

CT Environmental Health Association (CEHA)
Fall Chloride Workshop: November, 14, 2018

Sodium & Chloride in CT, from a Private Well Water Perspective

Connecticut Department of Public Health
Environmental Health Section
Private Well Program



Connecticut Department of Public Health
Keeping Connecticut Healthy



Sodium & Chloride in Connecticut: Private Well Standards

Sodium & chloride standards for private well water:

- 💧 **Sodium (Na):** CT DPH Guidance Level for Private Well water, **100 mg/L** (ppm)
- 💧 **Chloride (Cl):** CT MCL, **250 mg/L** (ppm)



Sodium & Chloride in Connecticut: Understanding the Standards

- ◆ Sodium and chloride are commonly found in nature and in the human diet



- ◆ Sodium: Potential health concerns for those on a medically restricted sodium diet because of certain heart, kidney or blood pressure conditions
- ◆ Standards also help keep water from:
 - Tasting salty
 - Harming household plants and gardens
 - Having a corrosive effect on plumbing and appliances (*lead & copper*)



Introduction

Sodium and chloride are elements that are not highly toxic and comprise the basic components of common table salt. However, they can create concerns when they appear at elevated levels in drinking water. This fact sheet describes the potential sources, health risks and target levels of sodium and chloride in drinking water.



There are no enforceable federal or state standards for the level of sodium in drinking water. However there is a CT DPH guidance level of 100 mg/L for sodium that reflects current scientific and medical opinion on sodium dietary restrictions in those at risk for high blood pressure. The amount of sodium in a normal diet is 10 to 20 times higher than this guidance level. Adhering to this level ensures that drinking water does not become a substantial source of daily sodium, even for those on a sodium-restricted diet.

The Connecticut Maximum Contaminant Level (MCL) for chloride in public water system and private wells is 250 milligrams per liter (mg/L). Aside from the potential health concerns with sodium and high blood pressure, these sodium and chloride limits are intended to keep the water from tasting salty and from having a corrosive effect on plumbing.

How Does Sodium & Chloride Get Into Wells?

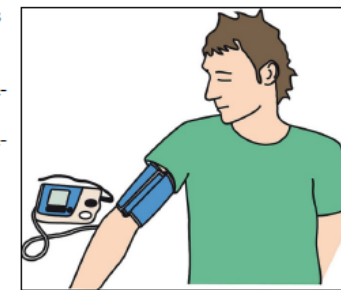
Sodium and chloride are elements that are very common in nature and in the human diet. They occur naturally in groundwater, typically at low concentration. However, sources such as road salt, both its storage and application to roads in winter, can be a significant source to groundwater. Other potential sources include industrial waste, sewage, fertilizers, water softener discharge, and living in coastal areas where sea water can influence the quality of groundwater.

In certain cases, the elevated sodium may come from a water softener as most softeners allow some sodium to enter the filtered water. The CT DPH guidance level of 100 mg/L applies to that case and any other reasons why sodium becomes high in a water supply well. Some water softeners use potassium chloride as the exchange agent to remove water hardness instead of sodium chloride. If this is the case, it is also important to monitor for potassium in tap water and inform your physician of the result.

Connecticut Department of Public Health
 PO Box 340308, Hartford, CT 06134-0308
<http://www.ct.gov/dph>

What Health Effects Are Caused by Drinking Sodium & Chloride Every Day in Tap Water?

There have been many studies on the potential effect of dietary sodium on blood pressure. Epidemiology studies show that in some cases lowering sodium intake to the official American Heart Association goal of 1500 mg per day can have a beneficial effect on blood pressure. In many cases the typical diet delivers greater amounts of sodium than this goal. For most people sodium in a water supply well does not present a substantial or unique health risk because the level obtained from water is much less than from the diet. However, certain individuals may be placed on low sodium diets (<1500 mg/d) due to heart, kidney or blood pressure conditions. Such individuals should test their water for sodium to make sure that it doesn't make a substantial contribution to the overall intake level. They should notify their physician if it is above 100 mg/L. This guidance value is primarily for private wells. For public supplies, CT DPH has a notification level of 28 mg/L that requires supplies to notify their customers at that and higher levels. However, that value is dated and the new 100 mg/L target can be used in discussion with your doctor regarding sodium levels in your drinking water.



As noted above, adults at risk for high blood pressure and related conditions are the sensitive group. We have no evidence that exposures to children at a school or day care center would lead to a health risk. Further, workplace exposures may tend to be of less concern than sodium in a residential supply given that most people consume more tap water at home than at work.

