Workshop on Radon Occurrence, Health Risks and Policy, With an Emphasis on Radon in Ground Water Drinking Supplies

Wednesday October 4, 2006

Panel Discussion
Moderated by Ted Campbell
Participants: William Field, Becky Allen, Felix Fong, Dave Chase, Avner Vengosh, Zoltan Szabo, Phil Jalbert, Eric Frohmberg, Debra Falta, David Vinson

- Q: Dr. Crawford-Brown mentioned that the risk associated with radon in water exceeded all the risks associated with all other regulated compounds…is this true? Have heard mixed messages on scope and level of concern related to radon in water…the issue seems to be that radon, also occurring in soil gas, but if it only occurred in water, there would be an MCL on the books already, however because the soil gas contribution is so large, it dwarfs the risks associated with water.
- Chase: SDWA charged EPA with est. MCL for variety of carcinogens, set levels for individual contaminants such that risk associated with model would be close to risk goals of congress; other goal was cost-benefit issue; working within these goal posts over the years, EPA has routinely used risk numbers for a variety of contaminants, cancer for 10,000:1 million. Risk estimates for radon in water alone, combined ingestion and inhalation, on order of 2.5 x 10-4. If no radon in indoor air, and only had radon in water, suspect that radon would be regulated. If there were no radon coming in thru the foundation, the level would be fixed. Seems that that would be the logic in setting levels. SDWA designed to protect public from contaminants in water supply…but however they get in a body, inhalation, ingestion, etc., they are still part of the water supply. I think they should look at radon in water by itself, and leave air issues separate.
- Q: Does the rest of the panel agree with this?
- Chase: Combined risk is 2x10-3, ingestion risk 10-4
- Falta: Some of the issues with that are up on the upper right line (10-4, a risk of dying in a year from a car accident); just treating for ingestion risk is 10-4, just over, but would only be for a small population, because those are the ones who would be on low capacity aquifers, etc. Not sure that MCL, only looking at ingestion risk, would actually be greater, perhaps right on the border
- Campbell – There are locations in country that have higher levels that will have more a part to play in this issue
- Szabo: Arsenic, radium, radon, in drinking water have near the same risk level; the issue is the total number of people affected; for all these contaminants there is some regional distribution; this argument alone does not separate radon, because exists for arsenic, uranium, radium; in general, all three of these should have some sort of MCL, comes down to a cost-benefit discussion argument, not a drinking water argument
- Falta: Its arbitrary to just look at ingestion, perhaps brings right back to lung cancer

- Q: I'm confused by the risk estimates, based on statistical studies, are they based on what oncologists see, on autopsies of persons with these cancers?
- Field: We discussed a lot of different studies; lung cancer studies mostly come from miner studies and extrapolated; no carcinogen more researched than radon and lung cancer association. Stomach cancer association purely speculative, no one can tell yet. Some models from animals, but large range around results; Not something which can be seen from epidemiology
- Frohmberg: Also worthwhile, as a toxicologist, when looking at what is regulated, there is a category of stuff….radon is head and shoulders above everything else we know about….we really know….despite uncertainty associated, we know so much more about radon than dioxins, PCB's, uranium
- Falta: There are epi studies and then a whole toxicology literature; Naomi Harley done lots of work on accidental ingestion; Human and non-human; Lots of other kinds of research

