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Environmental Fact Sheet

(Information compiled from New Hampshire Department of Environmental Services Literature)

Radon in Air and Water
An Overview For The Homeowner

Does your household water come from a well? If so, your water probably has radon gas. Radon gas is normally found in all well water. Bedrock wells typically have much higher radon concentrations than dug or point wells.

What is Radon?
Radon is a colorless, odorless, tasteless, naturally occurring radioactive gas produced from the Decay of the element radium, which occurs naturally in rocks and soil worldwide. Radon gas can dissolve in groundwater and later be released into the air during such normal household activities as showering, dishwashing and doing laundry. When radon accumulates in indoor air it can pose an increased health risk, primarily, lung cancer.

Radon Pathways into Your Home
Radon can enter a home via at least three common pathways:
- Migration (up from the soil) into the basement through cracks and/or other openings in the foundation.
- Release of dissolved radon gas from the household on-site water supply.
- Release from building materials such as a granite block foundation, some fireplace materials, and floor or wall tiles.

Although there are some exceptions, in general, **the migration of radon up from the soil contributes** the largest percent of radon found in the average home. Radon from a groundwater type water supply source, particularly a bedrock well (also known as an artesian or drilled well), contributes the next largest percentage of radon in the home. The radon contributed from building materials is typically very small. It is recommended that the two predominant pathways should be evaluated and that initial action to reduce radon exposure should target the pathway that contributes the largest percentage of risk to occupants.

Health Effects
The primary risk pathway from exposure to radon gas is through inhalation of radon-laden air in a home. Studies indicate that high levels of radon gas in the air increase the risk of lung cancer. An additional health risk is associated with the ingestion of the radon that remains dissolved in the water and is consumed. On average, this latter risk is substantially lower than that associated with inhalation. The risk from radon in water is relatively high when compared to other drinking water contaminants.

How Much Radon is too Much?

Radon in Indoor Air

The U.S. Environmental Protection Agency has set an advisory "action level" of 4 pCi/L for radon gas in indoor air. While not a mandated health standard, this level is a guideline for people to use in assessing the seriousness of their exposure to airborne radon. Concentrations noticeably lower than 4 pCi/L are desirable.

Development of the Radon in Drinking Water Standard

There are no water quality standards for private home wells in New Hampshire. Consequently, private wells owners often turn to the water quality standards for public water systems (PWSs) to evaluate the safety of their private wells. At present there is no federal or state standard for radon in drinking water. Such a standard is known as a **maximum contaminant level** (MCL). EPA has not set a MCL for radon in water. Since many New Hampshire residents have questions concerning what level of radon in drinking water is safe, and given the lack of a state or federal standard, we summarize below the history of radon proposals.

History – In 1991 EPA proposed to limit radon gas in residential PWSs to 300 pCi/L. Over 95 percent of New Hampshire wells would exceed this concentration. During the public comment period, DES and the Department of Health and Human Services (DHHS) commented on the proposal and suggested that in view of both societal cost and health benefit, that EPA set the radon standard for PWSs at 2,000 pCi/L instead of 300 pCi/L.

1996 SDWA Reauthorization – In 1996, Congress reached a compromise on reauthorization of the federal Safe Drinking Water Act (SDWA). Relative to radon gas in water, this legislation specified that EPA would re-propose the standard for the radon MCL and complete the entire regulatory task by August 2000. This statute specified that if EPA selected a stringent MCL for radon gas in water, an alternative MCL (AMCL) would also be proposed. The AMCL is explained below. The goal of Congress in establishing the AMCL was to provide regulatory flexibility characterized by both the regulated drinking water arena and the unregulated indoor air quality arena. The alternative MCL would have a risk similar to that from the equivalent concentration of radon normally found in outside air.