Chloride has a state MCL of 250 mg/L due to its taste in water at this and higher concentrations. While not elevated in concert with sodium.

Elevated levels of sodium and chloride can also irritate plants, and increase the corrosivity of water, which can damage plumbing.

Testing for Sodium Chloride

To determine if sodium and/or chloride are present in your water, you should have your water tested at a state certified laboratory. Follow the laboratory's instructions to obtain a good sample. Take precaution to not cross-contaminate. Consider proper transportation and handling of the sample as they may not provide accurate results.

Connecticut Department of Public Health
 Environmental & Occupational Health Assessment Program
 860-509-7740 • <http://www.ct.gov/dph/eoha>

Corrective Action

If chloride is present in well water at a concentration above the state MCL of 250 mg/L, or sodium is present above the state guideline of 100 mg/L, you should take steps to find and eliminate the source. The local health department and the state Department of Energy and Environmental Protection (DEEP) can help you determine where the sodium or chloride contamination may be coming from. If your doctor has prescribed a sodium restricted diet and the level of sodium in your water exceeds 100 mg/L, you should inform your doctor.

Water with elevated sodium or chloride is more corrosive and can cause leaching of metals from your plumbing. If you have elevated sodium or chloride levels in your water, you should also test your water for lead and copper.

If the sodium or chloride source cannot be identified or cannot be resolved, you may need to consider using bottled water, installation of treatment, connecting to a public water system, if available, or drilling a new well over the long term. If using bottle water, read the label to determine the water's sodium content.

Treatment methods for sodium and chloride include reverse osmosis and distillation. If sodium levels in your well water are moderately high (over 100 mg/L) small distillation or reverse osmosis treatment units are available that will produce three to ten gallons of water per day (enough for drinking and cooking needs for a household).

Protecting Your Private Well Water

You can protect your well by paying careful attention to the land use activities that occur in the area near your well. Regular testing and adopting practices to prevent contamination can help ensure that your well supplies you with good quality water.

For More Information:

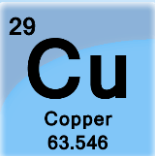
Treatment Questions:
 Public Water Wells: CT DPH Drinking Water Section, 860-509-7333
 Private Wells: CT DPH, [Private Well Program](http://www.ct.gov/dph/privatewellprogram), 860-509-8410.

Health Questions:
 CT DPH, [Environmental & Occupational Health Assessment Program](http://www.ct.gov/dph/eoha), (860) 509-7740
 Source Investigation: CT DEEP, contact the District Manager for your region, go to http://www.ct.gov/deep/cwip/view.asp?a=2715&q=324994&deepNav_GID=1626

Sodium & Chloride in Connecticut: Corrosivity Concerns

Sodium & Chloride increases the conductivity of water, which can promote corrosion of copper plumbing and appliances. This may cause metals like lead and copper to leach from plumbing.

- Lead can cause adverse health effects to the brain, kidneys, nervous system, red blood cells and blood pressure. The severity of these effects varies upon the exposure concentration and the individual's developmental stage at exposure. Young children and infants are especially vulnerable to lead poisoning.
- Copper is needed in the body in very small amounts, but at very high levels it can cause nausea, vomiting and diarrhea, and may cause damage to the liver and kidneys. People with Wilson's Disease may be at greater risk of adverse effects of consuming drinking water with elevated levels of copper.





Sodium & Chloride in Connecticut: Potential Sources

Potential Na & Cl sources in groundwater:

- ✓ Natural sources in bedrock and soils
- ✓ Salt water intrusion (coastal areas)
- ✓ Road salt, storage and application to roads in winter
- ✓ Water softener treatment backwash discharge
- ✓ Water softener treatment
- ✓ Industrial waste
- ✓ Sewage
- ✓ Fertilizers



Sodium & Chloride in Connecticut: Items to Note

Sodium and Chloride in CT private wells:

- ✓ Increase in Na & Cl related inquiries and complaints from private well users and professionals
- ✓ Elevated Na & Cl levels can range widely
- ✓ Elevated levels sometimes present slightly higher after winter, in spring, then in other months
- ✓ Sometimes, levels of other naturally occurring minerals and metals are also increased such as, manganese, iron and hardness



Sodium & Chloride in Connecticut: Private Well Contamination Coordination Protocol

