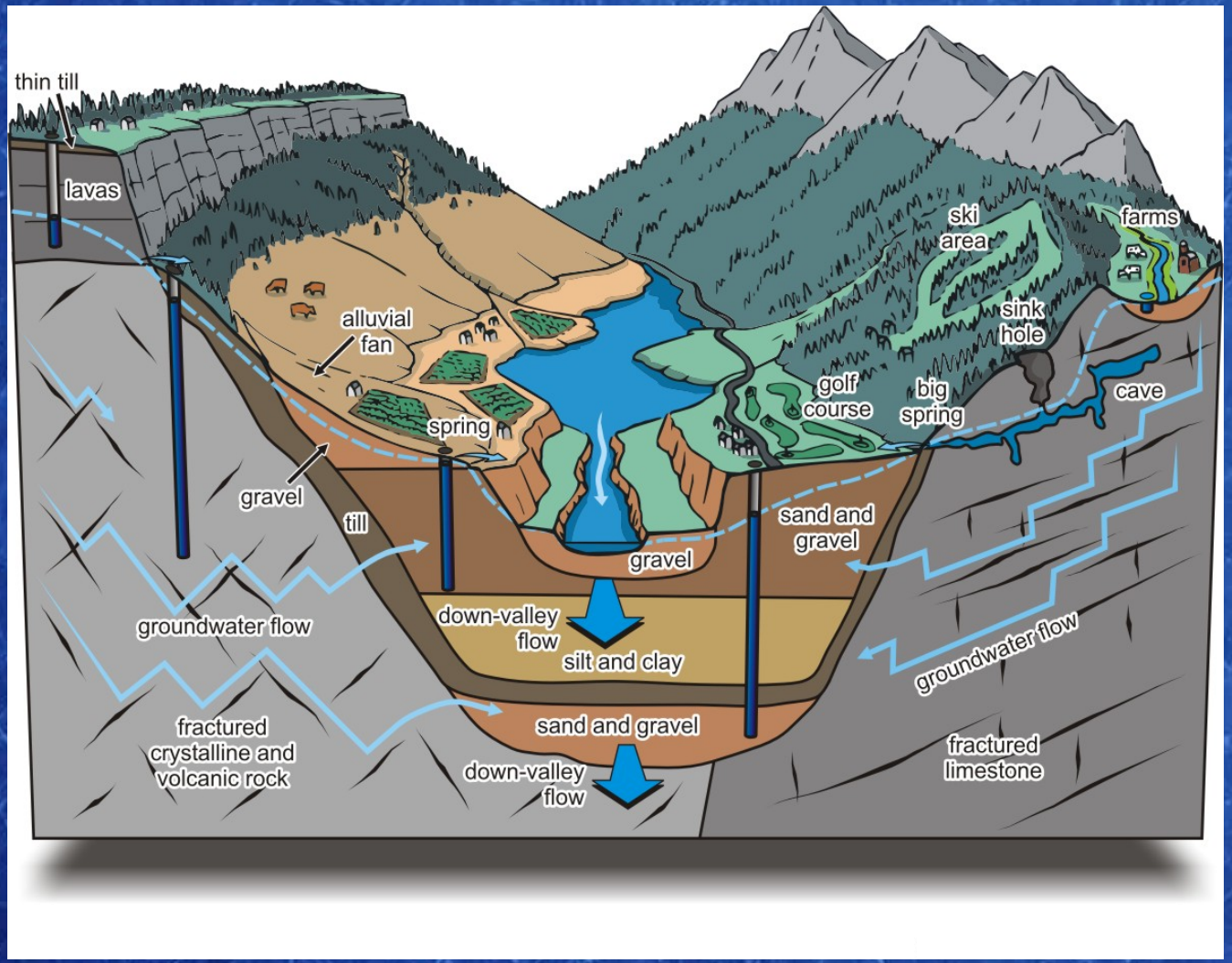
Well Productivity

The amount of water a well can produce is influenced by:

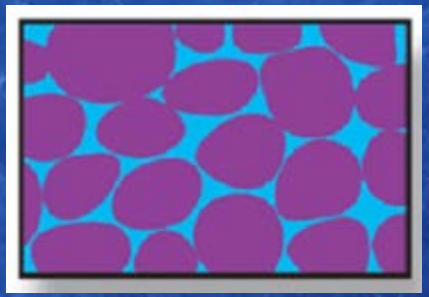
- Pumping rate.
- Depth of well.
- Geology, e.g. bedrock vs unconsolidated (sand and gravel).
- Aquifer size and type.
- Precipitation (recharge).
- Well interference.



Interior BC Aquifers



Water in rock fractures



Water between grains of sand

Understanding
How Your Well Works

What Kind of Well do I Have?

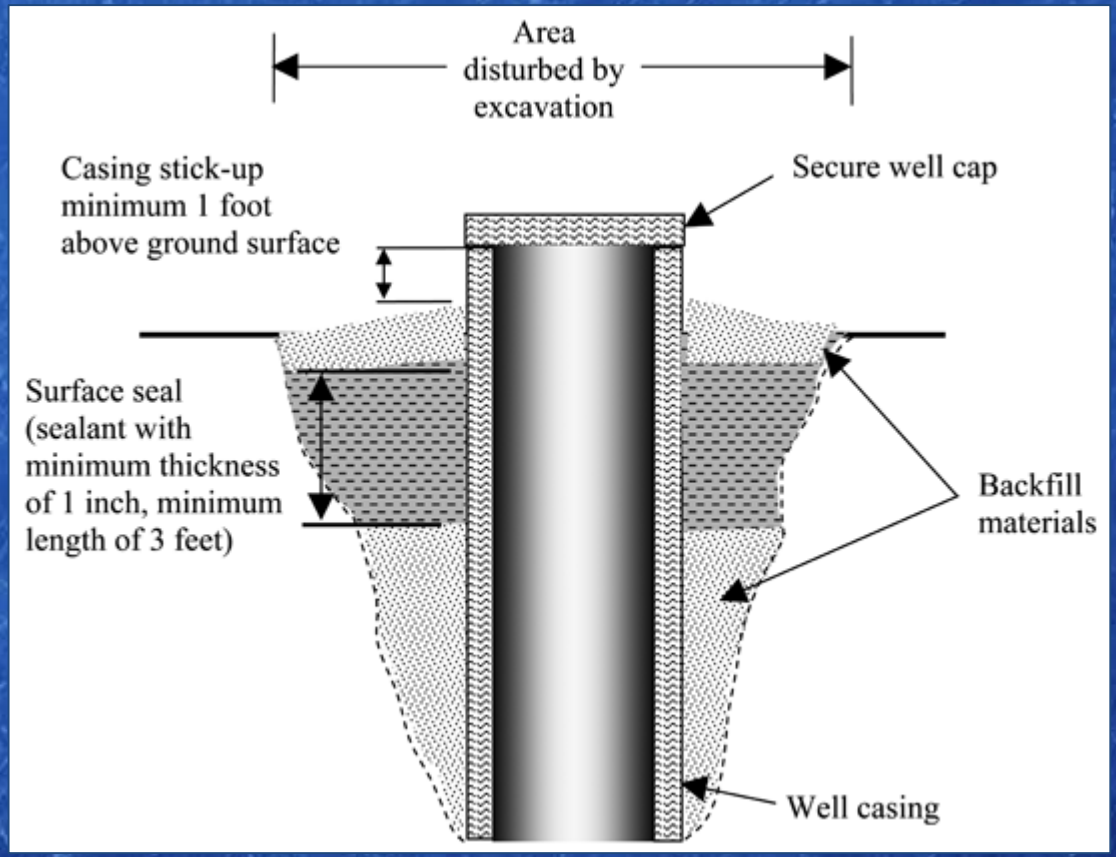
Dug Wells

Drilled Wells

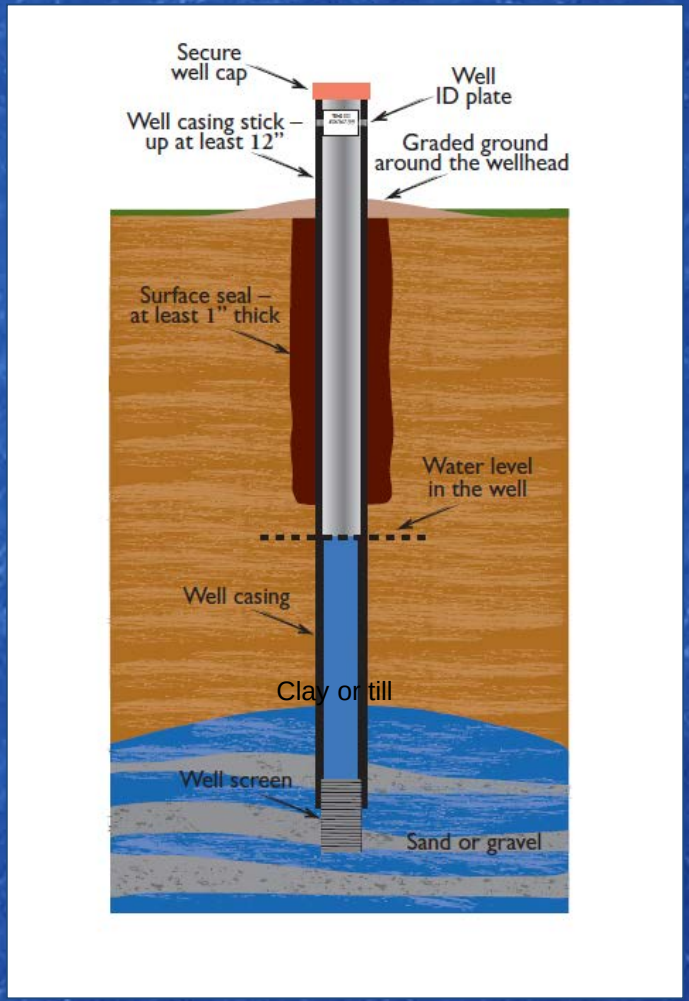
Drilled Wells in Pits

Well Types: Dug

- Large diameter – up to 3 feet in diameter.
- Shallow – less than 50 feet.