- Q: When people ask about radon in water, the EPA says to check air first, however data from this morning said no correlation between air and water….why do we say that and not say check both?
- Allen: I do tell them both…we all agree that the indoor air is the bigger risk…getting air tested would get at bigger risk, wouldn't take care of stomach cancer risk; If you remediate your air, any risk from water would be taken care of….scratch that
- Q: what we have found in the field is that mitigation systems being installed for soil gases will not mitigate for water, so even though there might not be radon in the air, there is still radon coming from the water/shower….could miss the entire source of radon in the air
- Field: Looking at a regulatory perspective, and regulatory risk perspective, depends on where you are. In NC or in Maine, would be more concerned about more than just the air, need water tested as well. People have mindsets about what they consider risks. Q: EPA has been put in a position to
- Allen: Mandated to justify levels from a cost benefit viewpoint. These levels do affect people's pocket books….because the way the statutory is designed, have to reach an equitable cost benefit arrangement, at 300
- Jalbert: One woman had 408 in air, 120,000 in water and wanted to know what to do, is there money from EPA. These are practical problems these people have faced. Take approach to test air, because often don't know level in air, but know level in water. Recommend an air test, inform about mitigation options. If still concerned, give risk numbers, info on mitigation techs and costs, contact info for health department of state. Bottom line on all comes down to cost…estimate of 5800 dollars for this one particular case….how will she pay for it? Radon in air has always been a more or less middle and lower class problem, because they do not have the funds to finance mitigation, and is a voluntary program. Encourage development of local community groups who can donate mitigation on pro bono level. Some states have revolving funds to help treat this.
- Vengosh: Need to take into consideration….higher radon activity takes place in private wells, not protected by state laws, even if EPA sets a higher level some

day, the new rule will not affect those most suffering, because they are private wells which will not be addressed by state

- David Grammar from Audience: This woman with high levels in her well tested by chance. State of NC seems to be moving in right direction, as does Maine and NJ, but EPA lagging behind. EPA benchmark will help private landowners, because there is some level. It is a loop that would be closed because the benchmark will create press and education….we have a big hole here, since 1986, and we aren't helping people. This helps, however how does the arsenic expense compare to radon? From the industry standpoint, could explain why it isn't moving forward
- Jalbert: The issue of having a standard…helps focus attention, larger issue in air program is that when in recent years trying to implement voluntary program, common argument they receive is there is no health based standard and cannot act….In perfect world even if we do not regulate, having a standard would be very helpful to provide guidelines to public and let people make decisions about cost on their own
- Chase: In radon and air program, there is no standard. No one cares that there is no regulation, people act on guidance

- Q: Where are we going in NC? What is in the background?
- Campbell: Forming steering committee made up of reps from key agencies, toxicology, wq, ws, industry, academia, getting right people together to flesh out reasonable level specifically for NC; North eastern states have set out a good guideline
- Fong: Making rules very difficult in state; have already expressed concern about Radon, but takes so long between recommendations and action; been trying to work on that
- Campbell: Not as concerned about regulation, and a state standard, as a reasonable sound guidance, and advisory, a reasonable first step. Some of the states have already created an advisory, a good first step, combined with a health standard, as guidance for citizenry
- Audience member from DWQ: Can show there is a problem. For arsenic and radon have shown them to be problems in NC, which is first step to get leg to act. Must go further and show where exactly the problem is….what is the range of problems? After this, can take info to legs. Private well rule, must have permit to construct a well; also defined whole range of contaminants to test for, arsenic on list, but not radon.
- Frohmberg: One benefit of NC is that it isn't all over the state, don't have to waste money sending info to whole state, can focus outreach
- Fong: the 10,000 and 1 rule is one problem, when people learn about this rule they don't worry about radon any longer

- Q: Where does this number come from? Seems to be in direct contrast with the studies that exist for radon coming from water, which generally have numbers much lower.