STATE OF CONNECTICUT
DEPARTMENT OF PUBLIC HEALTH



Dannel P. Malloy
Governor
Nancy Wyman
Lt. Governor

Raul Pino, M.D., M.P.H.
Commissioner

Environmental Health Section

Private Well Contamination Coordination Protocol

This protocol outlines generic responses that the Connecticut Department of Public Health (DPH) can initiate in the event of the discovery of one or more private wells with elevated levels of manmade or natural contaminants. Much of this response is not under the direct control of DPH, so this protocol generally contains suggested actions by a number of governmental agencies and private individuals. The Connecticut Department of Energy & Environmental Protection (DEEP) maintains primary responsibility to investigate cases where private wells may be at risk of becoming contaminated or have been contaminated as a result of manmade sources of pollution and to identify the party(ies) responsible for the pollution. DEEP does not investigate cases of naturally-occurring pollution, except in cases where such contamination is mobilized by manmade activity. Recommendations are provided below for coordination between the DEEP, the DPH and local health departments (LHD). This protocol is not intended to limit a LHD's discretion to respond to any water quality test result at any level of detection.

Naturally Occurring Contaminants:

Introduction: The finding of naturally occurring chemicals in private well water in a particular location can take a number of paths for investigation and resolution. No one agency has been delegated authority over this topic, but in general DEEP programs will not follow up on naturally occurring chemicals in groundwater. Therefore, it is up to the LHD and DPH to initiate steps once an area is suspected of having private wells at risk from naturally occurring chemicals, such as but not limited to, arsenic, uranium, radium, fluoride and radon. Manganese may also be naturally elevated but its migration to a well may be influenced by human activities and could therefore fall under either DEEP or LHD/DPH responsibility. The naturally occurring parameters identified in this section are those that have been found in Connecticut and can be considered toxic at high levels. Local Health Departments are encouraged to contact the DPH Private Well (PW) Program when any other naturally occurring parameters are detected at abnormally high values.

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1. Critical Response Screening Levels: When a LHD or DEEP becomes aware of a single well with a significantly elevated level of a natural chemical in well water, they should contact the DPH PW program and inform them of the result. For the purposes of this protocol, a significant¹ elevation means (and is not limited to):

- Arsenic > 100 ppb
- Uranium > 900 ppb
- Radium > 150 pCi/l
- Fluoride > 3.5 ppm
- Manganese > 500 ppb
- Radon > 40,000 pCi/L

¹ Significant levels for arsenic, uranium and radium are based on the [CT DPH Bathing and Showering Guidance for Private Wells](#) (see appendix).

The list of contaminants with respective elevated levels above, are not intended to limit a LHD's discretion to respond to any water quality test result at any level of detection, but rather provide general guidance on when action should be taken.

The DPH PW program will then discuss follow-up options with the LHD, as described below.

2. Whenever the LHD or the DPH PW program become aware of any single well that is "significantly" elevated or when two or more wells in close proximity are over an MCL or action level, then the discovering agency will notify the other agency. The DPH PW program will consult with the LHD to discuss response options. The DPH PW program may also notify DEEP if DPH or the LHD have reason to believe these conditions are the result of surrounding land use or other manmade sources of pollution.

The response options may include:

- ✓ The LHD will inform nearby neighbors about the elevated result and suggest they hire a private lab to test their well for the chemical in question.
- ✓ The LHD may initiate sampling of wells in the vicinity and submit samples to the DPH lab. The LHD may consult with the DPH lab and how far from the

✓ The town government may issue an order to the chemical in question may

3. If testing undertaken by the LHD index well, then consideration should

- ✓ Expanding the area of testing;

- ✓ Expanding the area where well owners are notified;

- ✓ Consulting with the United States Geological Survey (USGS) or the CT State Geologist to consider geology;

- ✓ Informing the entire town and recommending all private wells be tested through a private lab; and

- ✓ If elevations in a town are very widespread, then a town ordinance requiring testing for new wells should be considered.

4. Private labs are required to report testing data to the LHD and DPH when the test was conducted in connection with the sale of a property, no later than thirty days after the completion of the test. This data should be reviewed regularly by DPH and the LHD to see if any elevations in naturally occurring chemicals have been documented. Private labs should be encouraged to alert LHDs and DPH when wells with significantly elevated test results are identified.

5. If elevated levels of naturally occurring chemicals are documented over a wide area of a town, then the DPH PW program will consult with the State Geologist and/or the United States Geological Survey (USGS) to get an understanding of the underlying bedrock and its possible correlation to the elevated findings. If a suspected bedrock type extends into neighboring towns, the DPH PW program will notify those towns for possible follow up.