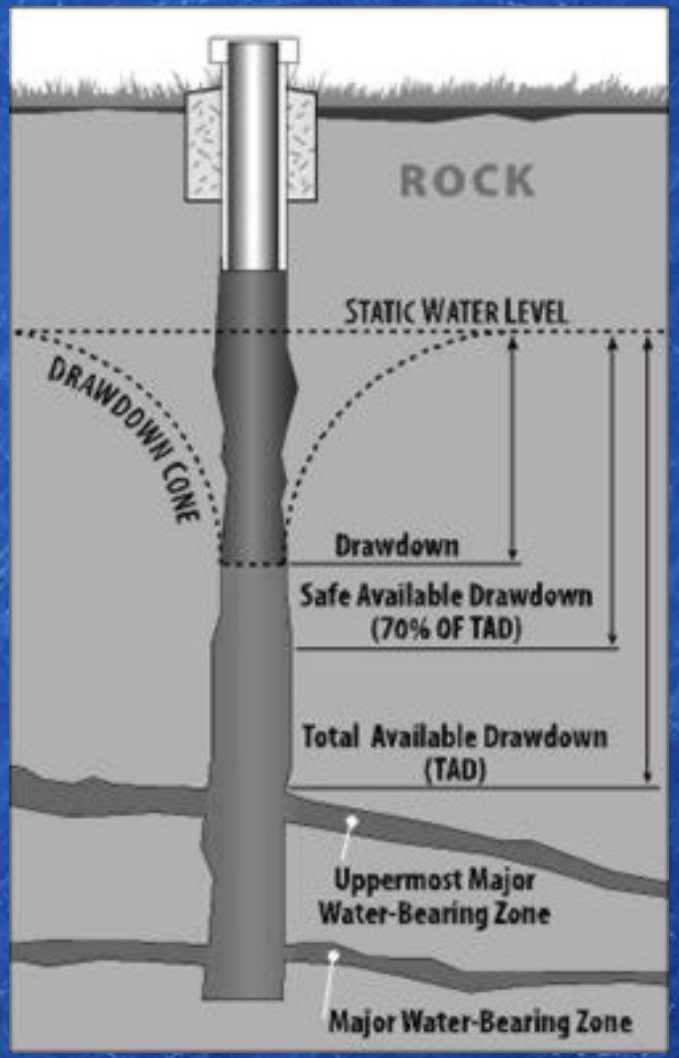


Well Types: Drilled (unconsolidated-sand and gravel)



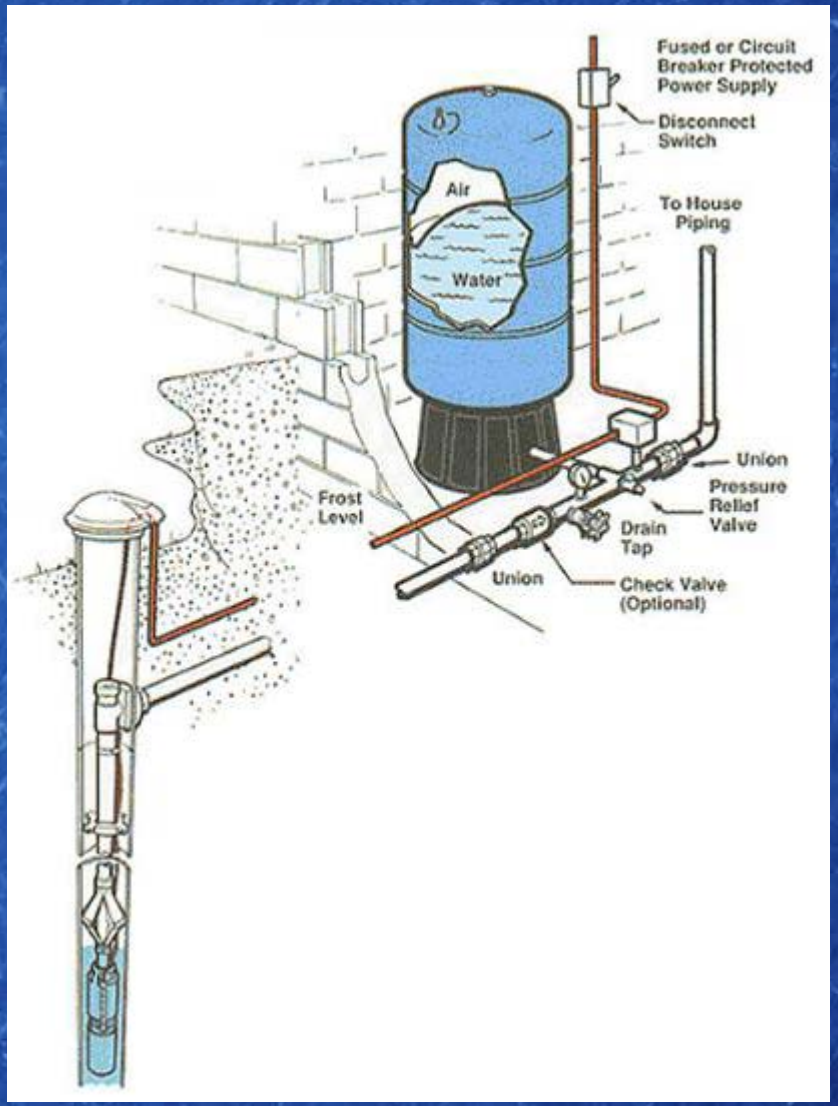
Well Types: Drilled (Bedrock)

- Usually 6 inches in diameter for domestic wells.
- Bedrock – deeper wells.
- Unconsolidated – depths can vary.



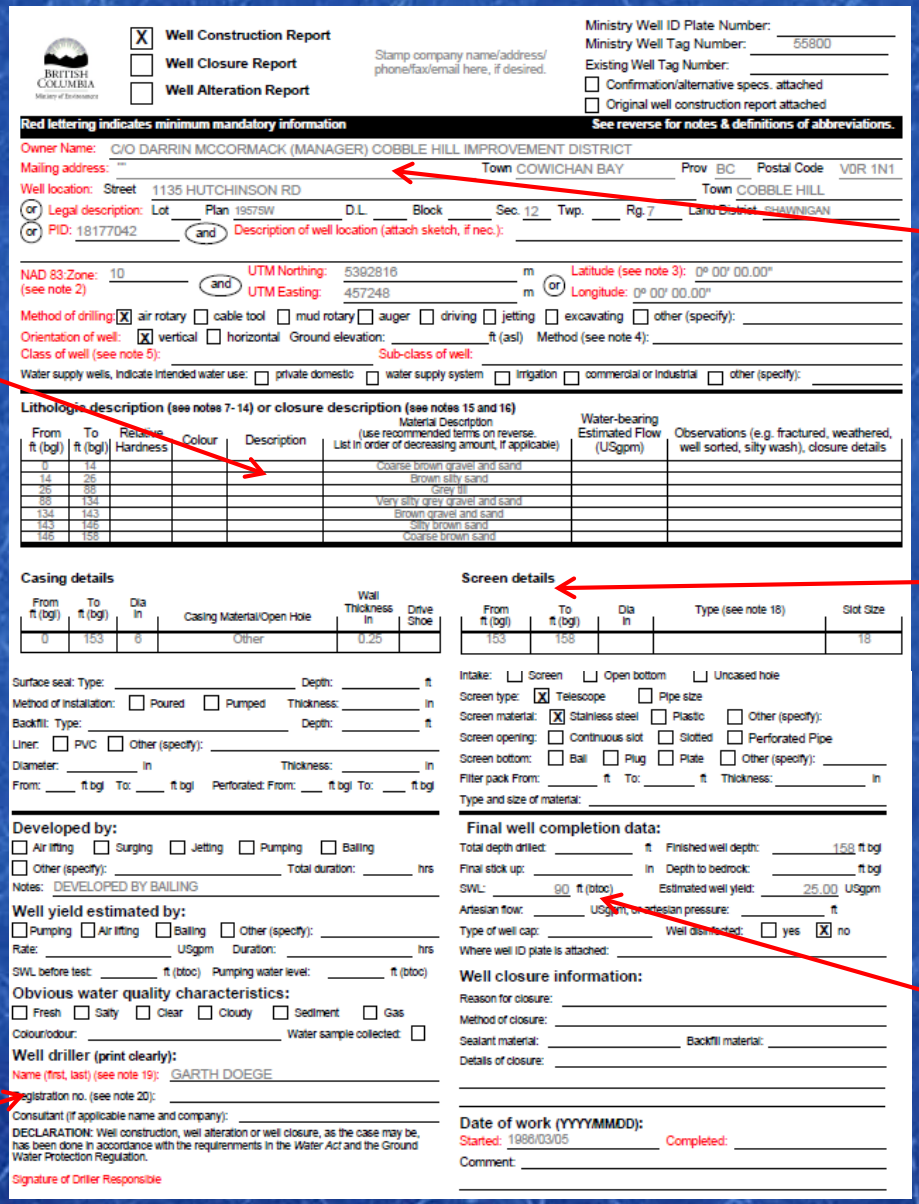
Other Components of a Well System - Pressure Tank

- Pressure tanks are used to stabilize the pressure in the distribution lines when the taps are turned on.
- The pressure switch tells the pump when to turn on.
- The check is used to prevent water flowing back into the well.