- Field: 10,000:1 study from a number of years ago….concern with how representative it is of whole populations, only done in CA
- Jalbert: NAS website has more details about this report 1999 Drinking water report, pg. 52 – 58. Committee came up with number because in mid-range of study
- Vinson: one of the follow-ups done in Maine, who did 80 houses, simulating water use during the day and radon in air; average a little less than 10,000 and 1
- Q: Two suggestions about getting people interested; 1 getting radon added to testing in wells, getting realtors involved, because when in contracts for new homes, much more concern
- Q: Add one additional line to real estate contract, regarding air and water
- Jalbert: To be clear, state wide real estates chose to voluntarily include radon concentrations in contracts, some local jurisdictions require disclosure of potential of radon in certain areas, other than that has been a voluntary adoption
- Chase: In NH, have radon notification clause, outside rule of real estate commission, says prior to contract, seller or agent must inform buyer of existence of radon in state and how it can get in and that buyer can test for it; switches all burden to potential buyer; does not disclose any past knowledge; most houses sold in NH are not required to have a radon test, but are tested b/c the real estate industry realized in best interest to get these things tested in stead of having deals fall thru a t last minute; simply an awareness issue, make buyer aware
- Frohmberg: When do real estate transactions take place? In summer, which doesn't give best level of radon in air, comes in winter.
- Q: I think your approach Ted, works really well as a first step, at least in New England states; sometimes advisories firs affect real estate communities; found that this started an entire industry in NE, all under advisory numbers, in terms of making people test for this; real estate attorney's put it in contracts as contingency, but they know about radon testing; having an advisory really starts ball rolling as to making this an issue, a good first step
- Hope Taylor-Guevara: Concerned about social justice aspects; We have a small emergency drinking water fund, idea was to assist with well users close to contaminant sites. Do you in Maine have funds for remediation?
- Frohmberg: Thru Maine state housing authority, income based, includes water treatment, perhaps not radon in the air
- Taylor-Guevara: Problem with real estate model, is lower-income folks are renters and wouldn't be affected by these contracts
- Frohmberg: Also, contracts are at a literacy level too high for most people to understand
- Chase: Low interest loan, revolving loan fund, to help with air quality…but who will administer? No one interested in administering small pools of money, trouble finding organization interested in helping with this
- Szabo: NJ requires informing department of naturally occurring contaminants, doesn't include radon; local matrix, some movement to come up with funding mechanism; landlords required on time schedule to test properties, perhaps a lax schedule, but it exists; low interest loan problem, however again, no one wants to administer a small amount of cash

- Q: If EPA passed a rule, wouldn't it be added to your list of contaminants monitored for?
- Szabo: You might think so
- Field: It would be interested to here from industry folks, a marketing tool to go with non-profit to do mitigation? Thoughts?
- Member of Audience: In western NC, have a few things as mitigators: Buncombe, Transylvania, Co. people using outhouses today; done a lot of HUD funded rehabilitation of housing, who does not recognize radon, but does recommend mitigation; some mortgage co, requiring radon mitigation and testing; all that aside, trying to get radon issue into public eye…constantly getting feedback suggesting that radon not really a problem, or at least no longer an issue; John Q. public is not aware of radon….make them aware of issue, and we'll get more cooperation and funding
- Fong: I disagree, compared to 10 years ago…
- Member of Audience: I agree, it is growing, no one who grew up in the counties, the locals do not know, only those who have transplanted to these counties from elsewhere know about radon…schoolrooms in buncombe county are above 10
- Member of Audience: I don't know the model referred to in the question, but mentions a problem, that we do not have an industry to speak of; no extra money that float to service in order to do pro bono work, have worked with habitat for humanity, but difficult locally to reach out and do too much because there isn't enough money; a lot of us are small mom and pop shops, great to help others, but first have to help self; needs to be risk reduction which will then lead to money in the community
- Member of Audience: Awareness in US is orders of magnitude higher than any other country; in B.C. wanted to check radon levels, only place to find testing materials was in Washington State; in England, significant amount of money for people with radon problem, however, seems to act in opposite direction, no one knows anything about this

- Vinson: There was a question about the past of 10,000 and 1, a deeply embedded assumption, what is the future of 10,000 and 1?
- Campbell: Or what are some of your thoughts about 10,000 and 1?
- ? :If we don't know how water is creating risk, how can we base a measurement upon this?
- Frohmberg: The 10,000:1 issues are an issue of uncertainty, however it is the number we have and can use; but how can you come up with a better number? There is variation from house to house, depending on water use, ventilation, but how does that translate into practical guidance?
- ?: Assuming a linear relationship between the variables
- Vengosh: If you look at paper by Hess and others, understand that the source of radon comes from house, no geological relationship between water and radon; radon in air measured in living room, as basis for study; good for epa, but from a scientific basis, ridiculous; radon in air not derived from radon in water; measure radon in basement or living room and measure in well, and no correlation.

