

The drop on water

Turbidity

Turbidity refers to the cloudiness or degree of clarity of the water.

Sources

Turbidity in drinking water can be naturally occurring. It is caused by suspended matter, such as silt, clay, fine organic and inorganic matter, and by microorganisms.

Turbidity is always present in surface water sources no matter how clear the water looks.

In groundwater, turbidity is common due to natural geology. Turbidity may also be caused by the following:

- **elements present in the water supply pipes, such as iron and manganese** – See our fact sheet on iron and manganese for more information.
- **poor well construction** – This allows surface water to enter the well. Poor well construction is more likely to be the cause of turbidity when bacteria are also found to be present.
- **recent shock chlorination of the well or piping system** – Shock chlorination is a common treatment method which involves flushing the water system with large amounts of chlorine. If water remains turbid after two or three days of normal use following treatment, investigate the source of the turbidity.
- **overpumping or large water level changes in a well** – This disturbs sediment in the well and may cause the water to become turbid.

QUICK FACTS

- Turbidity in water refers to its cloudiness or degree of clarity.
- Turbidity in drinking water can be from organic or inorganic sources.
- You must determine the source of turbidity to figure out if it is a health concern. This information also helps you choose the best solution for reducing turbidity and your treatment options.
- For surface water and some groundwater supplies, turbidity may indicate the presence of disease-causing organisms that can cause adverse health effects.
- Regularly test your well water for a standard suite of microbiological, chemical, and physical parameters, including turbidity.
- If you use a surface water supply, turbidity in drinking water can cause adverse health effects. Treatment for reducing turbidity involves both filtration and disinfection.
- If you have a groundwater well with turbidity above 1.0 NTU, you must determine the source of turbidity. If turbidity is a health concern, your water must be both filtered and disinfected.

Turbidity

Health Risks

You must know and understand the source of turbidity to deal with it appropriately. Whether there are health risks associated with turbidity often depends on the source.

Surface water and wells with turbidity that may cause health problems

For surface water and for wells with turbidity that may cause health problems, turbidity is an indicator for the presence of disease-causing organisms, such as bacteria, viruses, and parasites. These organisms can cause nausea, cramps, and diarrhea.

Wells with turbidity that is not likely to cause health problems

In groundwater sources with turbidity that is not likely to cause health problems, turbidity may be present due to the presence of inorganic matter, such as precipitates of iron and manganese from natural sources. These particles are not typically a health hazard in drinking water.

How Do I Know What Applies to Me?

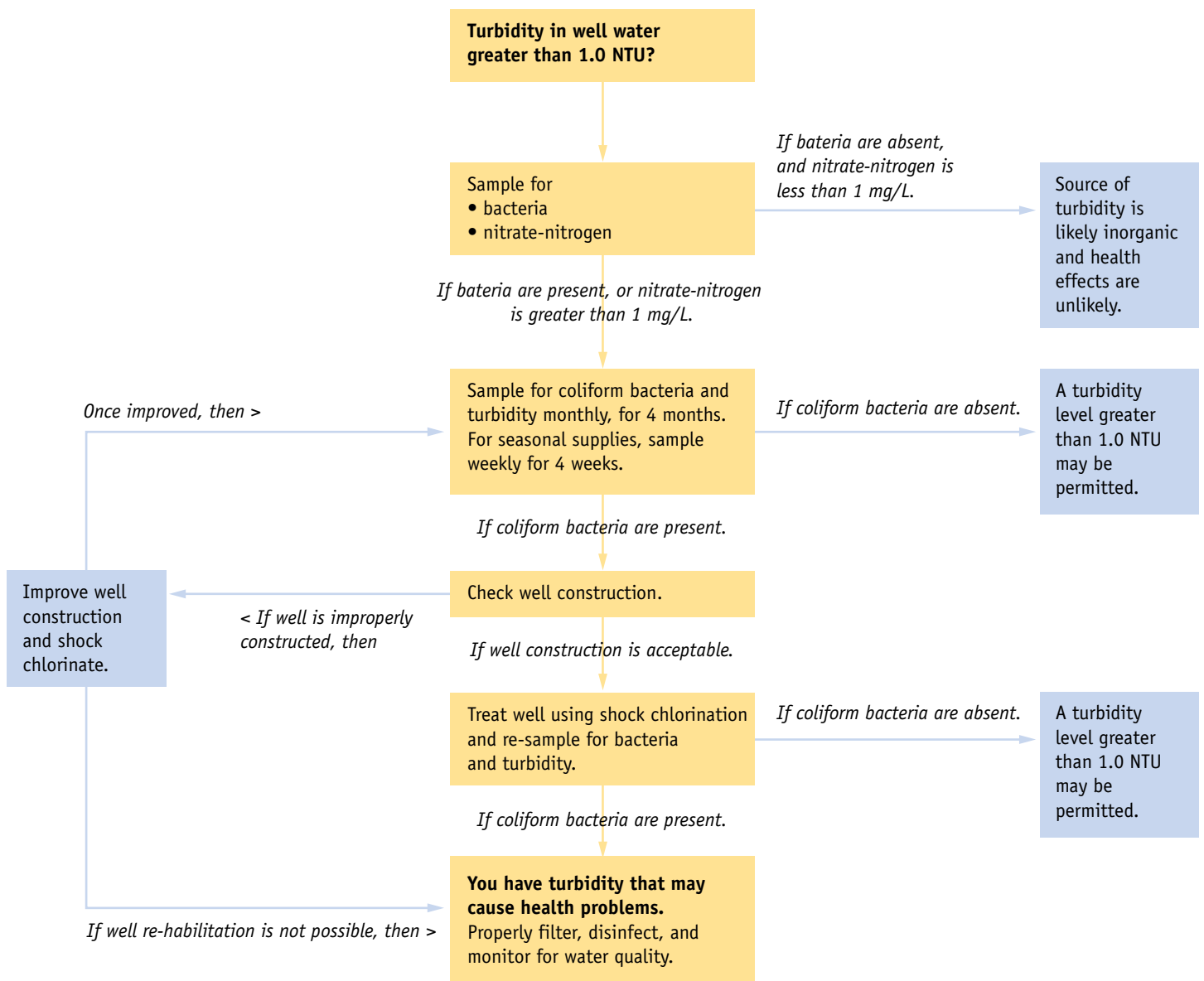
First you need to determine what type of turbidity you have. This will help establish whether there are possible health effects. It will also help you find the best solution for reducing turbidity and the treatment options that may work.