6. The DPH PW program will keep a database with all reported elevations for future analysis and reference.

Man Made Contaminants:

Introduction: Manmade contaminants may often be detected when sampling a water supply well. When they do not exceed health criteria, they may warrant further evaluation or monitoring, but additional actions are necessary to protect human receptors when criteria are exceeded. The LHD is typically the lead for problems of bacterial contamination, and may also assume the lead for contamination originating with on-site septic systems, such as nitrates. DEEP's Sub-surface Disposal and Agriculture program may also be involved in evaluation of these issues if associated with an activity under their jurisdiction. For most other manmade contaminants, the DEEP Remediation Division is involved.

1. Whenever private well sampling results are above federal or state maximum contaminant levels (MCL) or action levels, the agency receiving the results first should notify the other two agencies. The initial agency of discovery may seek additional information to substantiate the report before referral to the other two agencies.

2. If the LHD conducts any further investigations of manmade contaminants, they may use the general approach outlined in 2 and 3 above for progressive expansion of the study area. If this sampling identifies the source of the contamination, they should notify the owner of that property under the provisions of CGS 22a-6u (b) or (c).

3. In the absence of a viable responsible party conducting an investigation, DEEP will often be the lead in investigating sources of manmade pollution, including sampling of other nearby wells. DEEP will coordinate with the LHD on who will be collecting additional samples. Agency-obtained sampling results should be shared with the other agency. Reports of results sent to DEEP, but obtained by responsible parties sampling under DEEP's Remediation Programs (i.e., Significant Environmental Hazard Program, Potable Water Program, Pollution Abatement Order, Water Supply Order, etc.) will be shared with the LHD as they may request. However, if these results include exceedances of criteria, follow approach in 4 below. Also, if DEEP identifies the source of the pollution, they will inform the LHD. If the contamination impacts three or more private wells above established criteria, the DPH PW program will be informed of DEEP's investigation results.

4. If testing of a private supply well by a responsible party is ordered by DEEP and identifies contaminants elevated above MCLs or Action Levels, the responsible party must notify the owner of the well, DEEP, DPH, and the LHD within 24 hours. In addition, if not an owner-occupied dwelling, the well (property) owner must notify each lessee and one tenant in each rental unit within 24 hours. The LHD is required to verify within 3 days that this notification by the owner has been made. [Reference CGS 22a-6u (j)] If testing is done by DEEP or the LHD, a similar notification to well owners and occupants of rental units should be made.

5. The LHD or DEEP can contact the DPH Private Well (PW) Program if there are questions about relevant treatment technologies and the extent of the problem. If there are health concerns among the residents impacted, the DEEP will refer citizens to the DPH Environmental and Occupational Health Program, which will then coordinate health messaging with the LHD. When necessary, DEEP will also coordinate with DPH's Drinking Water Section about the potential to contact affected homes with private wells to public water supplies if such supplies are nearby.

All well owners with elevated test results should be referred to the DPH PW program to discuss relevant treatment technologies.

Appendix Materials:

- [CT DPH Action Level List for Private Wells](#)
- [CT DPH Bathing and Showering Guidance for Private Wells](#)

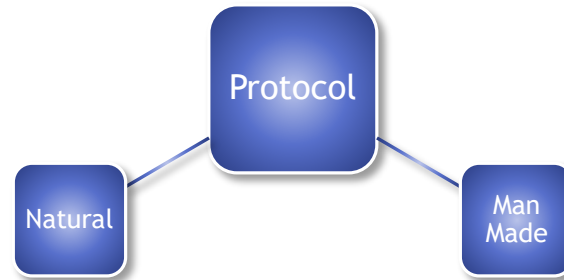


Sodium & Chloride in Connecticut: Private Well Contamination Coordination Protocol

	Maximum Contaminant Level (MCL)* mg/L	Action Level (AL)* mg/L	Guidance	Significant Elevation
Nitrate	10	10		
Nitrite	1	1		
Sodium			100 (PRIVATE WELLS)	
Chloride	250 (State of CT MCL)			
Manganese		0.5		0.5
Arsenic	0.01	0.01		0.1
Uranium	0.03			0.9
Radon			5,000 pCi/L	40,000 pCi/L
Fluoride	4.0			3.5
VOCs	MCLs, ALs and significant elevations will vary per individual contaminant			
Pesticides	MCLs, ALs and significant elevations will vary per individual contaminant			
All levels in mg/L (ppm) unless specified otherwise				