- Chase: One of things we will be looking for in NH, getting labs to do radon reading in water, when they come across high levels, there is a reasonable assumption that those houses would get mitigated; labs will put on bottom of lab report, that if homeowner is interested, the home may be eligible for radon air testing, before and after mitigation; in the hopes that may be able to see differences; not a controlled study, necessarily, but more recognition that not feeling all that confident in 10,000:1, does it make sense? Do we see drops in the house after water has been mitigated? We will be looking at really big numbers, because whatever applies to them will apply to everyone. Setting up a pilot study.

Dinner with Panelists

Attendants: Zoltan Szabo, Dave Chase, William Field, Dr. Luanne Williams (NC Department of Public Health), Becky Allen, Phil Jalbert, Eric Frohmberg, Missy Eppes (?), John Diemer (?), Avner Vengosh, David Vinson, Ted Campbell

Objectives of Session

To flesh out the salient points and come up with consensus document, and take-home points. Send out information on web to all people involved. Objective to be NC starting to talk about radon regulation, to have a recommendation from experts on what NC should do about radon in drinking water. A launch point to arrive at some standard, a document committees could take into account, also something the director of Water Quality could take into account.

Data placed on board:

Ra 226+8	5pCi/L	1:20K (2L/day)	
As	10Ng/L	1:150K (estimate, 2L/day)	
U	30 Ng/L	1:20K (1.2L/day)	
Rn222	300 pCi/L	2:10K	inhalation and ingestion
	4000 pCi/L	2.3:1000	inhalation and ingestion
			90% due to inhalation

Most MCL's are 1 in 100,000

Some of the take home points:

1) Controversy over 10K:1 – Range about 10 K to 15K:1 right around the median. 10% to 90% range 1:5000 to 1:500,000
2) Hotspots (Rn in water) occur in Piedmont and Mountains of NC
3) Data are not available for many counties
4) Linear risk model, no threshold
5) List other states guidelines (300 to 10K)
6) 10k:1 probably understates actual risk
7) recommend testing water in selected counties (see Ted for list)

8) Surface water typically contains very little radon

Conversation

Jalbert: I understand the importance of just radon in water, but could prove helpful to have framework for radon in air and other issues.
Vengosh: But no dispute about threshold values with that, as opposed to threshold values with water.
Field: If I have a mitigator come in to just a 3.8, I won't be happy, want as low as possible. In my backyard up to 20, then when air starts moving, it goes back down to 2, which is a good goal.
Frohmberg: that's what we are shooting for in Maine
Szabo: done separate surveys for air and water

Vengosh: As much as there is an overlap, should perhaps not be here in this discussion, because NC won't argue about threshold level
Szabo: Would it be helpful if you two lay out what you see as specific issues for purposes in NC, what are the really open barn doors without enough consensus
Campbell: There is controversy over 1:10,000 rule…
Field: What will be our guiding principles for coming up with standards? Will it include stakeholder comment? Will it include recommendations based on sound scientific evidence? We need to support recommendations
Avner: important to present what we have, which is diverse expertise coming from different backgrounds; would like to emphasize scientific because of what we have; its not our problem whether or not the state adopts; should not be our goal

