U.S. Environmental Protection Agency
NDWAC LEAD AND COPPER WORKING GROUP

September 18-19, 2014

Location:
Cadmus Corporate Office
1555 Wilson Blvd. Suite 300
Arlington, VA 22209

Meeting Objectives/Desired Outcomes:

- *Share follow up ideas and questions concerning webinars.*
- *Provide input on what cost effective sampling protocols that achieve public health improvement might look like.*
- *Provide input on questions related to public education.*
- *Consider a proposal to modify the work group charge.*
- *Plan next steps.*

A. Welcome, Introduction, Meeting Objective and Agenda

Ms. Gail Bingham, the meeting facilitator from RESOLVE, welcomed everyone to the third meeting of the National Drinking Water Advisory Committee (NDWAC) LCR Working Group (hereafter referred to as the "LCRWG" or "Group").[1] She asked each LCRWG member and all meeting attendees to introduce themselves before asking Dr. Peter Grevatt, the EPA Office of Ground Water and Drinking Water (OGWDW) Director, to provide opening remarks.

Dr. Peter Grevatt thanked the LCRWG for their work over the last few months. He reiterated the significance of this collaborative effort because the Lead and Copper Rule (LCR) is such an important rule, offering that we need a rule that is fully implementable and can be put into place successfully. These rule revision discussions need the diverse set of perspectives represented on the LCRWG.

Dr. Grevatt noted that this meeting will focus on important issues that include public education (PE) and the sampling protocol for lead. The next meeting in November will focus on lead service line replacement (LSLR).

Dr. Grevatt has heard reports of terrific collaborative effort over the last several months. He emphasized the importance of having the Group share their perspectives with each other and EPA. He added that with each additional meeting and discussion topic, it becomes important for the Group to consider how

[1] Please see Attachment A for a list of the LCRWG members and public presenters. Please see Attachment B for a list of the meeting attendees.

all of the pieces will integrate and fit within the greater rule. He expressed his appreciation for all that the Group has done and their participation.

Following Dr. Grevatt's remarks, the LCRWG asked the following questions and comments:

- One LCRWG member asked if all recommendations would be in the report to the NDWAC including those on which the Group did not achieve consensus. Dr. Grevatt responded that EPA is interested in all recommendations. Ms. Bingham explained that non-consensus could be addressed by structuring the report to present the main idea and the pros and cons of other options.

- Other LCRWG members asked if their recommendations could go beyond the Safe Drinking Water Act (SDWA) because lead issues are not limited to drinking water and in some instances, such as lead service line replacement (LSLR), the LCR may not be the best tool for solving the problem. For example, could recommendations include an expansion of the Childhood Lead Prevention Program and real estate requirement? In response, Dr. Grevatt agreed that the Group could consider recommendations that go beyond SDWA if they relate to lead in drinking water. The Group discussed having a separate section for those recommendations.

- Another LCRWG member noted that lead is only one component considered by his water system when they prepare a risk matrix. He is trying to envision a treatment process for the next 10 or 20 years. Dr. Grevatt agreed that the question of whether we want the same system in the future as we have today is an important one. For example, we do not want to replace a lead service line (LSL) with another LSL. He added that a lot of the discussion revolves around corrosion and for the Group to think holistically if a problem is related to corrosion.

Ms. Bingham reminded the Group of the progression of the LCRWG meetings. During the first meeting, they looked at the rule as a whole and will do so again after the November meeting. For this September meeting, the focus is on sharing perspectives on possible recommendations concerning public education and sampling protocols. In formulating recommendations, Ms. Bingham encouraged them to consider how the pieces are integrated, to draw each other out in conversations, to think collaboratively and to consider the recommendations' implications. She reminded the Group that she will be using the meeting notes to pull together draft recommendations that will be discussed during the early 2015 LCRWG meeting.