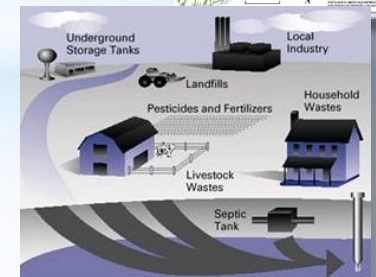
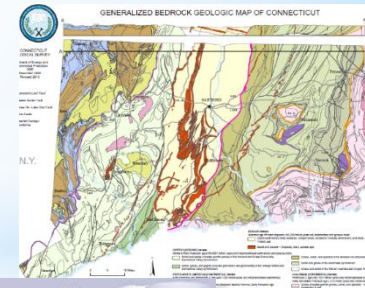
- ✓ Notify the other agencies
- ✓ Seek additional information
- ✓ Notify those potentially impacted
- ✓ Investigate and evaluate
 - Potentially identify source
- ✓ DPH Private Well Program can assist with treatment questions, etc.
- ✓ DPH Environmental and Occupational Health Program can assist with health concerns and questions

Sodium & Chloride in Connecticut: Private Well Contamination Coordination Protocol



Sodium and Chloride may fall into either category. At high levels it is more likely the result of salt water intrusion or man made activity:

- ✓ Road salt, storage and application
- ✓ Water softener treatment & backwash
- ✓ Industrial waste
- ✓ Sewage
- ✓ Fertilizers



Sodium and Chloride in Connecticut: Man Made Contamination, Referral?

CT Department of Energy & Environmental Protection (DEEP) has primary responsibility to investigate private wells contaminated by man made sources of pollution and to identify responsible parties:

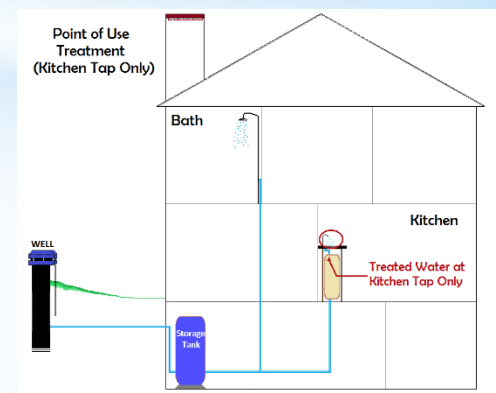
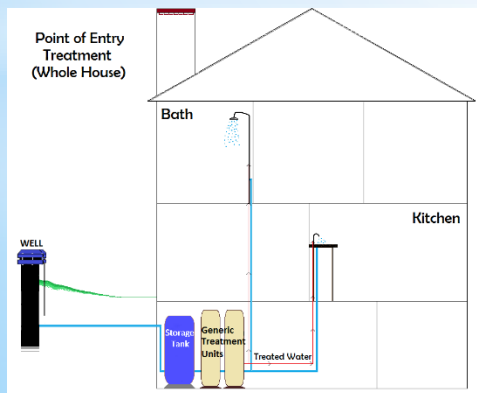
- ✓ DEEP does not investigate naturally-occurring pollution, unless it was mobilized by manmade activity
- ✓ Suspected man made contamination cases of sodium & chloride in private well water are generally referred to DEEP for follow up



Sodium & Chloride in Connecticut: Options When Levels are High

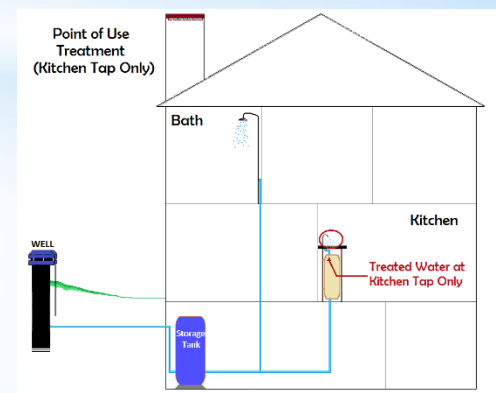
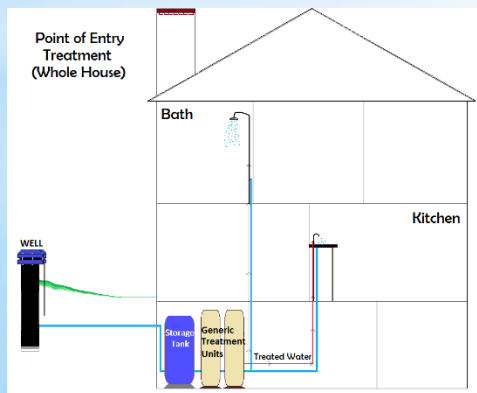
💧 Alternate Sources

- ✓ Temporary use of bottled water
- ✓ Replacement well
- ✓ Other well related options
- ✓ Connect to a public water supply (*if available*)



Sodium & Chloride in Connecticut: Options When Levels are High

- 💧 **Remove or mitigate the contaminant source**
 - ✓ Identify potential pathways, what may be causing the problem?
 - ✓ Mitigate vulnerability points



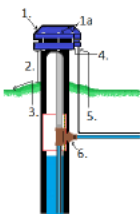
Sodium & Chloride in Connecticut: Ways to Mitigate Vulnerabilities

Private Well Water Systems in Connecticut: Best Management Practice Checklist

In Connecticut, there are currently no maintenance requirements for private well water systems. Private well owners are responsible for the quality of their private well water and maintenance of their well water systems. Poorly maintained well water systems can act as a conduit for pollutants to enter your home drinking water.