Williams: Question about scientific validity of risk assessment…do we really know…important issue to public health and I plan to share with state health director and initiate a program, perhaps with healthy homes, already have arsenic programs, is my understanding that have no private well results for radon…we have a long way to go, would like to review, come up with an action level….but what about scientific validity of 2 and 1000 inhalation…do we have confidence in this number?
2: 2.6 x 10-3 combined ingestion inhalation risk, roughly 10% is oral part, ingestion fraction, talking about ingestion risk for radon in water….is the NAS number…so we are fairly confident
Vengosh: we must always be cautious, question everything, NAS is not the Holy Grail, it is all we have, but if you look at literature, I have a serious problem with this
Field: You say the scope of problem has not been defined…is this true? A systematic survey to know the distribution of wells
Campbell: no systematic survey, looked at wells and distribution, but not imperative information for discussion
Williams: we need a target to evaluate the data against and to be able to put in a plug with the state, in addition to arsenic need to target radon
Field: Missing….
Vengosh: Can have some estimates based on geology, not necessarily good measures
Campbell: If you see this rock type and this range you can expect…

Eppes: This is a take home point, that this is a regional problem, not a statewide problem
Vengosh: Need to emphasize sampling, not base on assumption, should not stop there
Williams: But have to prioritize, where are you going, which health director are you going to target? Have to get them on board and get them to collect samples….maybe start with 10 samples per county…
Vengosh: True, we have grant from USDA studying natural contaminants of arsenic, radon in wells, in specific hotspots, studying geochemistry, socioeconomic aspects such as awareness and willingness to pay, someone from engineering looking at technology available, CWNC helping with outreach; already see a strong correlation with geology, radon associated with granite; now finding high radon concentration associated with granite rocks…can be much more focused

Campbell: The point is that we can acknowledge that there is not a full coverage of data across the State, we recognize that there are pockets where radon is focused, and can associate with certain rock types
Frohmberg: Positive and negative, nice to know whole state, but do know there are hotspots and can do focused studies, evaluate effectiveness on these particular locations and extrapolate to rest of state
Campbell: Purpose of USDA study, to be very focused, from which can extrapolate

Campbell: What constitutes a hotspot? My hotspot is not yours…When I go back to my office I'll have my own idea, which might be different from EPA
Vengosh: How many people will be affected? But even before knowing that, what is the guideline?
Jalbert: Suggest take existing list of guidelines from other states and look at other state's basis for guidelines…might be instructive in knowing how they set their guidelines
Chase: Conn. 5,000; MA 10,000; RI 4,000, try to stay away from saying anything, VT 4,000; NH is 2,000, NJ 300, ME 4,000
Szabo: New Jersey still believes there will be an MMP program, if that doesn't exist, then they are talking somewhere between 1,000 and up
Frohmberg: WI 5,000
Williams: If our geology similar to NE, and we went with 4,000…
Vengosh: to clarify, only some parts of NC similar to Maine
Frohmberg: and levels tend to be lower, right?
Campbell: in a three county study area, was…and extending out median about 2,000
Frohmberg: Our median is 2 or 3,000
Vengosh: but still not relevant, question still threshold value
Frohmberg: still kind of relevant, Maine came up with 2,000 on a practical level, not a health level

Chase: How much risk prepared to have citizens undertake?
Szabo: Up and down Appalachians, median was 1,000 or 2,000
Campbell: Anything above 2,000 in most places is a hotspot…within Appalachians, 6,000 is a hotspot
Chase: To come up with a recommendation of when to or not mitigate is a question of risk…which is a question we can't answer for you…

Vengosh: From health perspective…forget that…if I have a well, what is the probability of risk from my perspective
Jalbert: 2.6 x 10-4
Eppes: Assuming linear risk model, that there is no threshold…is there literature?
Field: No threshold for lung cancer exposure…
Eppes: A homeowner will want to personalize their risk…that risk really is linear