Driller's Well Construction Report

To The lithology tells us what formations the well is drilled through, e.g. at least 80 feet of aquitard.



[X] Well Construction Report
[ ] Well Closure Report
[ ] Well Alteration Report

Stamp company name/address/ phone/fax/email here, if desired.

Ministry Well ID Plate Number:
Ministry Well Tag Number: 55800
Existing Well Tag Number:
[ ] Confirmation/alternative specs. attached
[ ] Original well construction report attached

Red lettering indicates minimum mandatory information — **See reverse for notes & definitions of abbreviations.**

Owner Name: C/O DARRIN MCCORMACK (MANAGER) COBBLE HILL IMPROVEMENT DISTRICT
Mailing address: " Town COWICHAN BAY Prov BC Postal Code V0R 1N1
Well location: Street 1135 HUTCHINSON RD Town COBBLE HILL
(or) Legal description: Lot Plan 19575W D.L. Block Sec. 12 Twp. Rg. 7 Land District SHAWNIGAN
(or) PID: 18177042 (and) Description of well location (attach sketch, if nec.):

NAD 83: Zone: 10 (see note 2) (and) UTM Northing: 5392816 m UTM Easting: 457248 m (or) Latitude (see note 3): 0° 00' 00.00" Longitude: 0° 00' 00.00"

Method of drilling: [X] air rotary [ ] cable tool [ ] mud rotary [ ] auger [ ] driving [ ] jetting [ ] excavating [ ] other (specify):
Orientation of well: [X] vertical [ ] horizontal Ground elevation: ft (asl) Method (see note 4):
Class of well (see note 5): Sub-class of well:
Water supply wells, indicate intended water use: [ ] private domestic [ ] water supply system [ ] irrigation [ ] commercial or industrial [ ] other (specify):

Lithologic description (see notes 7- 14) or closure description (see notes 15 and 16)

From ft (bgl)	To ft (bgl)	Relative Hardness	Colour	Description	Material Description (use recommended terms on reverse. List in order of decreasing amount, if applicable)	Water-bearing Estimated Flow (USgpm)	Observations (e.g. fractured, weathered, well sorted, silty wash), closure details
0	14				Coarse brown gravel and sand		
14	26				Brown silty sand		
26	88				Grey till		
88	134				Very silty grey gravel and sand		
134	143				Brown gravel and sand		
143	146				Silty brown sand		
146	158				Coarse brown sand		

Casing details

From ft (bgl)	To ft (bgl)	Dia in	Casing Material/Open Hole	Wall Thickness in	Drive Shoe
0	153	6	Other	0.25	

Screen details

From ft (bgl)	To ft (bgl)	Dia in	Type (see note 18)	Slot Size
153	158			18

Surface seal: Type: Depth: ft
Method of installation: [ ] Poured [ ] Pumped Thickness: in
Backfill: Type: Depth: ft
Liner: [ ] PVC [ ] Other (specify):
Diameter: in Thickness: in
From: ft bgl To: ft bgl Perforated: From: ft bgl To: ft bgl

Intake: [ ] Screen [ ] Open bottom [ ] Uncased hole
Screen type: [X] Telescope [ ] Pipe size
Screen material: [X] Stainless steel [ ] Plastic [ ] Other (specify):
Screen opening: [ ] Continuous slot [ ] Slotted [ ] Perforated Pipe
Screen bottom: [ ] Ball [ ] Plug [ ] Plate [ ] Other (specify):
Filter pack From: ft To: ft Thickness: in
Type and size of material:

Developed by:
[ ] Air lifting [ ] Surging [ ] Jetting [ ] Pumping [ ] Bailing
[ ] Other (specify): Total duration: hrs
Notes: DEVELOPED BY BAILING

Well yield estimated by:
[ ] Pumping [ ] Air lifting [ ] Bailing [ ] Other (specify):
Rate: USgpm Duration: hrs
SWL before test: ft (btoc) Pumping water level: ft (btoc)

Obvious water quality characteristics:
[ ] Fresh [ ] Salty [ ] Clear [ ] Cloudy [ ] Sediment [ ] Gas
Colour/odour: Water sample collected: [ ]

Well driller (print clearly):
Name (first, last) (see note 19): GARTH DOEGE
Registration no. (see note 20):
Consultant (if applicable name and company):
DECLARATION: Well construction, well alteration or well closure, as the case may be, has been done in accordance with the requirements in the *Water Act* and the Ground Water Protection Regulation.
Signature of Driller Responsible

Final well completion data:
Total depth drilled: ft Finished well depth: 158 ft bgl
Final stick up: in Depth to bedrock: ft bgl
SWL: 90 ft (btoc) Estimated well yield: 25.00 USgpm
Artesian flow: USgpm Artesian pressure: ft
Type of well cap: Well disinfected: [ ] yes [X] no
Where well ID plate is attached:

Well closure information:
Reason for closure:
Method of closure:
Sealant material: Backfill material:
Details of closure:

Date of work (YYYY/MM/DD):
Started: 1986/03/05 Completed:
Comment:

Owner and well location information

Screen information tells us where the well is sourcing its water.

Static water level and estimated well yield

Driller information

Common Well Problems

Water Well Problems

Common well problems include:

- Water quality problems:
  - Changes in water quality through:
    - Biofouling.
    - Mineral Incrustation.
    - Sediment Plugging.
    - Well casing failure.
- Water quantity problems such as reduction in yield due to sediment plugging.
- Over-pumping can compound these problems.

Biofouling – *What Is It ?*

- Nuisance bacteria that accumulate in a well.
  - Iron-related bacteria (IRB).
  - Sulphate-reducing bacteria (SRB).
  - Other slime forming bacteria.
- Pumping a well increases nutrients and oxygen leading to an increase in production of slime in groundwater susceptible to bacteria conditions.

Biofouling - *Symptoms*

- Slime build-up on plumbing fixtures.
- Changes in water quality such as:
  - Water discolouration.
  - Staining of plumbing fixtures and laundry.
  - Bad taste and odour (rotten egg smell).
- Gradual decrease in yield.
- Increased corrosion of metal parts in your well and distribution system.

Biofouling – *What You Can Do*

- Regularly test your well for bacteria.
- If bacteria found, disinfect your well.
- Contact a Qualified Well Driller or Qualified Well Pump Installer to clean the well before disinfecting, if needed.

Well screen before

Well screen after

Mineral Incrustation/Scale – *What Is It ?*

- Dissolved minerals (calcium, magnesium, iron) precipitate and plug the well intake.
- Common occurrence in hard water supplies.

Mineral Incrustation/Scale – Symptoms.

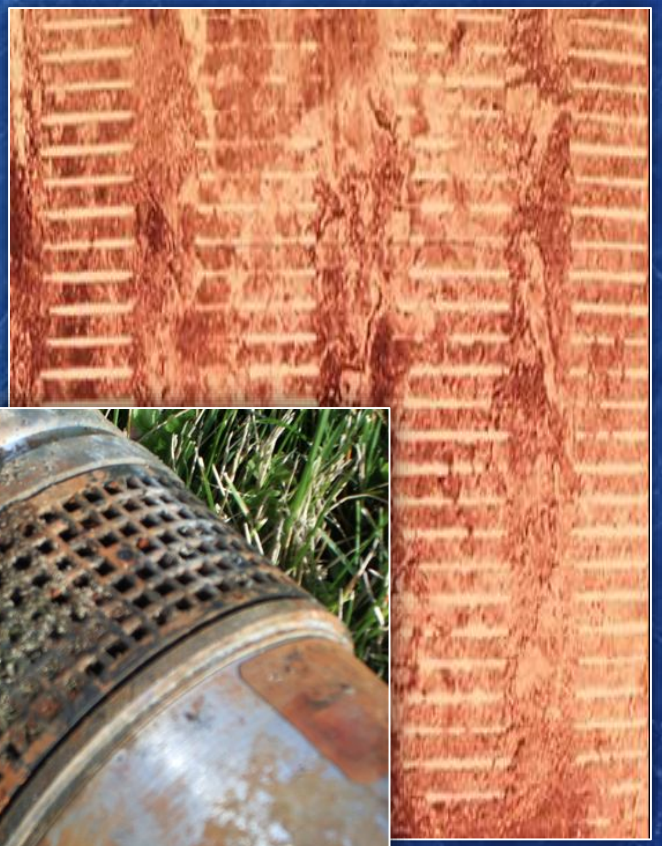
- Build up of mineral incrustation/scale in your well and on plumbing fixtures
- Gradual decrease in yield

Mineral Incrustation/Scale – *What You Can Do*

- Perform chemical analysis to determine risk.
- Reduce pumping rate.
- May need to have well cleaned by a Qualified Well Driller or Qualified Well Pump Installer.

Sediment Plugging – *What Is It ?*

- Sediment plugs well screen and surrounding aquifer.
- Accelerated by:
  - Poor well design and construction.
  - Inadequate development.
  - Over-pumping.



Sediment Plugging - *Symptoms*

- Increased sediment in water.
- Decrease in yield:
  - Well won't provide the amount of water you're used to.
  - Static water level remains unchanged but pumping water level declines.