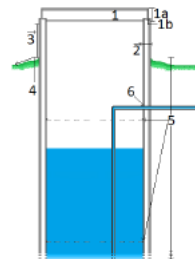
Proper maintenance and operation of your well water system is an essential component to protecting the water quality supplied by your well. Even with proper maintenance, well water system equipment will eventually need repair or replacement. Consider performing the following items to be proactive in promoting the health and longevity of your well water supply and system:

- Test the quality of your well water; refer to [Publication #24: Private Well Testing](#)
- Keep the area around your well accessible
- Limit activities around your well that may contaminate your water supply, such as over applying fertilizers, pesticides and herbicides and store these products in watertight containers or in secondary containment
- Keep hazardous chemicals, such as paint, lawn chemicals, or other chemicals away from your well and store these products in watertight containers or in secondary containment
- Be aware of local land use activities that may affect your well water quality
- At least annually, inspect the exposed well casing and the area around it:
 - ✓ Is the exposed well steel casing in good shape?
 - Look for cracks, holes or signs of corrosion
 - ✓ Is the well cap watertight?
 - Check Bolts, rubber gasket, seals
 - ✓ If there is an electrical conduit at the well cap, is it watertight?
 - ✓ Is the top of your well casing at least six inches above the ground?
 - ✓ Does the ground around the well casing slope away from the casing?



DRILLED WELLS:

1. Well cap condition and watertight seal to the well casing;
 - 1a. check bolts and rubber gasket
2. Top of the well casing is at least 6" above ground
3. Ground is sloping away from the well casing
4. Well cap air vent is accessible and screened
5. Watertight connection from the cap to the electrical conduit
6. Pitless adaptors provide an underground connection below the frost line to bring water pumped from the well into your home



DUG WELLS:

1. Well cap is in good condition and watertight to the well casing;
 - 1a. 4-inches thick, 1b. 2-inch overlap
2. Dug well casing or side wells, made of 4-inch thick watertight concrete, or other CT DPH approved material
3. Top of the well casing is at least 6-inches above ground
4. Ground should slope away from the well casing
5. Watertight joints between well casing tiles or other approved material to a minimum depth of 10-feet below the ground surface
6. Water line from the well to the home should be sealed watertight

- Take precautions to prevent the well from being struck by motorized machinery, such as lawnmowers or vehicles
- Prevent cross connections by installing hose bibb vacuum breakers on outdoor spigots
- Never place a water hose inside any type of container when mixing chemicals or solutions
- If there are old unused wells on your property, have them properly abandoned by a [registered well driller](#)
- If your well, well pump or water system requires repair or maintenance be sure to use an appropriately licensed individual
- Have your well water system inspected every five to ten years by a licensed professional
 - ✓ Well pump and its components
 - ✓ Well tank and its components
 - ✓ Well head integrity
- Keep all well records, such as [well completion](#) and water quality reports in a safe, accessible place

Remember that private well owners are responsible for their private well water systems. When you routinely care for your well water system you improve your chances of avoiding a catastrophic problem in the future.



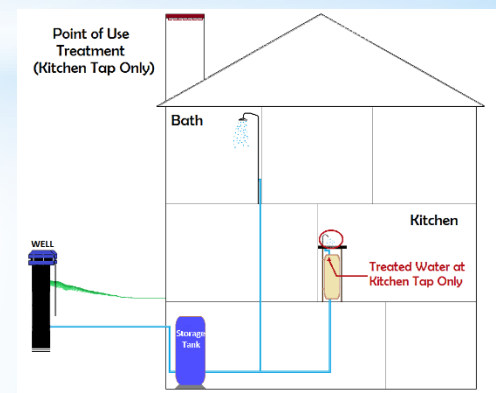
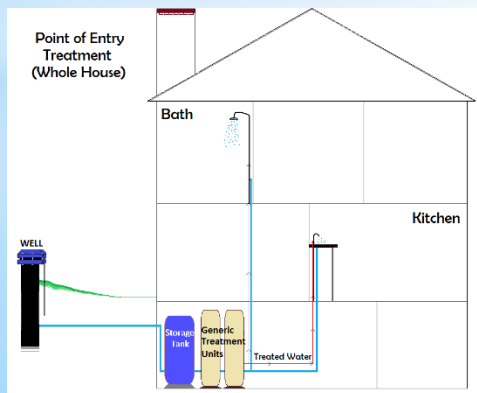
For more information regarding private wells please contact:
 CT Department of Public Health, [Private Well Program](#), (860) 509-8401