Williams: If health were to come up with a level which they could actually get by with…risks based on a 1 million cancer risks, and if she chose something different, would have to justify it; for arsenic, if you take arsenic it is a health concern
Vengosh: but cannot set this level for radon…because the issue is not drinking water with radon, the issue is more from showering, degassing of radon…If a sample has any level of arsenic then a lab will say that you shouldn't drink…want to set a standard for ingestion and inhalation of radon in drinking water
Williams: If we went in a 1 and 10,000 ratio, much less stringent than for other contaminants
Campbell: 2.6 x 10-4 for ingestion, for inhalation .7 out of 1000
Vengosh: If you isolate inhalation, forget about ingestion
Williams: at .4, would be .7 out of 1000 based on inhalation, if I went with 1 in 10,000 risk it would be .4….for nonsmokers; .04 would be 1 in 10,000; so if you get .04 ambient air, that would be 400 pCi/L in water to get the risk of 1 in 10,000 for the risk of inhalation, still 2 orders of magnitude for what they shoot for
Campbell: Clear when looking at these risk numbers that it is real…important of take-away document
Vengosh: To refresh assume 1 to 10,000 ratio, even as a conservative estimate
Chase: 1 to 5,000 on one end and 1 to 15,000 on the other end gives you a range to work in
Vengosh: Sounds similar to arsenic

Frohmberg: Is anyone buying a sig reduction in risk to get down to 400, by buying a GAC system, if they are getting exposed to .4 when they walk outside
Williams: We thought about this with PCB's…what level would not sig increase background level…if we went with that back at 4,000
Chase: If you dump water with 4,000 and it outgases .4, you are doubling the effects of those coming in the window, the background
Williams: Would not sig increase indoor air levels…4,000 would be .7, still below …
Jalbert: Still issue of true risk of radon in aerated water only?
Vengosh: Have only very small studies…

Campbell: If we used risk levels of other compounds, what does that translate into?
Williams: Ingestion and Inhalation would be 2…is not going to work…
Chase: Practical limits of which cannot go below anyway, because it will decay…
Vinson: Take away point: Everything that is being proposed for radon is less stringent than other contaminants
Szabo: The EPA standard for radium cancer risk is 1 in 20,000 and the arsenic is 1 to 1000 (10)

Vinson: All the other standards are more stringent
Williams: What is lowest level can reliably detect?
Chase: Can't go any lower than 200, cause protocol for shipping won't allow you to
Campbell: What is a reasonable risk level and also is it even at all reasonable, if you have a standard of 200, every well will exceed that

~Short Dinner Break~

Chase: Look into NC State Health goals, sometimes they enable universities input putting in new suggestions, could try to push a radon health goal, Healthy North Carolina, CDC
Williams: When launching educational campaign, encourage testing of homes, provide list of reliable companies to provide testing; second messages, if levels are high, then encourage testing of water….
Frohmberg: But as already discussed, testing air sometimes missed the mark; We are getting people to test and then playing catch up to analyze the results, is a little confusing and unfair to have them test when the support for interpretation is not there; If its above 2, test the air, if between 4000 and something and depending on what air is, give us a call and we'll talk about best way to spend money and risk; That is what the plan is…will depend upon the lab to distribute the brochures
Chase: Most programs don't do that
Szabo: NJ tried this on the MMMP, focus groups hated it, couldn't understand

Field: To Becky Allen: From what you are saying, sounds like MMP might not go?
Allen: Hard to say…from where its sitting…no senators really support it, haven't seen any congressional inquiries on radon in years
Field: Lieberman? Did he support it for a while?
Allen: Don't hear about it…no push

Eppes: If water comes from surface water better off than ground water…an important statement to make…
Szabo: Maybe not better or worse, but contaminants are different,
Field: A number of systems mix surface and ground

Vengosh: Question we need to address, Bill, if we are talking about different variation of different ratios…the question of accurate exposure, how does this come into levels of risk?
Campbell: Not addressed explicitly, but general rule of thumb perhaps address, but there might not be explicit…let's walk thru data on board
Campbell: Controversy over 10k:1, range about 5K to 15K:1…
Vinson: Two orders of magnitude difference of values you should allow
Campbell: Showers affect houses in drastically different ways
Field: Not necessarily air, just gets back to ….understanding of variability for people to make a choice
Campbell: How universal is this rule?
Vinson: Can you aggregate across North Carolina?