Ms. Bingham described the handouts provided by EPA to the LCRWG, which included an agenda, a lead sampling protocol primer, public education (PE) primer and a document from Dr. Elise Deshommes and Dr. Michele Provost from Polytechnique Montreal that summarizes some of their research on lead sampling protocols.[2] Ms. Bingham noted that Hector Gonzalez, who is a LCRWG member, cannot attend but sent an email with a few thoughts that she can share with the Group. In addition, she indicated that

[2] See Attachment C for the meeting agenda. See Attachments D and E for the public education and lead sampling site protocol primers, respectively. See Attachment F for a copy of the written statement from Dr. Deshommes and Dr. Provost.

three individuals had signed up to provide public comment for the first day (See Section H for public comments for both meeting days.)

B. Summary of Webinars

Ms. Lisa Christ, EPA Targeting Analysis Branch Chief, provided a summary of the August 20, 2014 webinar on lead and copper health effects and PE requirements and the September 9, 2014 webinar on the lead sampling protocol.

During the August webinar on health effects and PE[3]:

- Joyce Donohue (EPA – Office of Science and Technology) first discussed lead health effects, environmental lead control efforts over four decades and a Montreal case study that examined the impact of lead on children's blood lead levels (BLLs) from three sources of lead (drinking water, indoor dust and paint). She also discussed copper nutrition and toxicology.

- Jerry Ellis (EPA – Office of Ground Water and Drinking Water) talked about the current lead PE requirements and the 2007 revisions to those requirements, which included revisions to the content and delivery requirements, additional health information for lead in the consumer confidence report (CCR) and supplemental monitoring and customer notification requirements. He also presented some options for copper PE for the LCRWG to consider.

- Melissa Elliott (Denver Water) also discussed the 2007 PE revisions. She emphasized the importance of ensuring that the message is understood and informative to everyone, that the delivery mechanism targets the right audience and to consider these points when thinking about copper PE. She noted that effective communication takes a lot of time and must be very proactive. She also presented Denver Water's case study that showed excellent execution but noted the difficulty is measuring whether it was effective.

- Stacy Jones (Indiana Department of Environment Management) discussed the current lead PE requirements, the most effective types of PE materials and some of challenges states have with oversight. She also discussed the difficulty in gauging customers' understanding of the PE materials.

During the September webinar on the sampling protocol:

- Marc Edwards (Virginia Tech) talked about lead poisoning, health effects and lead sources. He discussed a child lead poisoning case where drinking water was the source. He also explained factors that can affect lead concentrations in a sample (e.g., sample technique, preservation method, flow rate, bottle size and particulates). In addition, he explained that a first-draw

[3] The webinar recording, presentations for and questions raised during these webinars can be found at: https://drive.google.com/?tab=mo&authuser-0#folders/0B-3D2NT30pQDaFlGTTJnTWxmZ0k

sample and the practices of pre-stagnation flushing and aerator removal misses LSL lead and particulate lead when present. He also noted the potential for exposure from lead in cooking.

- Miguel Del Toral (EPA Region 5) talked about the LSL sampling study in Chicago. He discussed the variation in lead levels among sites and included some configurations of interior plumbing and LSLs. Mr. Del Toral also talked about how variations in water usage can impact lead concentrations. In addition, he discussed particulate lead release, which is sporadic and difficult to capture. Further, he did a quick assessment of the current lead protocol and how using the same liter at all sites can miss peak lead levels.

- Jeff Kempic (EPA – Office of Ground Water and Drinking Water) discussed the current sampling protocol and the studies used to develop it. He talked about first-draw samples and subsequent liters and their relationship. Mr. Kempic also talked about lead spikes, which are generally due to particulate as opposed to peak lead levels that typically represent LSL contributions. In addition, he presented some of the sampling protocol changes that EPA is considering.