If your water comes from a surface water supply, such as a lake or stream, it is important that water be properly treated using filtration and disinfection. See our fact sheet on surface water for more information at www.gov.ns.ca/nse/surface.water/docs/SurfaceWaterQA.pdf.

For groundwater supplies, if turbidity levels are greater than 1.0 NTU, it is important to determine whether turbidity will cause health problems or not. Follow the procedure outlined in Figure 1 to investigate and determine the type of turbidity. The procedure involves sampling for additional parameters such as bacteria and nitrate because these can enter groundwater through the same pathways as other contaminants. The procedure also recommends you inspect the well construction.



Figure 1 – Procedure to Investigate and Determine the Type of Turbidity



Turbidity

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If you detect bacteria or nitrate in your well water, then the turbidity may be a health hazard. If this is the case, you must filter and disinfect the water before consuming it.

A turbidity value higher than 1.0 NTU may be acceptable if you find that the turbidity is not a health concern. Turbidity is not a health concern if all of the following are true:

- bacteria are absent
- nitrate-nitrogen is less than 1 mg/L
- well construction is acceptable
- no evidence of other contamination is found

If all of the above are true, it is likely that the turbidity is caused by inorganic materials due to metals, such as precipitates of iron or manganese, or natural geology. The parameters in a standard suite of chemical and physical parameters that may provide a clue about whether the turbidity is caused by natural geology or elements present in the water supply pipes include pH, alkalinity, and a metal scan. See our fact sheet *General Chemistry and Metals* for more information.

Maximum Acceptable Concentration

Turbidity is measured in nephelometric turbidity units (NTU). Turbidity is a measurement of how light scatters when it is aimed at water and reflected from suspended particles in the water. It is not a measurement of the number of particles themselves. However, the more particles suspended in water, the more difficult it is for light to travel through it and the higher the turbidity, or cloudiness.

The Maximum Acceptable Concentration (MAC) for turbidity depends on the water source.

Surface water and wells with turbidity that may cause health problems

For surface water and for wells with turbidity that may cause health problems, turbid water may harbour microorganisms that can make you sick. Turbidity in these cases is a maximum acceptable concentration based on potential health effects. The level to which turbidity can be removed is specified by certified drinking water treatment units. See the Treatment section of this fact sheet for more information.



Wells with turbidity that is not likely to cause health problems

For groundwater wells that have turbidity that is not likely to cause health problems, turbidity levels above 5.0 NTU can affect the taste, smell, or colour of water. A turbidity of 1.0 NTU or less is generally recommended.

Testing

Regularly test your well water for a standard suite of microbiological, chemical, and physical parameters, including turbidity. Use an accredited water testing laboratory. Find a list of accredited water testing laboratories at www.gov.ns.ca/nse/water/waterlabs.asp or see the Yellow Pages under “laboratories.”

Get the special sampling bottles and instructions on proper sampling from the laboratory.

The cost of analyzing water samples can range from \$20 for a single parameter to \$250 for a full suite of microbiological and chemical parameters. The cost can vary depending on the lab and the number of parameters being tested.

Solutions

To find the best solution for reducing turbidity, determine the type of turbidity.

Surface water

If you have a surface water supply, the water must be properly filtered and disinfected before it is consumed. See the Treatment section of this fact sheet for more information.