Sediment Plugging – *What You Can Do*

Existing wells:

- Reduce pumping rate.
- Provide storage.
- Have a professional evaluation of your well

New wells:

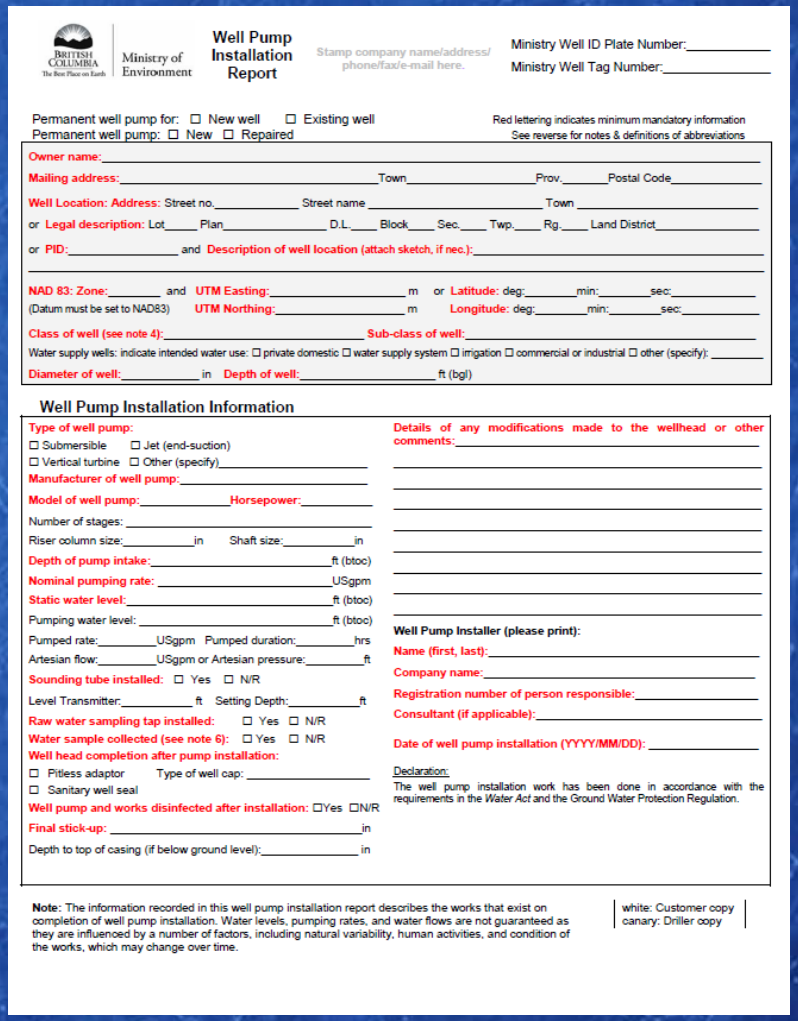
- Talk to a Qualified Well Driller or Qualified Well Pump Installer about proper design and development of your well.
- Have your well system designed to meet your needs based on the capability of the well.

Water Quantity Problems

- Under the *Water Act*, groundwater use currently not licenced in BC.
- Potential water quantity issues:
  - Over-pumping.
  - Uncontrolled flowing artesian wells.
  - Aquifer overuse or depletion.
  - Interference between adjacent well users.
  - Low well yields e.g. bedrock aquifers.
  - Seasonal water shortages .

Over-pumping

- **Do not over-pump your well!**
- Check your well pump installation report for:
  - Recommended pump intake depth.
  - Recommended pumping rate.
- Could eventually cause well failure.



BRITISH COLUMBIA The Best Place on Earth | Ministry of Environment

Well Pump Installation Report

Stamp company name/address/ phone/fax/e-mail here.

Ministry Well ID Plate Number:_____
Ministry Well Tag Number:_____

Permanent well pump for: ☐ New well ☐ Existing well
Permanent well pump: ☐ New ☐ Repaired

Red lettering indicates minimum mandatory information
See reverse for notes & definitions of abbreviations

Owner name:_____

Mailing address:_____Town_____Prov._____Postal Code_____

Well Location: Address: Street no._____ Street name _____ Town _____

or Legal description: Lot_____ Plan_____ D.L.____ Block____ Sec.____ Twp.____ Rg.____ Land District_____

or PID:_____ and Description of well location (attach sketch, if nec.):_____

NAD 83: Zone:_____ and UTM Easting:_____ m or Latitude: deg:_____min:_____sec:_____
(Datum must be set to NAD83) UTM Northing:_____ m Longitude: deg:_____min:_____sec:_____

Class of well (see note 4):_____ Sub-class of well:_____

Water supply wells: indicate intended water use: ☐ private domestic ☐ water supply system ☐ irrigation ☐ commercial or industrial ☐ other (specify): _____

Diameter of well:_____ in Depth of well:_____ ft (bgl)

Well Pump Installation Information

Type of well pump:
☐ Submersible ☐ Jet (end-suction)
☐ Vertical turbine ☐ Other (specify)_____
Manufacturer of well pump:_____
Model of well pump:_____Horsepower:_____
Number of stages: _____
Riser column size:_____in Shaft size:_____in
Depth of pump intake:_____ft (btoc)
Nominal pumping rate: _____USgpm
Static water level:_____ft (btoc)
Pumping water level: _____ft (btoc)
Pumped rate:_____USgpm Pumped duration:_____hrs
Artesian flow:_____USgpm or Artesian pressure:_____ft
Sounding tube installed: ☐ Yes ☐ N/R
Level Transmitter:_____ft Setting Depth:_____ft
Raw water sampling tap installed: ☐ Yes ☐ N/R
Water sample collected (see note 6): ☐ Yes ☐ N/R
Well head completion after pump installation:
☐ Pitless adaptor Type of well cap: _____
☐ Sanitary well seal
Well pump and works disinfected after installation: ☐Yes ☐N/R
Final stick-up: _____in
Depth to top of casing (if below ground level):_____in

Details of any modifications made to the wellhead or other comments:_____

Well Pump Installer (please print):
Name (first, last):_____
Company name:_____
Registration number of person responsible:_____
Consultant (if applicable):_____
Date of well pump installation (YYYY/MM/DD): _____

Declaration:
The well pump installation work has been done in accordance with the requirements in the *Water Act* and the Ground Water Protection Regulation.

Note: The information recorded in this well pump installation report describes the works that exist on completion of well pump installation. Water levels, pumping rates, and water flows are not guaranteed as they are influenced by a number of factors, including natural variability, human activities, and condition of the works, which may change over time.

white: Customer copy
canary: Driller copy

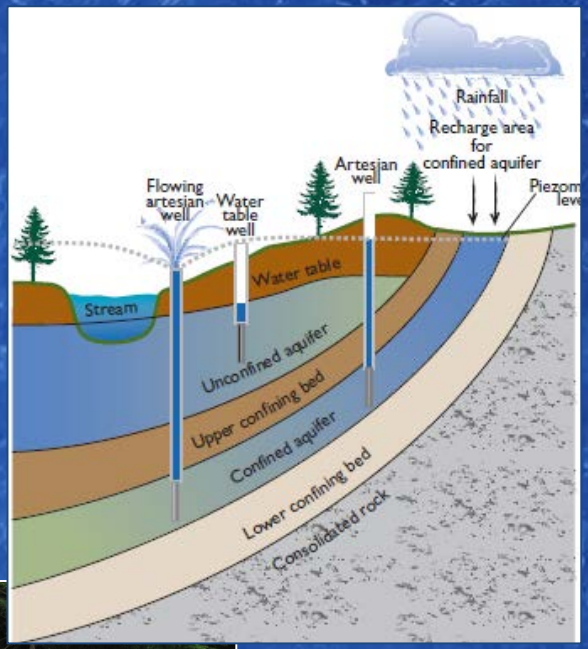
Overpumping – *What You Can Do*

- Operate the well at the recommended pumping rate.
- Size pump properly to match well capability.
- **DO NOT** place pump inside intake portion of well (e.g., well screen) or below the major water bearing fracture.
- Conserve water.
- Install flow control device and additional storage, if needed.

Flowing Artesian Wells

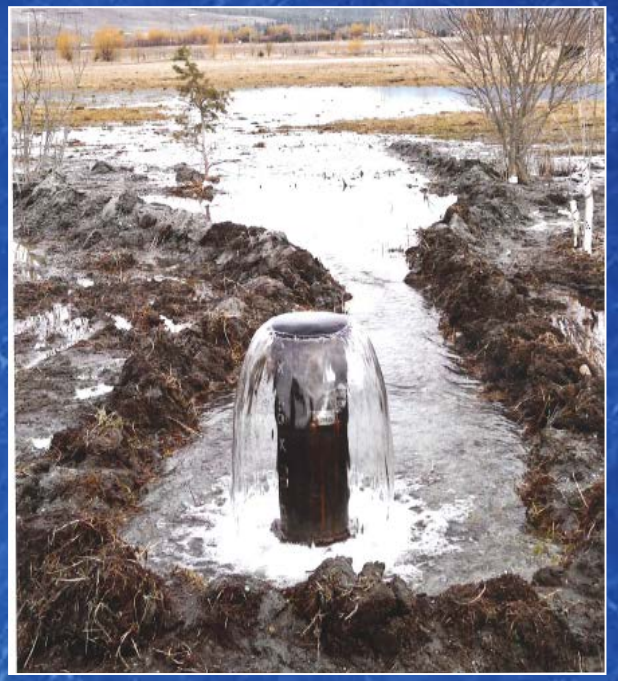
An uncontrolled flowing well:

- Wastes lots of water.
- May lower the confining pressure and affect neighbouring wells and nearby streams and springs.
- May cause flooding damage and/or subsidence.