**Proper wellhead maintenance may help
 make private wells less vulnerable to
 Na & Cl contamination**

Sodium & Chloride in Connecticut: Options When Levels are High

💧 Treatment

- ✓ Point of Use vs. Whole House...
- ✓ Things to consider

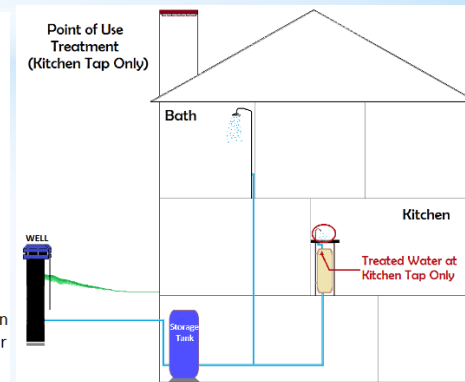
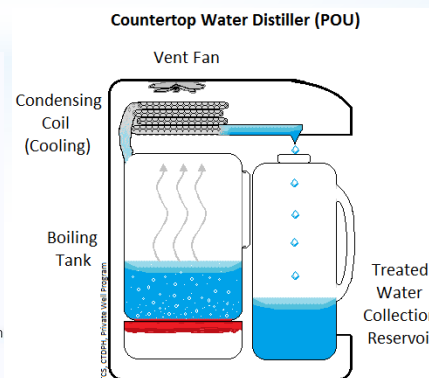
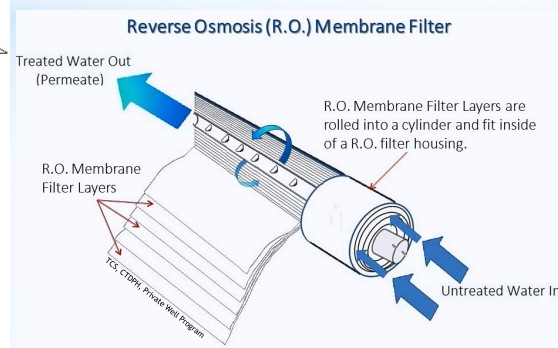
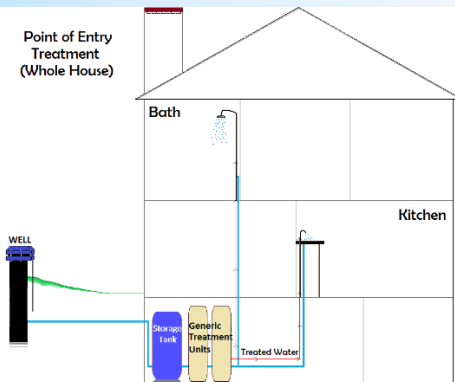


Sodium & Chloride in Connecticut: Residential Treatment Options

Point of Use (POU) vs. Whole House...