Field: Do they give info on volumes of houses tested and did this data factor into the numbers? Safe to say this number based on small sampling…
Vinson: Probably in the low hundreds of samples
Eppes: Interesting point of discussion…need more data about this…all studies utilize very small sample sizes
Vengosh: Now we have this value and no one wants to look anymore, but perhaps we need to have more resources to challenge it
Allen: Something to keep in mind, the science has changed so much, we are going to have to update based on the new science, it would be irresponsible to pass new rule without reevaluating
Vengosh: Given that there are so few systematic studies, should raise red flag and make sure we are on right track
Chase: Agreed

Allen: I don't disagree that it is a research need, but have whole laundry list of needs, unfortunately radon not one of the things getting a lot of attention in office at the moment
Chase: This is something that you people [Duke University, scientists] could do without too much problem, could ask if clients are willing to add to reports if they have higher levels, and if they are willing to have further testing in their house, could do pre-mitigation testing all over the house
Vengosh: Ted saw no correlation in his study…
Campbell: In order to get a sound data set for the purposes of 10K:1, need to do it a systematic way
Chase: The bigger the number…Only way to see contribution levels from different sources is by looking at water in use, not in use, and mitigation; trailers are good small box examples
Field: If this is the ratio it only applies in certain housing conditions, not year round
Campbell: Any way you look at the ratio, it looks like it falls apart, doesn't hold
Vengosh: Unless have a systematic way how the water is used in house…
Williams: Unless we know what the risk is, can't know…look at the air and the water and the advice you give to the homeowners
Campbell: Is there any consensus…we are in agreement about controversy of rule of thumb…could we say that rule of thumb underestimates?
Chase: Could go either way!
Vengosh: Not necessarily…doesn't take into account short-term exposure…we do underestimate our risk just accepting that rule of thumb…following train of thought, radon in water and radon in air, conservative approach, and doesn't take into account short-term exposure
Field: This is just a general conversion from whole house

Vengosh: The 10K:1 underestimates exposure time, exclude 10K:1 as a low-end estimate, saying there is a general correlation between radon in water and in air, if you go there, neglect the fact that there are short phases of exposure
Field: Did similar things with water plain operators…student looked at same risk, this does more back-washing; in my state it doesn't matter, but here it matters, lower ground source but higher water source

Campbell: Thus the problem with EPA coming up with general rule
Jalbert: Homes in NC with air over 4, 8 counties in Zone 1, lower than 20% of population; water big contributor compared to ground source
Campbell: Need to look at both of those to see what makes sense
Field: Regardless of transfer/source, getting contamination in home; and can do something about it…probably socioeconomics to this as well, poor have smaller homes fewer space to dissipate, however older drafty homes have more ventilation

Campbell: Do we really know the risk?
Field: We aren't going to assess it
Frohmberg: A good enough estimate
Eppes: Well, if we are agreeing that the 10L:1 is underestimated, have to assume that the risk is underestimated

Frohmberg: Need to recommend testing water and air and then what??
Campbell: May not be ready to move forward with this…
Vengosh: The major point!
Williams: We may not have a consensus, may just have a range, which still works…what is Maine proposing…
Frohmberg: Action level: above 2 in air, 4,000 in water, take notice and do something (strictly for private wells, and how it will be interpreted by public drinking water is yet to be determined); above 10, recommendations do everything from recommending bottled water to…
Vengosh: Testing in NC is not regulated, because there is no standard, they don't care
Frohmberg: Can the drinking water program set their own numbers for drinking water supplies?
Williams: Generally they don't, but if there is no MCL, they will occasionally set a public health goal, or recommended goal…
Frohmberg: Is it enforceable for public water supplies?