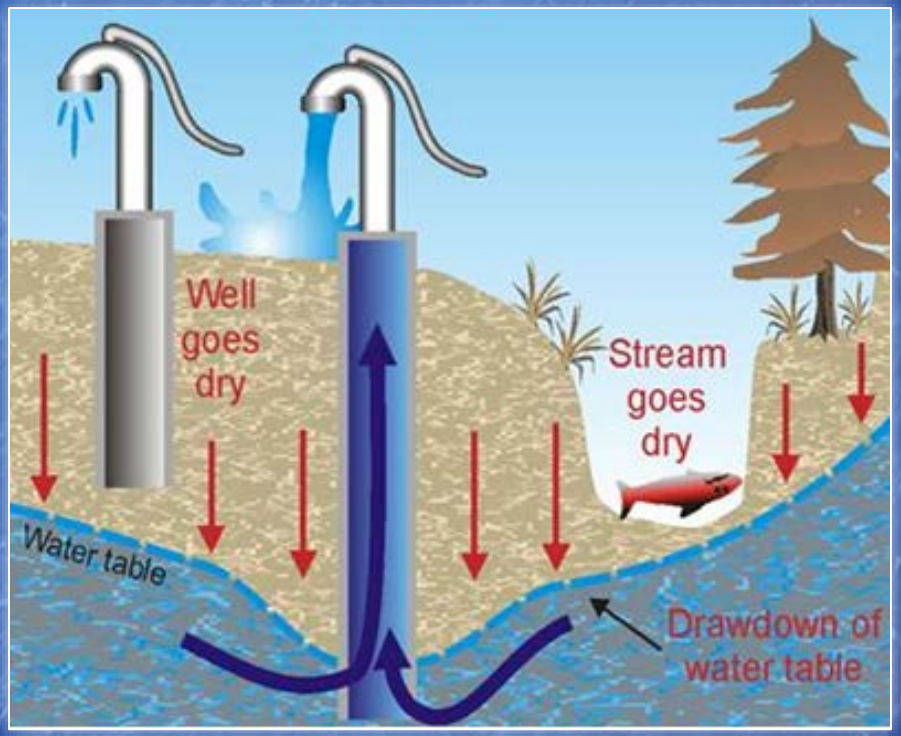
Flowing Artesian Wells – *What You Can Do*

- It is the well owner's (or land owner's) legal responsibility to stop and control the flow.
- New wells – talk to the driller and make sure stopping and controlling the flow is part of the contract before beginning drilling, if in an area of known flowing artesian conditions.
- Existing wells – hire a qualified well driller or qualified professional to stop and control the flow.



Aquifer Depletion

- Drop in local or region water levels due to overuse or drought or flowing artesian wells.
- Lowering of static water levels over time.
- Drop in well yield is not always due to aquifer depletion.



Aquifer Depletion – *What You Can Do*

- Everyone contributes to aquifer depletion so conserve water!
- Close or control flowing wells.
- May need to drill a replacement well into another deeper aquifer, if another aquifer is present and if preventative measures were not successful.
- Expand provincial observation well network.

Provincial observation well at Meyer's Flat

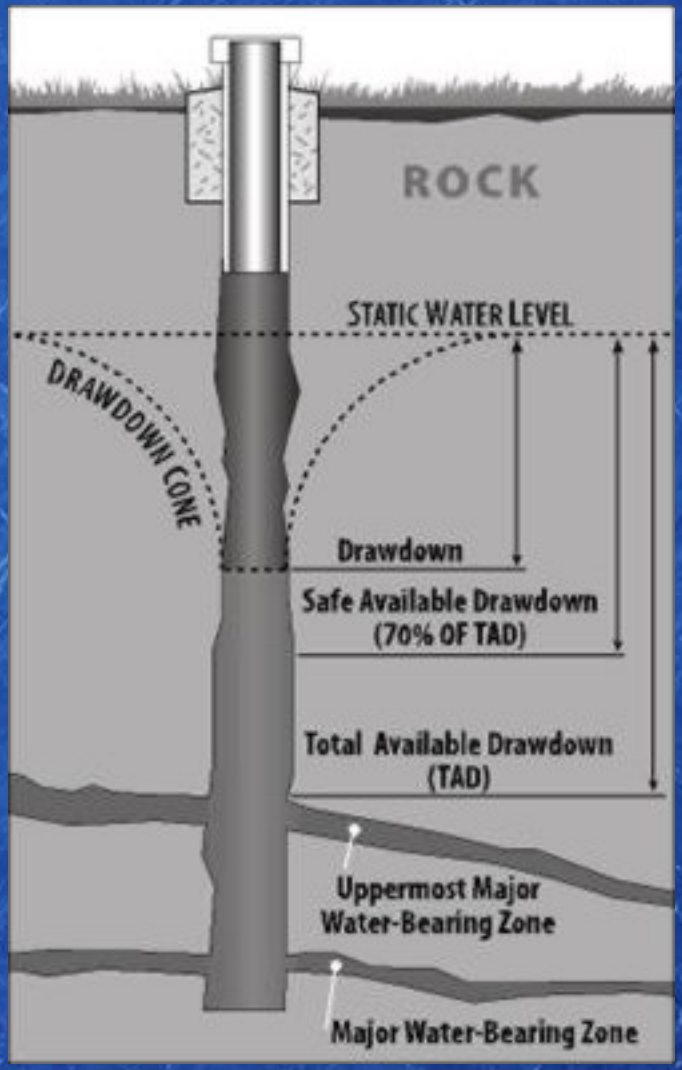
Interference Between Adjacent Well Owners

- Well interference occurs when large capacity wells lower water levels and yields of neighbouring wells, (e.g. Surrey, Mill Bay, Saanich).
- For example if two wells are sited close to one another or are drawing water from the same distinct fracture zone or aquifer formation.
- At present, due to no regulations around the extraction of groundwater, litigation is a well owner's last option to address this issue.
- Well interference can also occur when water levels are low (e.g., during the summer) and where micro-fractures go dry or dewater.

Groundwater protection group in Spallumcheen

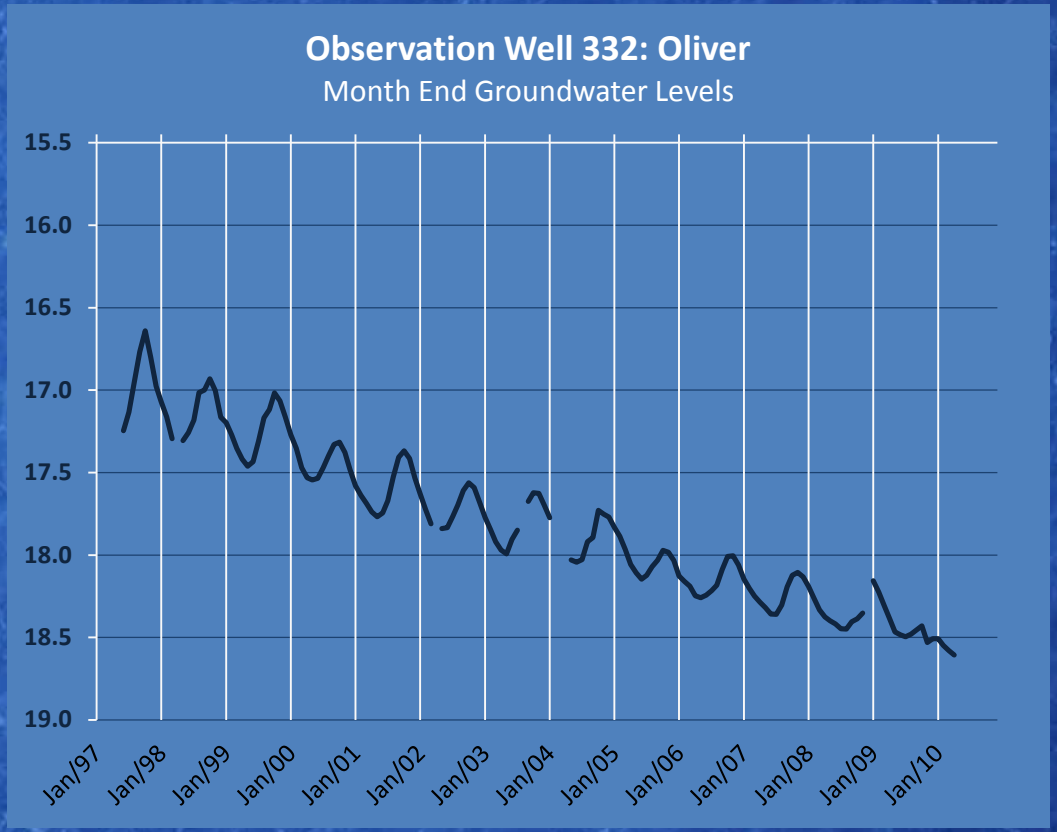
Low Yielding Wells

- Wells constructed in bedrock aquifers may have very low yields because of the nature of the material or if few fractures are intercepted by the well
- Care must be taken not to draw the water down below the major water bearing fractures.
- If no major water-bearing fractures are present, set the pump in the lower portion of the micro-fracture formation.