On November 2, 1999, EPA began the formal process of establishing a radon gas standard for community PWSs. The proposal consists of two standards that would regulate the concentration of radon gas in community PWSs. A health based standard with two different concentrations is unique in the drinking water field.

a. a. One standard would be the conventional MCL. If a PWS meets this MCL, the utility will be in full compliance with the requirement and will have totally satisfied its responsibilities under the Safe Drinking Water Act (SDWA). The proposed MCL is 300 pCi/L. b. The second standard would be called the **alternative** maximum contaminant level (AMCL). If proposing to be evaluated by this AMCL, a water utility will need to apply to DES or EPA for approval to use the higher standard. The approval process will require the establishment of a supplemental program that addresses radon from the foundation of typical homes referred to as multi-media mitigation (MMM), as explained below. The proposed AMCL is 4,000 pCi/L. The AMCL was set at an equivalent to the concentration of radon occurrence in outside air approximately five feet above the ground surface (0.4 pCi/L).

Multi-Media Mitigation (MMM)

The multi-media mitigation (MMM) approach to radon reduction described above is based on an understanding of the two principal radon exposure pathways as explained further below. In order to use the less restrictive AMCL as identified above, a second health outreach program must be provided. The goal of this program is to reduce radon exposure from the foundation pathway. The MMM program will involve a variety of outreach programs. The basic goal of the MMM program will be to reduce the risk from the radon contribution associated with the foundation pathway by an amount equal or greater than the increased risk associated with using the AMCL of 4,000 pCi/L rather than MCL of 300 pCi/L. Each public water system MMM program will require initial approval by

DES/DHHS/EPA and subsequent periodic review of the program's accomplishments. The EPA has not interpreted how the MMM program would apply to a single family home with a private on-site well.

Transfer Ratio
As radon escapes from water it raises the radon level of the air within a building. The "radon transfer ratio" predicts the increased radon level of indoor air in a home due to the off-gassing of radon from the water. The transfer ratio can very widely from one home to another. On average this transfer ratio predicts that 10,000 pCi/L of radon in water can be expected to increase the overall annual average radon concentration of the air in a conventional single family home by approximately 1 pCi/L. To illustrate this conversion assume the following example: if the radon in water concentration was 5,000 pCi/L, and the radon in the air measure was 3 pCi/L, then 0.5 pCi/L of the airborne radon would likely be attributed to the water and the remaining 2.5 pCi/L would be attributed to radon gas migration up from the soil through the home's foundation. It is important to note that this ratio is an approximation and may vary widely from home to home.

Testing for Radon
It is recommended hat both the interior air of a home and that private well water supplies should be tested for radon.

Testing Water for Radon – If the well/water system is in regular use, the entire system should be flushed for at least 20 minutes to ensure that fresh water is captured in the sample container. If the home has been vacant, it is recommended that the well be flushed for a minimum of 1 hour. Radon concentrations in water may vary substantially from one test to another due to many reasons including the level of saturated soil above the rock, atmospheric pressure, prior well pumping and other factors.

Nelson Analytical Lab can direct our clients to companies that perform radon water treatment.

Radon in Air Testing
Radon in air test devices are typically placed in the lowest frequently occupied level of the home. The testing period that typically yields the highest results is during the winter months. The year round average measurement maybe appreciably lower than the winter reading. In many cases, the removal of radon that originates from infiltration through a home's foundation is the most effective means of reducing one's risk from exposure to radon. The most common method used for radon removal from indoor air is soil-gas ventilation, which works by drawing away radon gas from under and around the house foundation.

For More Information
Please contact Nelson Analytical Lab regarding testing your drinking water and indoor air for radon. We can mail you a radon water test kit with the necessary test bottle and water sampling instructions. Results will be emailed upon completion within 1 to 2 business days. We can also mail you a radon air test kit that contains the necessary sample vials instructions and pre-paid mailer. Results will be emailed upon completion the next business day. Nelson Analytical Lab will discuss your test results with you should you have any questions or concerns, or would like to be directed to speak with a water treatment company or radon air mitigation company regarding treatment options.