



Individual wells for First Nations

A guide for Environmental Health
Officers (**EHOs**) and Community-Based
Drinking Water Monitors (**CBWMs**)
(Bacteriological and chemical testing)



Introduction

Health Canada recognizes the importance of preventing contamination and monitoring the quality of drinking water for all First Nations water systems. To better assist First Nations residents who are served by wells with fewer than five connections¹, Health Canada has developed a policy that offers them:

- Public awareness materials to prevent contamination, including educational materials for visually inspecting and maintaining wells
- On-request bacteriological and chemical sampling and testing services

With the implementation of this new policy, Environmental Health Officers (EHOs) and Community-Based Drinking Water Quality Monitors (CBWMs) will play an important role in knowledge transfer and capacity building within their communities.

With this new policy, First Nations residents will be responsible for ensuring the quality and safety of their drinking water by visually inspecting and maintaining their wells and requesting, as needed, bacteriological and chemical testing of their well water.

In order to help EHOs and CBWMs build First Nations capacity to inspect wells, this guide provides detailed procedures for the inspection and maintenance of wells. It also provides information about bacteriological and chemical sampling and testing services available on request, free of charge.

¹ The target audience of the new policy is First Nations residents who are served by wells with fewer than five connections. For brevity, this has been shortened to “First Nations residents” or simply “residents.”

How a well supplies water

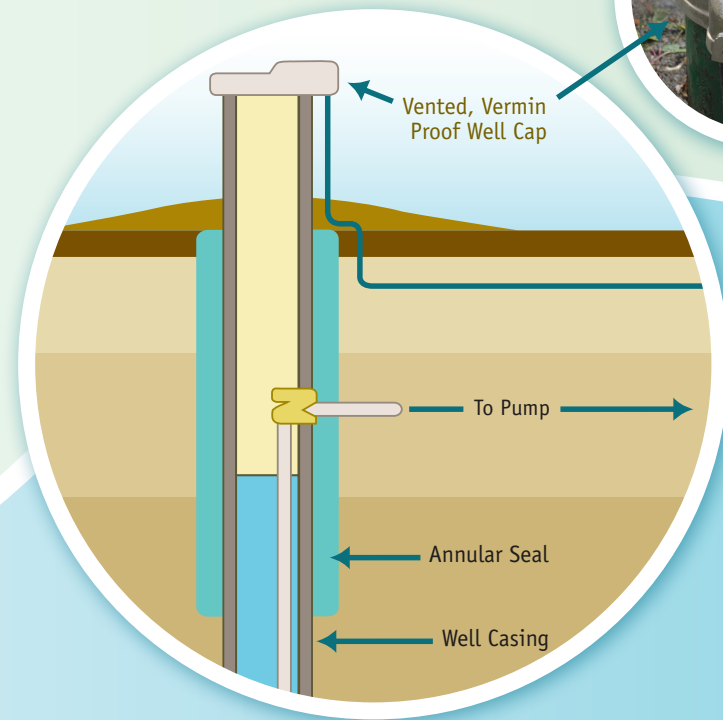
In shallow and deep wells, water is drawn directly from a groundwater source. Water lines run underground to the house.

The water lines connect to a reservoir—called a bladder tank or a pressure tank—which contains a large air-filled bladder.

When the water pump turns on, water is pumped into the pressure tank. The water then compresses the bladder. A pressure switch turns the pump off when the pressure reaches a preset maximum value.

When a faucet is opened, the pressure in the pressure tank forces water through the pipes to the faucet. When the pressure in the tank falls to a preset minimum value, the pump turns on and increases the pressure once again. This keeps the well pump from running continuously and burning out.

Key parts of a well



Types of wells

The most common types of wells in Canada are dug, bored, drilled, and sand point.

The water table depth and nature of soil are key factors that help determine the type of well to be built.

Shallow wells (like dug, bored wells and sand point) are usually less than 15 metres deep.

Deep wells (like drilled wells) are usually more than 15 metres.