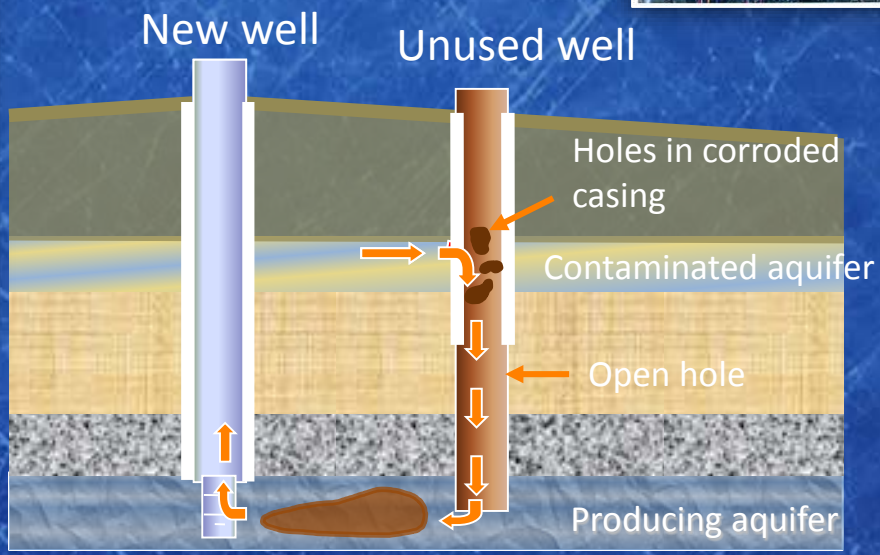
Seasonal Water Shortages

- Occur in areas where there is a long period with no rain or recharge, such as on the Gulf Islands or in the Okanagan region.
- In some areas, observation wells are showing more water is being taken from the aquifer than is coming in from rainfall and precipitation.



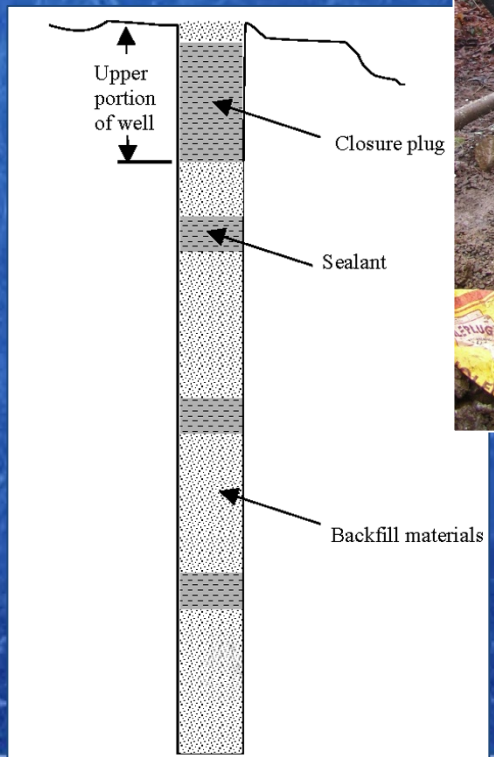
Water Quality Enemies

Old, Abandoned Wells



Abandoned Wells – *What You Can Do*

- Hire a Qualified Well Driller or Qualified Well Pump Installer to properly close all unused wells.
- If an unused well is planned for future use, make sure it has a proper cap or cover.
- Well is permanently closed by back-filling well bore with combination of fill and sealant materials.



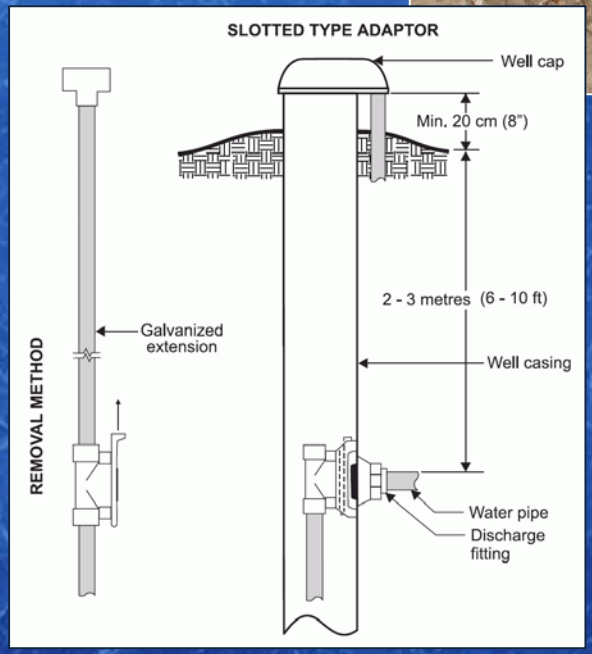
Wells in Pits

Problems with wells in pits:

- Confined space can accumulate dangerous gases and present a hazard to workers or home owners.
- Pit wells are often flooded –surface water can transport nasty things into the well.
- Rodents, frogs and bugs can fall into the pit and into the well.

Wells in Pits – *What You Can Do*

Hire a qualified well driller with confined space entry certification to remove well pit cribbing and extend the casing above ground level.



Pitless Adapter Setup

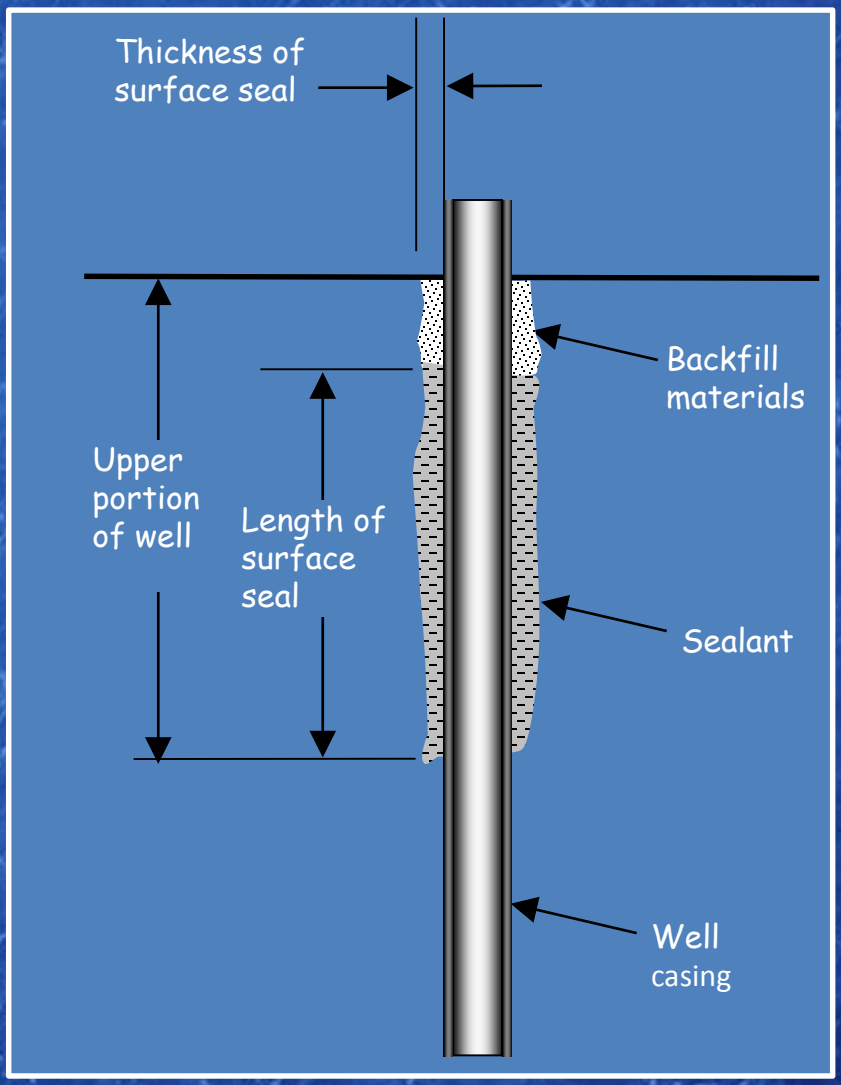
Hire a qualified well pump installer with confined space entry certification to install a pitless adapter below the frost line to protect water lines from freezing.

Missing or Inadequate Surface Seal

- Seal prevents contaminants from entering the well along the outside of the casing.
- All new domestic wells require a surface seal .
- Owner of a new well with a surface seal must ensure integrity of the seal is maintained.

Surface Seals – *What You Can Do*

Contact your qualified well driller or qualified well pump installer about options for establishing or re-establishing the surface seal.



Inadequate Well Cap

Inadequate Well Cap – *What You Can Do*

Install a secure well cap

Locking cap

Cap with space for wiring
(pitless adapter style set-up)

Sanitary seal

Concrete lid on dug well

Poor Siting and Wellhead Protection

- Top of casing at or below ground surface.
- Ponding around wellhead.
- Well located on lower elevation than potential contamination sources.
- Well not accessible for inspection, maintenance, testing or repair.

Poor Siting and Wellhead Protection - *What You Can Do*

- Ensure wells are not located in low lying areas when siting new wells. If possible relocate existing wells.
- Make sure the land surface surrounding the well is mounded and sloped away from the well casing.
- Keep or extend top of casing at least 1 foot above ground level.
- Maintain proper setbacks from potential sources of contamination.