Frohmberg: Getting back, we want you to act at numbers in this range, need to act, though recommended actions have not yet been listed
Williams: Do other states have costs and actions for mitigation if levels are high, or above the safe levels?
Chase: Sounds like price ranges for mitigators around here are much higher, about 50% higher, then in NE, except NJ
Jalbert: List of mitigators available through proficiency website, www.radongas.org, www.nrsb.org
Frohmberg: After talking to mitigation people, can get below 2 pCi/L, of course if costs much more water…not a function of mitigators skill, but of house and layout
Jalbert: Mitigation can get under 4 95% of time
Frohmberg: One group suggests that can get below 2 80, 85% of the time

Williams: Two options, greater than 2, problem, greater than 4000 in water, have problem with radon in water and air, limit showers, crack windows over door

Field: Get and use a fan in the bathroom, much cheaper than getting an aeration system installed
Williams: Can then keep the door closed, as long as there is a fan…
Vinson: with fan on peak sooner and smaller, not huge, or significantly
Vengosh: Gut makes us think that fan would do something, however data suggest doesn't have significant effects…no data for fan on door open…
Jalbert: How about a respirator while showering?

Campbell: Difficult to decide what at risk level should be, can only discuss what the literature suggests, challenges suggest, what the risk level should be, would be arbitrary…if you set a 2 standard, will have homes all across the state freaking out
Eppes: Can list these things in a report, risks and risks for MCL's, lay it out such that can compare risks
Jalbert: What does the state do for people on private wells in communicating risks?
Campbell: No concerted, systematic effort, outreach,
Williams: For outreach there is a concerted effort, have asked health departments to go out door to door to collect health samples, and they are doing this free of charge; they cooperatively collected samples which we then analyzed; then there are underground storage tanks, which we also coordinate sampling, etc.; if people live near a farm or a service station, they will have their water tested, the results of which go to our department, and we write a risk assessment
Frohmberg: But not a comprehensive program because people could send their samples to any lab in the state, they don't have to go to your department
Szabo: But there is outreach, and you give them a risk assessment, which is?
Williams: We give them a list of recommendations…for private well, if level is above 10, they could minimize exposure by getting on public water or bottled water, perhaps could use reverse osmosis…
Szabo: Here we see a contaminant with a lower risk level, and it already has outreach to the public; what we are doing with radon is what we are already doing with arsenic,
Williams: Recommend ways to mitigate exposure and minimize risk
Jalbert: If already have program of outreach to private well owners, can maximize this program; perhaps can fold radon into outreach program
Campbell: Could fold into Healthy Homes project
Szabo: Even if arsenic levels are low, at 1, they still tell people what their risk is, that any detection of arsenic in water creates a cancer risk, such that if one was to drink this over a lifetime, 2L per day, the person would have a 1 out of 10,00 risk of developing cancer
Frohmberg: Measured alternate water supplies for arsenic, such as bottled water, which always showed up with very low levels
Allen: EPA has big study on bottled water study and levels of contaminants

Eppes: Might be helpful to have list of mitigations and solutions in document as well, as a final point, not necessarily that we discussed the options, but they exist.
Field: Should look at issue of training of mitigators, how is mitigation implemented?
Campbell: Another take home point….how are mitigators qualified? State should have a list of qualified and recommended mitigators, that provide radon services, people screened to see if they have been trained and will follow the EPA protocol…

Jalbert: A lot of cross over businesses between states, some states have good programs; want to enforce against unregulated mitigators, cannot rely upon the two existing organizations, because they don't have the resources or the reliability to delist and check after mitigation techniques and mitigators
Chase: It takes a long time, and people just don't want to do this, the State should create their own list and enforce qualified persons; Maine has certification, and has conditions for being added to a list of qualified mitigators;
Field: In Iowa to be a tester need a bachelor and 3 years experience of testing, almost too stringent
Chase: This refers to a lot of radon air stuff, not radon in the water…the question and issue and whole list of protocols for radon which is removed from water, what to do with product…