- ✓ Reverse Osmosis
- ✓ Distillation

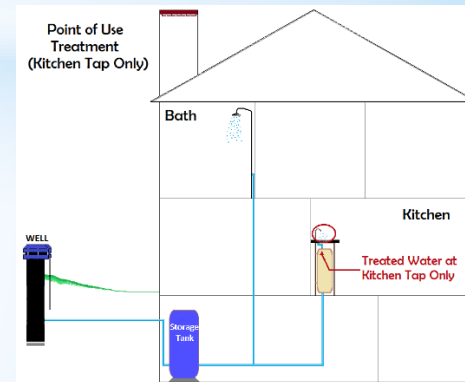
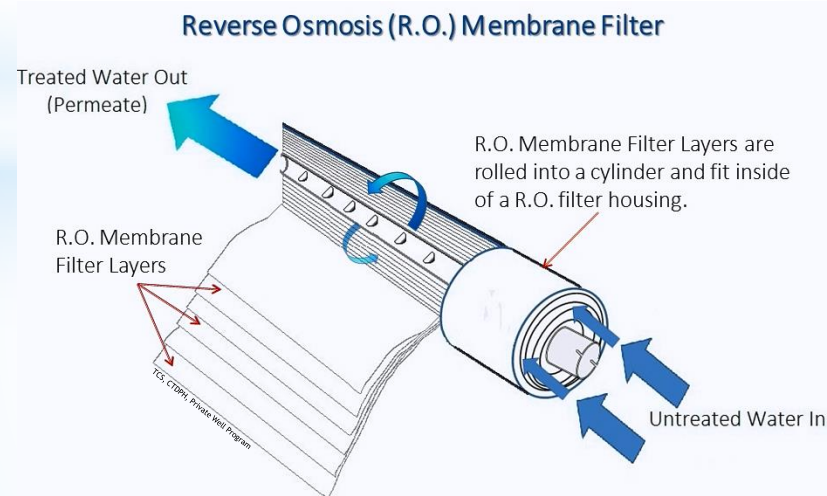
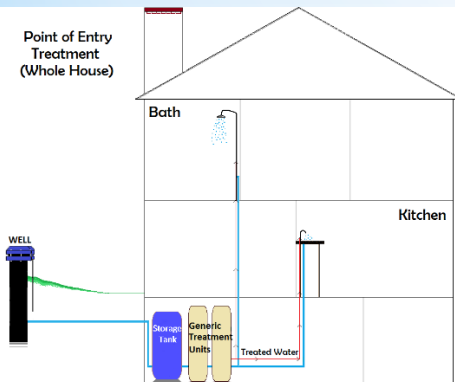
Effective treatment options, however, whole house applications can be challenging or impractical due to efficiencies and cost



Sodium & Chloride in Connecticut: Residential Treatment Options

✓ Reverse Osmosis (RO)

Pressure is used to force water through a semi-permeable membrane filter. Treated water is collected in a storage tank and a stream of concentrated contaminated water is sent to waste (reject water). --- POU and Whole House

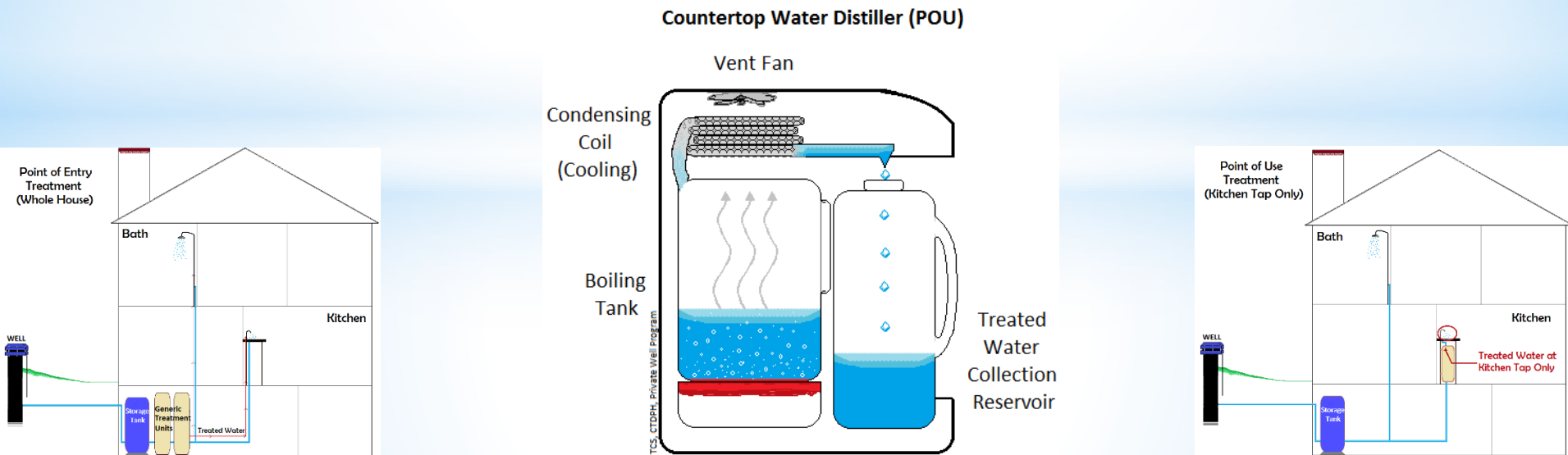


Sodium & Chloride in Connecticut: Residential Treatment Options

✓ Distillation

Uses evaporation and condensation. Water is boiled and vaporized, then condensing coils cool vapor back to water which is collected in a reservoir.

--- Generally POU





CT DPH
Environmental Health Section
Private Well Program

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www.ct.gov/dph/privatewells