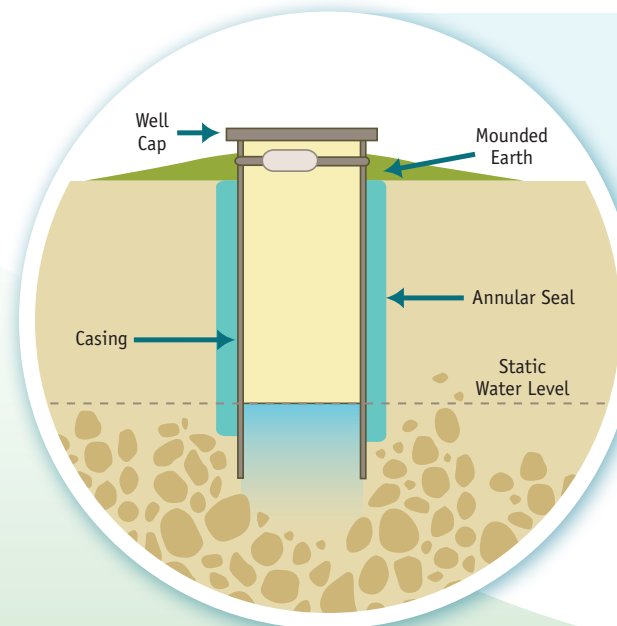
The following is an overview of each type of well.

Dug wells

Dug wells are dug by shovel or backhoe and are usually 3 to 9 metres deep. Dug wells are not very deep because it is difficult to dig below the groundwater table. These wells are lined (or “cased”) with watertight materials, such as stones, brick or tile, to keep them from collapsing. They are covered with a cap (preferably concrete and always above ground). They are grouted or sealed along the outside of the casing to the top of the well. The land around the well cap should be mounded so that surface water does not pool around the wellhead. The pump should be inside the home or in a separate pump house.

Bored wells

Bored wells are usually used where aquifers are both shallow and low-yielding. Bored wells range in depth from 9 to 15 metres and are larger in diameter than drilled wells. They store water so that it can be provided during periods of high demand.



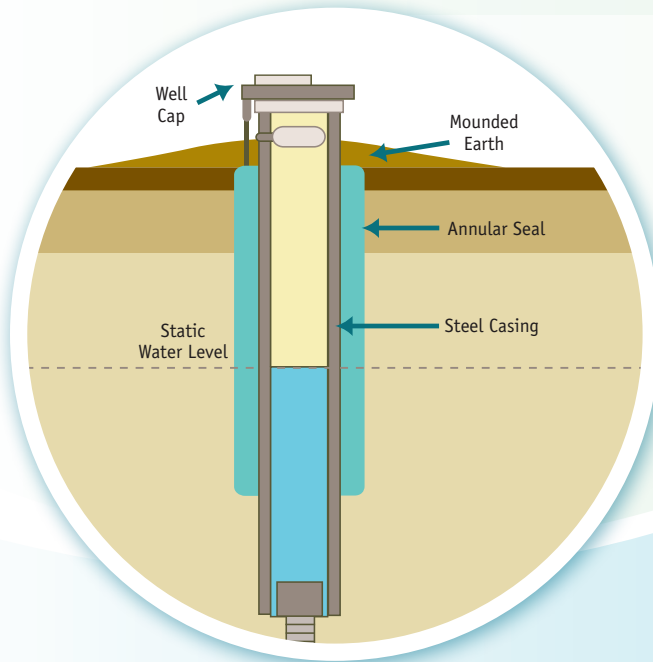
Dug or Bored Well

Diameter: 60 to 120 centimetres

Depth:
(Dug well) 3 to 9 metres
(Bored well) 9 to 15 metres

Drilled wells

Drilled wells are small-diameter wells that are about 30 to 120 metres in depth and must extend deep into the ground and bedrock. The casing must intersect cracks in the bedrock that contain groundwater. The casing should extend 30 to 60 centimetres above ground and the earth around the cap should be mounded to drain water away. The well is capped to prevent surface water from entering it.



