Radon in Water
A Wisconsin State Fish Hatchery Case Study

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March 13, 2015
WGWA Conference
How radon enters a house

- Radon in soil
- Radon in well water
- Radon in groundwater
- Cracks
- Water table
Radon in Water

• Waterborne radon to air ratio 10,000 : 1
  – 10,000 pCi/L in water = 1 pCi/L in air

• No Federally enforced drinking water standard for radon.
  – EPA does not regulate private wells.
  – 300 pCi/L for public water supplies
  – EPA has proposed community water supplies contain no >4,000 pCi/L; which contributes about 0.4 pCi/L of radon to the air in your home.
    • This is only if the state has an enhanced radon program in place.

• About 1-2% of the radon in the air comes from water.
Drinking Water

Not all drinking water contains radon.

• Surface water generally does not contain radon; it is released in air before entering home.

• Underground sources, such as a well that pumps water from an aquifer, may be more likely to contain radon.
Radon in drinking water causes about 168 cancer deaths per year:

- 89% from lung cancer caused by breathing radon released to the indoor air from water

- 11% from stomach cancer caused by consuming water containing radon.

Source: NAS Report  www.water.epa.gov
Nevin Fish Hatchery
Nevin Fish Hatchery

- Over 400,000 trout are raised annually at the Nevin Hatchery.
- 70 percent of the state’s inland wild trout are raised at Nevin.
- 3-4 employees
Why Test Here?

• Employee health concerns

• Ennis Study shared at training.
Initial Test Results

• April 2012 Pro-Lab test kit: 195 pCi/L

• Follow up test performed by radon measurement professional
  – Results = 213 pCi/L on average.
  – Closed building, no venting, over weekend.

• Radon level in water tested around 500 pCi/L
Six flowing artesian wells and two springs at Nevin Fish Hatchery provide all the water for our operations. A combined total of 1,400 gallons of water per minute (or two million gallons per day) flow naturally through the hatchery. None of the water is pumped. State-owned lands around the area provide some protection to this valuable underground resource.

**Flowing Artesian Wells**

Flowing artesian wells supply water to the surface under natural pressure. Sandstone contains the aquifer and when a well is drilled, the water rises to the surface. The deepest well here is 180 feet.

Spring water bubbles up through sand. The springs at Nevin have been covered to protect them from contamination.
Tested offices above hatchery = 19.6 pCi/L
Upstairs offices have windows for ventilation in summer.
Data from DHS Initial site visit Weekend 8/18-19 windows closed

5 hrs after opening windows

Overall Avg: 87.0  No Motion Detected  
Avg Temp: 57 F  Avg Press: 29 inHg  Avg Humd: 76 %

- Black: Radon pCi/l
- Orange: Action Level
- Red: Temp F
- Green: Press inHg
- Blue: Rel % Humidity
State of the art ventilation system
Worker Protection Issues

• OSHA contacts

• What protects workers?
  – 100 pCi/L; 30 pCi/L; or 4 pCi/L??

• 30 pCi/L NRC standard.
Prevent Worker Exposure

- Workers are being exposed and hatchery needs to stay functioning for production.

- Back up plan needed for winter
  - Can’t continue to ventilate the same way
  - Slippery floors, cold temperatures

- New fan belt in back-up Spiral Building
  - Radon now 1.3 pCi/L
Spiral Building – Back up work area for winter.
No heat.
Radon is 1.3 pCi/L
Worst winter ever...
Indoor Air Inspection Performed

- Tested airflow – received tips on changing ventilation

- Conventional mitigation system would not be the answer.
  - Area is very wet, high water table.
  - Radon is not subslab
What’s Next?

• Need for funds to try and fix the problem.

• Prove radon is coming off the water and that an exterior degassing system will fix it.

• Is this even going to work?
  – Bids $$ with no guarantees.
Turning on more aeration, windows closed

Weekend

Reducing aeration processes, windows opened.
Things to Consider

• Other fish hatcheries in the state will likely get tested and questions will arise.
• Water treatment plants - MN study
• Indoor aquaculture – urban farming on the rise
• Waterparks?
• Enclosed buildings where water is being aerated and moved through at high volumes, particularly from deep water wells.
Thank You!

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