REGULAR TESTING

Homeowners are responsible for monitoring the quality of their well water:

- Test for bacterial quality every 6 months.
- Test for chemical quality every 2 years.
- Test more often if you notice changes in physical qualities – taste, smell, or colour.

Regular testing alerts you to problems with your drinking water.

Turbidity

Turbidity

Wells

If your well water has turbidity above 1.0 NTU, follow Figure 1 to determine whether the turbidity in your well water is likely to present a health risk or not. Sample for bacteria and nitrate-nitrogen.

If bacteria are present or nitrate-nitrogen is greater than 1 mg/L

If bacteria are present or nitrate-nitrogen levels are greater than 1 mg/L in your well water, you will need to do further testing to determine if the turbidity is a health risk. Sample for coliform bacteria and turbidity monthly for four months, or weekly for four weeks if you have a seasonal supply. See our fact sheet on coliform bacteria for precautions to take when coliform bacteria are present.

If coliform bacteria continue to be present, inspect the well construction and repair or reconstruct the existing well, if necessary. In some cases it may be necessary to properly decommission the existing well and construct a new well. See our fact sheet on well decommissioning for more information. Once well construction is acceptable, you should treat your well using shock chlorination and resample for bacteria and turbidity. If bacteria continue to be present, you have turbidity that may cause health problems. You must properly treat the water using both filtration and disinfection.

If well rehabilitation or reconstruction is not possible, consider turbidity to be a health risk. Properly treat the water using both filtration and disinfection.

If bacteria are absent and nitrate-nitrogen is less than 1 mg/L

If bacteria are absent and nitrate-nitrogen levels are less than 1 mg/L, turbidity is not likely to cause health problems. This type of turbidity is often caused by high iron and manganese levels and does not pose a danger to your health. You may choose to treat your water to improve the aesthetic quality.



Treatment

Treatment for turbidity that may cause health problems

Turbidity that may cause health problems is an indicator that disease-causing organisms may be present. All surface water supplies and wells with turbidity that may cause health problems must be properly treated to make it safe. Proper treatment involves both filtration and disinfection. It is health related and therefore essential.

Filtration

Turbidity can be removed by means of filtration. Filters are often rated by the average pore size. The smaller the pore size, the smaller the grain size the filter can remove. The finer the filter the sooner it will be coated with debris and the more often it will need to be cleaned or replaced.

Buy a treatment system that has been certified to NSF Standard 53 for reducing turbidity. NSF International is a not-for-profit, non-governmental organization that sets health and safety standards for manufacturers in 80 countries. See its website at www.nsf.org. There are various point-of-use and point-of-entry filtration units certified to Standard 53. Units certified under this Standard are able to reduce turbidity from 11 NTU to 0.5 NTU.

Disinfection

Disinfection options include distillation, chlorination, ozone or ultraviolet disinfection. An ultraviolet light unit purchased for the inactivation of pathogenic microorganisms must be certified to NSF Standard 55 Class A. Units without the Class A designation are only intended to be used for the reduction of non-pathogenic, nuisance organisms. Ultraviolet lights are intended for water that is visually clear (that is, not coloured, cloudy, or turbid). If the water is turbid, it should be filtered first to clarify the water.

Turbidity

Turbidity

Treatment for turbidity that is not likely to cause health problems

If you have determined that the turbidity in your well water is not likely to cause health problems, you may choose to treat the water for aesthetic purposes. Effective treatment methods include

- adsorption systems (such as carbon filtration)
- reverse osmosis

Buy a treatment system that has been certified to NSF Standard 53 or Standard 58 for reducing turbidity. Standard 53 certifies filtration units. Standard 58 certifies reverse osmosis systems. Units certified under both Standard 53 and Standard 58 are able to reduce turbidity from 11 NTU to 0.5 NTU. Reverse osmosis systems are certified for point-of-use and should only be installed at the tap.

If turbidity is due to iron and manganese, additional options include

- aeration followed by filtration
- greensand filtration
- oxidizing filters, including birm units
- mechanical filtration by sand and gravel or other filtration media to trap suspended solids
- ion exchange

See our fact sheet on iron and manganese for more information.

Once installed, re-test your water to ensure the treatment system is working properly. Maintain the system according to the manufacturer's instructions to ensure a continued supply of safe drinking water.

For more information on water treatment, see our publications *Water Treatment Options* and *Maintaining Your Water Treatment*, part of the *Your Well Water* booklet series at www.gov.ns.ca/nse/water/privatewells.asp.

Considerations

When sampling, it is important not to overpump a well. Turbidity may increase with overpumping. As a result, the sample will not be representative of typical water conditions.

FOR MORE INFORMATION

Contact

Nova Scotia Environment at
1-877-9ENVIRO
or 1-877-936-8476

www.gov.ns.ca/nse/water/


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