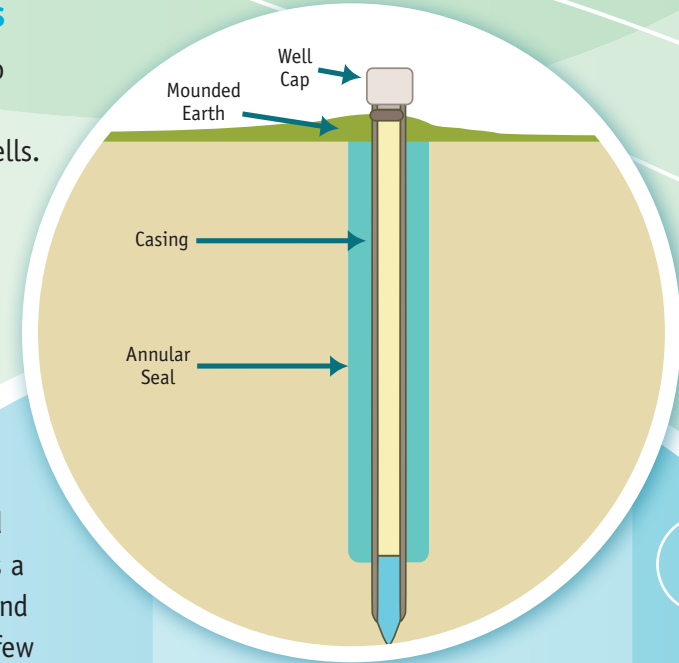
Drilled well

Diameter: 10 to 20 centimetres

Depth: more than 15 metres

Sand point wells

Sand point wells, also called “driven wells”, are small-diameter wells. They are constructed in sand and gravel aquifers and are either driven or jetted (inserted using high-pressure water) into the ground. Sand point wells are usually used where the aquifer has a shallow water table and the ground contains few or no stones. Threaded to the bottom of the string of pipe is a drive-point well screen. The screen allows groundwater to flow into the well while keeping the surrounding sand out. Water can then be pumped up through the pipe to the surface.



Sand Point Wells

Diameter: 2.5 to 5 centimetres

Depth: less than 3 metres

Well inspections

Introduction

Residents should inspect their wells at least once a year. Water should be tested two or three times a year for bacteriological parameters. A good time to do this is in the early spring after the snow melts. For chemical parameters, water should be tested at least once every five years.

This section will help identify the parts of the well that need to be inspected. It also identifies what residents should be looking for during an inspection.

During inspections, residents should carry a strong flashlight and an inspection log to record the date and any problem areas or necessary repairs.

Inspection log

It is very important for residents to keep a written log of their well inspections. As they complete each item on their inspection checklist, they should make a note of any signs of damage and necessary repairs. An inspection log can help provide EHOs and CBWMs with more accurate information on the state of wells.

If residents have concerns or have identified a problem after they have inspected their well, they are encouraged to contact an EHO or CBWM for assistance and/or advice.

How to inspect a well

Possible contaminants

It is important that all potential contaminants be kept as far away from the well as possible. The closer they are, the greater the risk. Contaminant sources that can affect the well are most often found in the backyard. It is recommended that residents pay special attention to:

- **Animal waste** (from livestock and pets): All waste should be removed from around the well. Pens, cages and animals should be kept away from the well at all times.

Contaminants

Something that can make water impure or infected, such as animal waste, pesticides, fertilizers, fuel and oil.

- **Chemical products** (such as fuel, oil, pesticides and fertilizers): Chemical storage containers and vehicles that may leak or drip chemicals or fuels should also be located far from the well.
- **Septic fields and tanks:** They need to be properly located and maintained.

Other possible sources of well water **contamination** include:

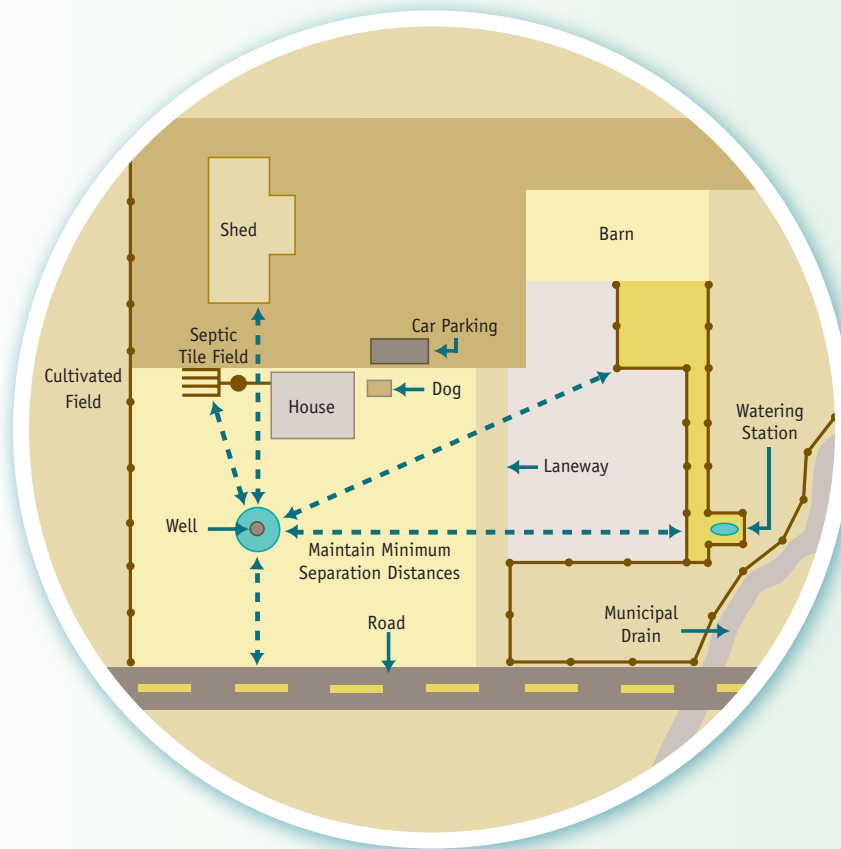
- Community development (such as run-off from industries, urban development and agriculture)
- Unused wells (these should be plugged and sealed by a licensed well contractor)
- Open excavations
- Quarries
- Contaminated sites

If a resident suspects any of these sources may be harming the quality of their well water, they should be encouraged to contact their EHO and ask for an inspection. In the event of potential contamination, it is recommended that the well water be tested for bacteriological and chemical parameters.



Well inspections

Diagram of well location



Example of suitable well location

Rainwater should flow away from the well since it can pick up harmful bacteriological and chemical contaminants. Water that gathers in puddles or pools around a well could seep into it. Drinking this water may cause health problems.

To prevent pooling and puddling:

- The well casing should extend between 30 to 40 centimetres above the mounded earth.
- No erosion should appear around the wellhead.
- It is recommended to maintain a grassy area of at least 3 metres around the well to reduce erosion.
- No areas of ground settling should be identified around the outside of the well casing. If there is settling, surface water may be getting into the well. The area should be levelled with clean fill.
- To prevent pooling, ground slopes should allow water to run away from the wellhead.

Well cap inspection

- The well cap should not be cracked or damaged. If the well cap needs to be replaced or repaired, First Nations residents should contact a licensed well contractor.
- The well cap should be attached firmly to the casing.
- The vent should face the ground and be properly screened to keep out insects but allow air to flow in.
- The well cap should be above ground (30 to 40 cm) and exposed at all times.
- The well cap should be kept clear of snow, leaves, debris and other obstructions.
- Drilled wells must have a vermin-proof cap. Dug well caps should be built to keep vermin from entering dug wells. It might be difficult to find commercially manufactured caps since dug wells vary in size. They can be custom made using materials such as fibreglass, food grade plastic or concrete. It is not recommended to use wood as it rots and is not watertight.

Food grade plastic is used in food packaging and is usually of greater purity than other plastics. It does not contain dyes or recycled plastic deemed harmful to humans.

Pictures of well cap



Annular seal inspection

- The sealant used to fill the space between the well hole and the well casing must be in good condition. A depression in the ground around the edge of the casing can indicate that the sealant has shrunk, collapsed, or cracked.
- A faulty annular seal needs to be repaired to prevent groundwater from becoming contaminated.
- Any gaps around the annular seal should be filled with a material such as bentonite, cement grout or concrete that will seal the space.