Regulatory Setbacks* from Potential Sources of Contamination

20 ft → Nearest building or private dwelling

100 ft → Any probable source of contamination

400 ft → Cemetery or dumping ground

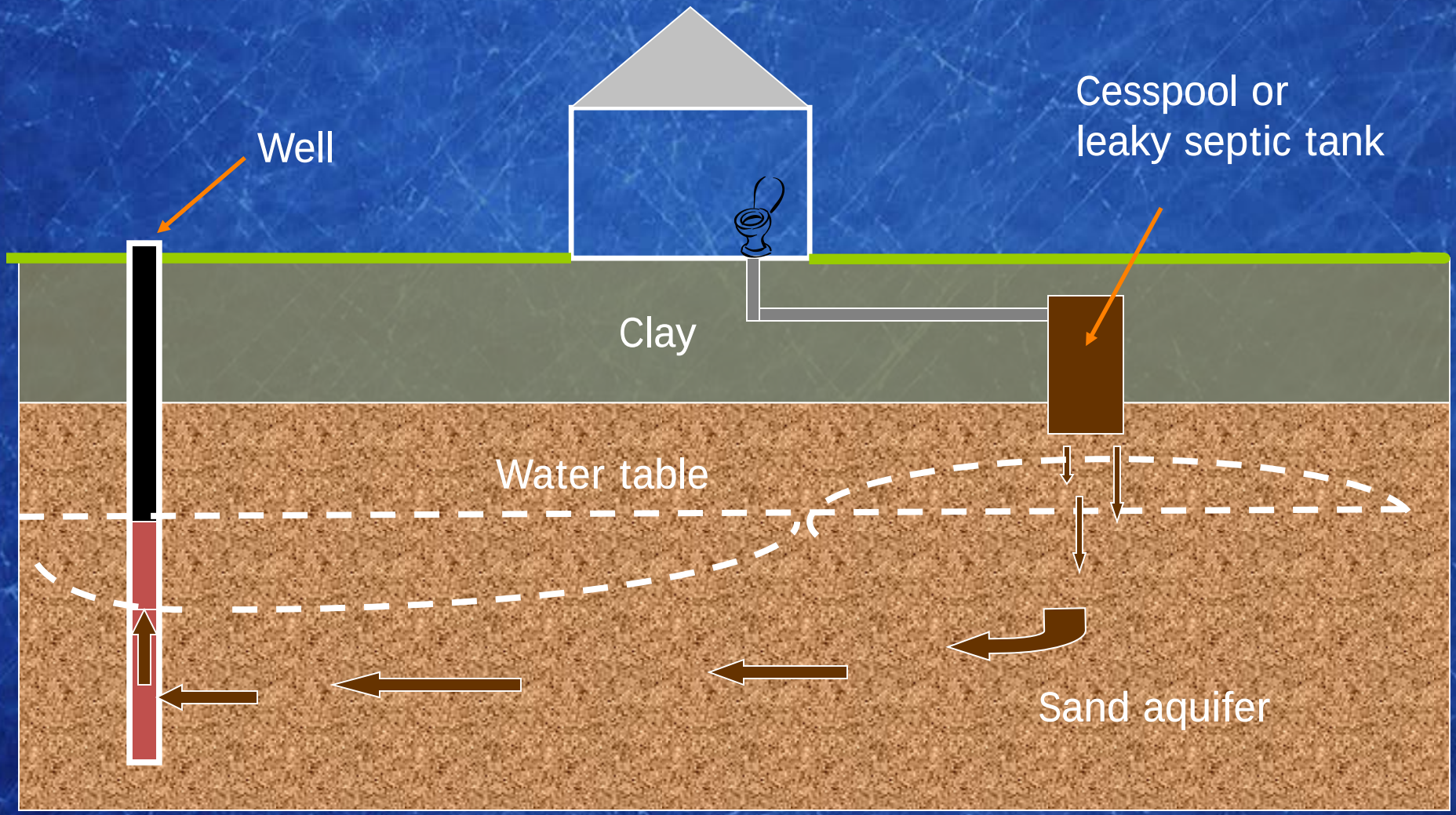
**Note: these are minimum setbacks, the distance can be greater.*

Septic Systems - Improper Maintenance or Location

Improper maintenance or location can result in:

- Premature malfunction of the system.
- Create a health hazard.
- Contaminate your groundwater and/or surface water.

Poor Septic Systems



Poor Septic Systems – ***What You Can Do***

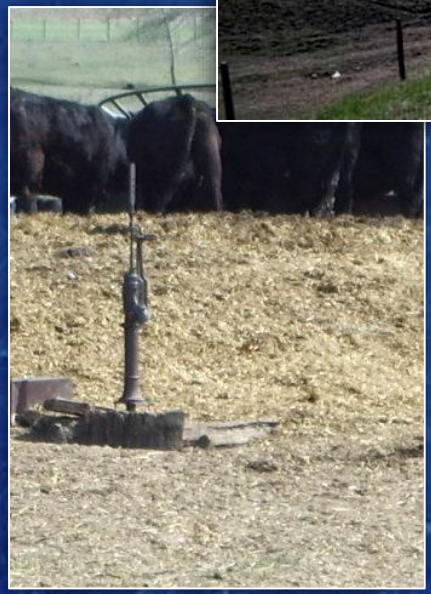
- Your well should be located:
  - at least 15 meters away from your septic tank.
  - 30 meters away from the drain field.
- Properly site and construct your sewage system.
- Note down the location of your well in relation to your septic system.
- Hire an Authorized Person to maintain the sewage system.

Hazardous Material Storage

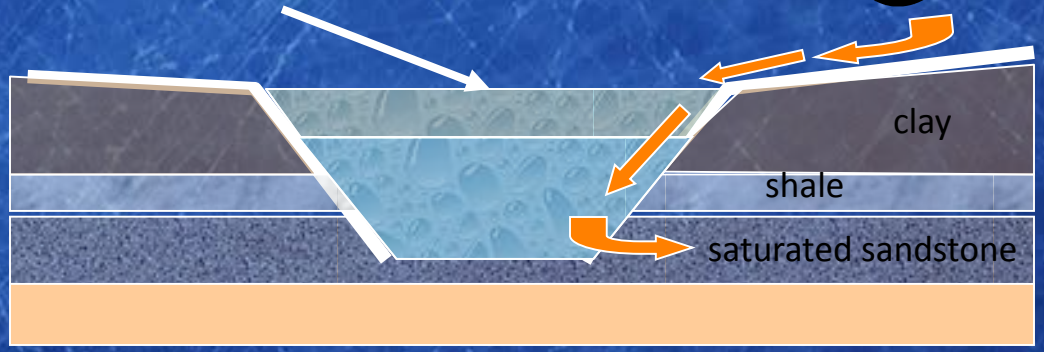
Storage – *What You Can Do*

- DO NOT use the pump house for storage of hazardous materials (fuels, solvents, pesticides).
- Keep well head free of debris and clutter.
- Control/eliminate vermin (rodents, insects) in and around well head and in pump house.

Poor Manure Management and Groundwater Fed Dugouts



Run-off supercharges the dugout



What You Can Do

- Adopt best management practices for manure handling.
- Provide off-site watering.
- Protect groundwater fed dugouts.
- In BC there is a regulation for proper manure management – manure piles should be at least 15 meters from a watercourse and 30 meters from a drinking water well.

Water Quality and Disinfection

Water Quality

- Most well owners drink untreated groundwater.
- Wells can contain naturally occurring harmful minerals, or become contaminated with harmful *chemicals or pathogens.*
- Some water quality parameters can't been seen or smelled such as toxic metals (e.g. arsenic, lead, chromium) – need to test for these.

Potential Contaminants

Fecal matter

- **Bacteria**
  - e.g. , *E. Coli, Salmonella, etc.*
- **Viruses**
  - *e.g., Norovirus*
- **Parasites**
  - *e.g., Giardia (beaver fever), Cryptosporidum*

Human activities

- **Chemicals**
  - *e.g., Nitrates, pesticides, hydrocarbons*

Minerals

- **Naturally Occurring Minerals**
  - *e.g., Iron and/or manganese, hardness (calcium & magnesium), boron, fluoride, sodium, sulphate, chloride, arsenic, or other metals*

Water Quality – Check List

Observation	Possible indicator of
Gastroenteritis – acute diarrhoea and vomiting	Presence of bacteria (e.g., E. Coli) in the well
Rotten egg smell to the water	Hydrogen sulphide produced by natural bacteria
Gasoline smell, gas bubbles in water	Presence of hydrocarbons (natural or contaminant source)
Scaling on fixtures and around faucets	Hardness (high calcium & magnesium)
Salty taste	High TDS or salt water intrusion
Red/brown staining of fixtures and toilets	Elevated iron and/or manganese

When to Test?

Bacteria:

- 1 time per year.
- After any major plumbing work or work done on well or well pump.
- After you move into a new home.
- When you detect any changes in your water quality. eg: Clarity, Colour, Odour, Taste.
- When a new child is brought into the home.

Chemicals & other Parameters*:

- Test every 3 – 5 years.
- Test during a dry period.