Well casing inspection

- Well casing should not present any signs of damage, cracking, or discolouration on the outside. If so, residents should contact a licensed well contractor for advice.
- All holes and cracks in the well casing must be repaired. Residents should contact a licensed well contractor for information.
- Insects should not enter the well casing at any time. If any insect infestation is found, the well is not watertight and must be repaired.
- If there are stains coming from the joints, the well casing is not watertight. This generally means that water is escaping from the top or the sides. Leaks must be repaired quickly. Residents should call a licensed well contractor for technical advice on how to repair leaks.
- Observations and actions taken can be noted in the inspection log.

Pictures of well casing



FOR A DRILLED WELL

It is not recommended to remove the cap to inspect the inside casing. A licensed well contractor can help inspect the inside of a well, if needed.

FOR A DUG WELL

Remove the lid carefully, listen for water seeping into the well and, use a strong flashlight to inspect the inside casing.

Well maintenance

Residents should routinely:

- Clear the well of brush, debris, snow and other obstructions.
- Keep surface runoff and foreign materials away from the well.
- Make all repairs and note in the inspection log.
- Note the completed repairs in the inspection log.

Responsibilities of EHO and CBWM *(for inspection and maintenance)*

EHOs and CBWMs are important drinking water quality resources for First Nations residents who are served by wells with fewer than five connections. EHOs and CBWMs can assist residents with visual well inspections and offer maintenance tips.

For technical advice on well repairs, residents should contact a licensed well contractor.



Well water testing

As mentioned earlier, on-request sampling and testing services are now available for First Nations residents served by wells with fewer than five connections to ensure the quality and safety of their drinking water.

Types of water tests

Testing drinking water regularly will verify that the water supply is safe. This is an important way to protect the health and safety of everyone who uses the water.

First Nations residents will contact their EHO or CBWM to have their water sampled for bacteriological and chemical testing.

Bacteriological parameters: Drinking water from a well should be tested two or three times a year or any time there is a concern as to the safety of the water supply, for example:

- Once just after the spring thaw.
- After an extended dry spell, following heavy rains or after lengthy periods of non-use.
- After major plumbing work.
- Right away if there is any change in water clarity, colour, odour or taste.
- Right away if there has been any change or development of the surrounding land.
- As soon as possible if there is any doubt about the safety of the water supply.

WELL SOURCE WATER VULNERABILITY:

A water supply may be prone to contamination if:

- *the aquifer is close to the surface;*
- *the soil or rock covering it is loose;*
- *the soil or rock around it is full of large cracks and spaces;*
- *water is able to flow quickly through the ground into the aquifer.*

Chemical parameters: Chemical testing should be done at least once every five years or any time it is suspected that chemicals may have leaked into the well. Water does not have to be tested for chemical parameters as often as for bacteriological parameters because the risk of chemical contamination is lower.



Sampling procedures

It is important to ensure that all instructions for collecting and storing the sample have been followed. The test results may be misleading if the sample has not been collected or stored properly. In case of doubt, a new water sample can be collected.

NOTE

Samples collected for chemical analysis may require preparation in order to stabilize them, depending on chemical parameters that are to be tested.

Bacteriological sampling procedure

(Based on section 5.2 of the Procedure Manual for Safe Drinking Water in First Nations Communities South of 60°)

Here is a reminder of the sampling procedure:

- Read the sampling instructions carefully before beginning.
- Label all bottles with the proper identification number and, if sending to an accredited laboratory, complete the corresponding chain of custody form.
- Wash hands before and after performing water analyses.
- Use only sterile sample containers. Note that the sample containers contain sodium thiosulphate crystals to neutralize chlorine in chlorinated drinking water samples; it is important not to discard them.
- Keep sample containers clean and free from contamination before and after collecting the sample (containers should not be opened at this stage).
- Remove any attachments on the faucet (aeration devices, water purification device, or screens).
- In some circumstances, flame or disinfect the tap with alcohol or bleach (at the sampler's discretion).

- Turn on cold water and allow it to run in a steady stream for two minutes.
- Lower the water flow rate before taking the sample. The flow rate should be low enough to ensure that no splashing occurs as the container is filled. Do not adjust the flow rate if you are taking samples at a location where the water runs continuously.
- While holding the sample container at the base, remove the plastic seal around the cap before attempting to open the bottle (not all water bottles have seals).
- Remove the cap with your free hand, taking care not to touch the edge or the bottom of the cap or the top neck of the bottle. Use only a proper container. Do not use the bottle if the cap is loose or cracked, if the bottle contains no seal, if the seal pulls away from the cap, if the bottle appears dirty, or if there are any other conditions that place the quality of the bottle in doubt. Take care not to breathe onto or into the cap or the water bottle.
- Hold the cap on the outside. Do not touch the inside of the cap or bottle with your fingers. Do not set the bottle cap down.
- Do not rinse the bottle before filling it. Position the bottle under the flowing stream of water.
- Fill the bottle to the fill line.
- Seal the container as soon as it is filled.
- Turn off the water and replace any attachments that were removed.
- Label the bottle and fill out the forms with corresponding number of codes.
- Complete the required form and make sure all necessary information is included.

If samples are to be sent to an accredited laboratory, EHOs and CBWMs are advised to:

- Immediately place the samples in coolers with ice packs (not loose ice).
- Keep the samples in the coolers during transit to the laboratory.
- Ensure that the transit time between sample collection and analysis at the laboratory does not exceed 24 hours.

Chemical sampling procedure

Procedures related to sample collection, preservation, storage and transport should be those recommended by the accredited laboratory that will be testing the water samples.

The Tests

Bacteriological tests

Samples are tested onsite by the EHO or CBWM for the following bacteriological parameters:

- **Total coliforms** – These are bacteria that are present in animal waste and sewage, and are also found in soil and vegetation. If they are found in your water, it may mean that surface water is getting into the well.
- ***Escherichia coli* or *E. coli*** – These are bacteria found only in the digestive systems of humans and animals. If they are present in the water, it is usually due to contamination by animal or human waste from a nearby source.



Chemical tests

Chemical analysis of samples is not done onsite. Once samples are taken, they are sent to an accredited laboratory for testing. The chemical parameters are selected in accordance with the latest edition of the Health Canada Guidelines for Canadian Drinking Water Quality (GCDWQ). EHOs may decide to add or remove parameters on the basis of their assessment of risk relating to regional/local human activities and geological conditions.

Chemical tests are used for:

- **Routine monitoring** - the purpose of routine chemical monitoring is to provide information on the water supply for use in monitoring drinking water quality from a public health perspective.

The results

If water tests show that the quality of the water is satisfactory, the test results will be mailed to the resident(s) served by the well. The information will include the test results and information on acceptable quality levels according to the latest Health Canada Guidelines for Canadian Drinking Water Quality.

If the results from either a chemical or bacteriological test show that there is a problem with the water, the EHO and CBWM will contact the resident(s) served by the well to discuss further testing and/or recommendations.

Responsibilities of EHO and CBWM (for water testing)

First Nations residents served by wells with fewer than five connections can contact an EHO or CBWM for their water testing needs. EHOs and CBWMs can assist residents by:

- Offering on-request sampling services.
- Sending well water samples for free laboratory testing.
- Providing water quality monitoring tips.



Community resources

Publications

To help First Nations residents served by wells with fewer than five connections to inspect their wells and to monitor water quality, the following resources will be made available for distribution to community members:

- A booklet with a step-by-step checklist for well inspections

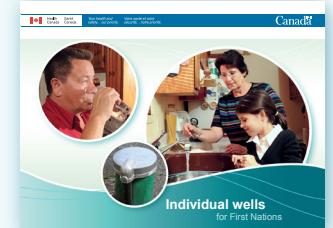


- A booklet with a step-by-step checklist for testing well water



To better inform communities about inspecting wells and monitoring the water quality of wells, the following products have also been developed:

- A PowerPoint Presentation for laptop/group presentations



- A radio announcement reminding residents about the importance of well inspections, maintenance and water tests

To help First Nations residents monitor their water quality, the following services are now available on-request, free of charge:

- Water sampling and testing for bacteriological and chemical parameters

To receive copies of these materials, please contact:

Publications
Health Canada
Ottawa, Ontario
K1A 0K9

e-mail: publications@hc-sc.gc.ca

Telephone: 1 866 225-0709

TTY: 1 800 267-1245

Fax: (613) 941-5366