**Note: If there is a treatment system in place the well should be monitored every 2 years for chemicals of concern.*

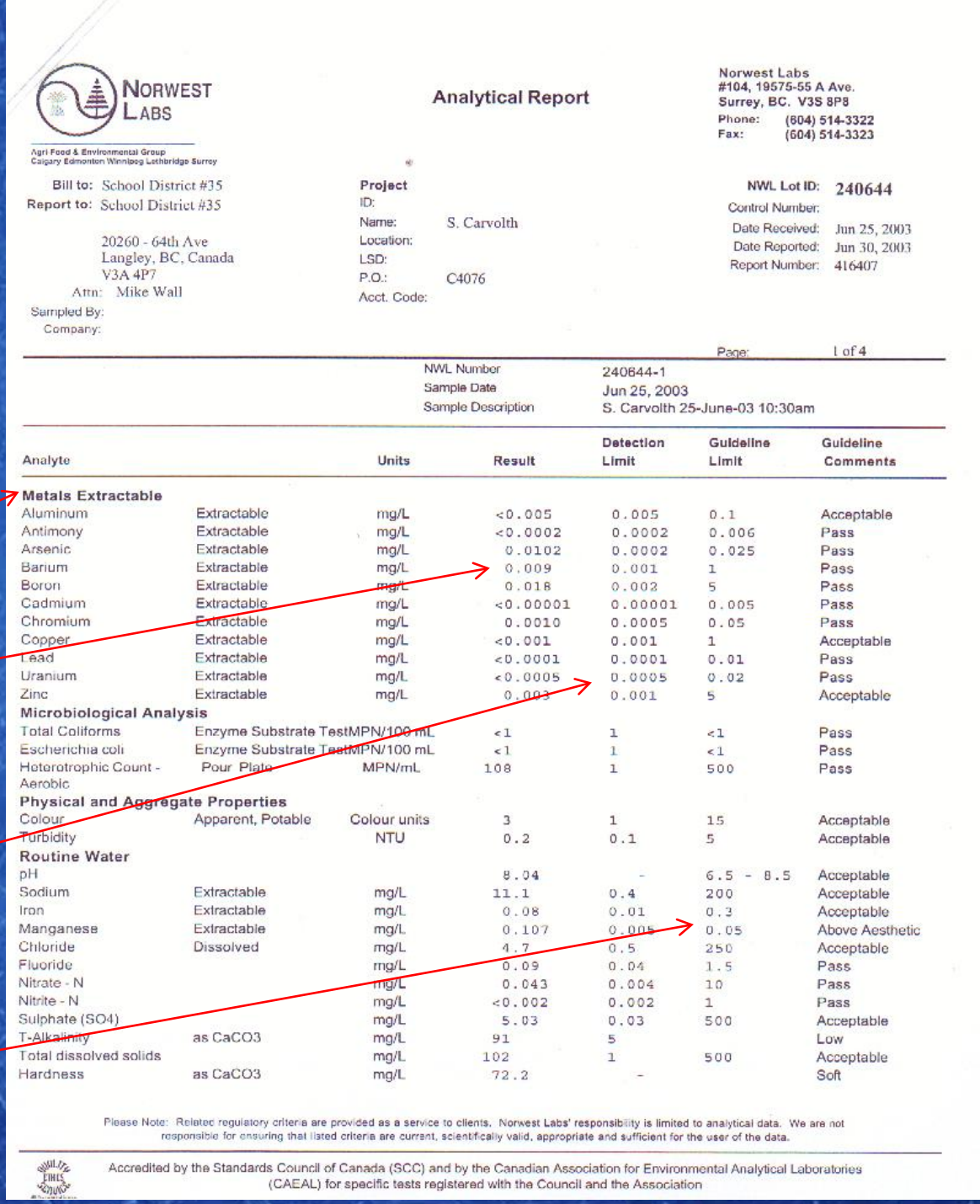
Example of a water quality report from a lab

Parameters analyzed

Results

Method detection limits

Guidelines for Canadian drinking water quality



NORWEST LABS

Agri Food & Environmental Group
Calgary Edmonton Winnipeg Lethbridge Surrey

Analytical Report

Norwest Labs
#104, 19575-55 A Ave.
Surrey, BC. V3S 8P8
Phone: (604) 514-3322
Fax: (604) 514-3323

Bill to: School District #35
Report to: School District #35

20260 - 64th Ave
Langley, BC, Canada
V3A 4P7
Attn: Mike Wall

Sampled By:
Company:

Project ID:
Name: S. Carvolth
Location:
LSD:
P.O.: C4076
Acct. Code:

NWL Lot ID: 240644
Control Number:
Date Received: Jun 25, 2003
Date Reported: Jun 30, 2003
Report Number: 416407

NWL Number 240844-1
Sample Date Jun 25, 2003
Sample Description S. Carvolth 25-June-03 10:30am

Analyte		Units	Result	Detection Limit	Guideline Limit	Guideline Comments
Metals Extractable						
Aluminum	Extractable	mg/L	<0.005	0.005	0.1	Acceptable
Antimony	Extractable	mg/L	<0.0002	0.0002	0.006	Pass
Arsenic	Extractable	mg/L	0.0102	0.0002	0.025	Pass
Barium	Extractable	mg/L	0.009	0.001	1	Pass
Boron	Extractable	mg/L	0.018	0.002	5	Pass
Cadmium	Extractable	mg/L	<0.00001	0.00001	0.005	Pass
Chromium	Extractable	mg/L	0.0010	0.0005	0.05	Pass
Copper	Extractable	mg/L	<0.001	0.001	1	Acceptable
Lead	Extractable	mg/L	<0.0001	0.0001	0.01	Pass
Uranium	Extractable	mg/L	<0.0005	0.0005	0.02	Pass
Zinc	Extractable	mg/L	0.003	0.001	5	Acceptable
Microbiological Analysis						
Total Coliforms	Enzyme Substrate Test	MPN/100 mL	<1	1	<1	Pass
Escherichia coli	Enzyme Substrate Test	MPN/100 mL	<1	1	<1	Pass
Heterotrophic Count - Aerobic	Pour Plate	MPN/mL	108	1	500	Pass
Physical and Aggregate Properties						
Colour	Apparent, Potable	Colour units	3	1	15	Acceptable
Turbidity		NTU	0.2	0.1	5	Acceptable
Routine Water						
pH			8.04	-	6.5 - 8.5	Acceptable
Sodium	Extractable	mg/L	11.1	0.4	200	Acceptable
Iron	Extractable	mg/L	0.08	0.01	0.3	Acceptable
Manganese	Extractable	mg/L	0.107	0.005	0.05	Above Aesthetic
Chloride	Dissolved	mg/L	4.7	0.5	250	Acceptable
Fluoride		mg/L	0.09	0.04	1.5	Pass
Nitrate - N		mg/L	0.043	0.004	10	Pass
Nitrite - N		mg/L	<0.002	0.002	1	Pass
Sulphate (SO4)		mg/L	5.03	0.03	500	Acceptable
T-Alkalinity	as CaCO3	mg/L	91	5		Low
Total dissolved solids		mg/L	102	1	500	Acceptable
Hardness	as CaCO3	mg/L	72.2	-		Soft

Please Note: Related regulatory criteria are provided as a service to clients. Norwest Labs' responsibility is limited to analytical data. We are not responsible for ensuring that listed criteria are current, scientifically valid, appropriate and sufficient for the user of the data.

Accredited by the Standards Council of Canada (SCC) and by the Canadian Association for Environmental Analytical Laboratories (CAEAL) for specific tests registered with the Council and the Association

Type of Treatment Systems

Reverse Osmosis

Chlorination

Ultraviolet Disinfection

When to Disinfect?

- Immediately after installing a new well.
- Whenever you repair or replace your well, pump, or distribution system.
- Following change in water clarity, colour, odour, or taste.
- When lab results show coliform bacteria or *E. Coli* in water.
- When slime is present in toilet tank.

Before disinfecting, inspect your well.

1. Are there any sources of potential contamination near your well?
2. Is your wellhead protected?
3. Does your well have a secure vermin proof cap?
4. Does the well casing stickup at least a foot from the ground?
5. Is there an unfilled space or gap between the well casing and the ground around the well?
6. Are there any cracks in the surface seal around the well casing?
7. Is the well finished below grade?

If you answered “yes” to any of the previous questions

- **Fix the problem(s) before disinfecting**

Estimated cost of well upgrades to protect the water quality

FIX	APPROX. COST
Well cap	$40 to $60 (approx. $100 or more for dug well)
Re-grade area around well head	$0 - $100
Increase height of stickup*	$100 - $300
Retrofit surface seal*	$500 to $1500
Close well*	$800 to $2000
New well*	$7,000 to $20,000

*Registered qualified well driller or qualified well pump installer required to do this work.

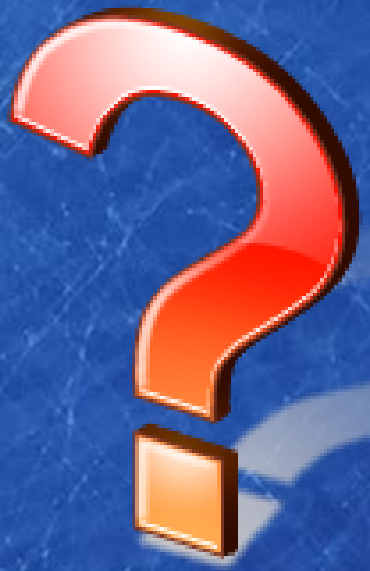
Take Home Messages

- Groundwater is shared by your family, your neighbors, and the environment;
- Regularly inspect your well and see if any upgrades or maintenance is required;
- Regularly test your water;
- Keep good records of water levels, water testing, chlorination, and repairs and maintenance, pumping test reports; and
- ALWAYS properly close unused wells.

Workshop Evaluation Form

- Tell us how we've done
- Please fill out the Workshop Evaluation Form

Questions ?



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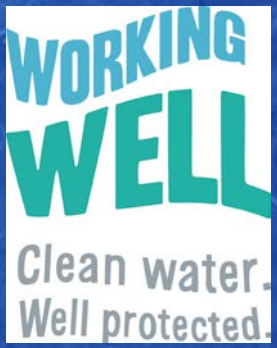

Panel Discussion