- Jeff Swertfeger (Greater Cincinnati Water Works) talked about the variability among states' guidance regarding stagnation time prior to sample collection. He emphasized that the sampling protocol should be easily understood, should not dis-incentivize investigatory sampling and should create actionable data. He discussed the challenges with maintaining sampling pools and with collecting and analyzing the large number of samples. He also discussed how spikes from particulate lead and peaks from LSLs might be used to inform corrosion control treatment (CCT).

- Stacy Jones (Indiana Department of Environment Management) provided several states' perspectives on the LCR sampling protocol. She noted that states vary in their perceptions on whether tap sampling is trying to assess exposure or CCT effectiveness. She discussed challenges with the sampling protocol that included no maximum stagnation time and samples being collected from improper sampling locations (e.g., at janitors sink). Ms. Jones also talked about the rigidness of the current sample invalidation protocol and the inability to do investigative sampling. She also discussed the high cost of sample analysis for more remote areas and the difficulty in maintaining a sample pool. In addition, she noted that higher lead levels are sometime found beyond the calculated volume for internal plumbing and LSLs and that particulate lead "spikes" are often seen in the water prior to the LSL.

The LCRWG had the following observations related to the August webinar:

- One LCRWG member noted that PE message should not make people afraid of living in their homes but needs to inform them of the risk from lead to make an informed decision and take appropriate actions. He provided a handout ("Recommendations on the Public Education Requirement for Lead in EPA's Lead and Copper Drinking Water Rule") that provided 10 ideas based on Melissa Elliott's presentation. (The suggestions in this document are reflected in the PE discussion in Section F for lead and Section G for copper.)

- One member provided a handout (The LCR's shared-responsibility regime) that describes the shared responsibility of the public water system (PWS) and consumer under the LCR to protect public health. It highlights on-going consumer responsibilities that are independent of the lead 90th percentile level and consumer responsibilities that apply when the PWS has a lead action level exceedance (ALE).

- Another member noted that some of the current LCRWG members were part of the 2006 NDWAC workgroup who recommended the revisions to PE, some of which are reflected in the 2007 Short-term Revisions. He summarized some of the changes they hoped to accomplish as follows:

    - Provide a broad-based program and identify places where information should be disseminated so that everyone would get some information. This involved a coordinated approach within a community to include public health groups and public health practitioners.

    - Revise the CCR to provide lead information even if the public water system (PWS) had no ALE to recognize that there is no safe level of lead.

    - Provide plain language by minimizing the amount and complexity of the mandatory language and include key topics that must be covered. He noted that based on feedback from a focus group, people mistrust more complicated language because they think it is hiding information.

    He added that the PE language for homes with LSLs needs substantial improvement and could include better ways to identify LSLs. He noted that the PE working group was not asked to focus on LSLs.

- Another member agreed that better communication is needed but thought that the suggestions made by the other two LCRWG members belong in guidance and not in the rule. He provided a handout (Public Communication – Lead vs Copper) to help the Group think about what information should be in the regulation. He defined three audiences: 1) Everyone; 2) Certain higher risk customers (e.g., those with LSLs or those with new copper plumbing/those receiving water that is corrosive to copper) and 3) Sensitive populations. He noted that the level of education should be greater for higher risk customers and that the medical community and not the PWS has access to sensitive populations.

- Another member agreed that PE should be thought about broadly and stressed the importance of the language and types of materials being distributed. She also agreed that PE or communication should not be limited to a lead ALE but should be proactive and consider critical opportunities to reach people, such as when a woman is pregnant and people are buying a house. She asked the Group to consider bidirectional PE as opposed to the current unidirectional communications.

- Another member noted that when discussing effective PE, the Group needs to think about the changing demographics of our communities. For example, a community may have an increase in the Spanish-speaking population and Spanish has different dialects. Sometimes our English does not translate well into another language. This emphasizes the need for partnerships with health departments and other public health agencies who are more experience with these communication challenges.

- One member suggested that the Group look at the September 2013 EPA document "Protect your family from lead in your home", which explains risk from lead paint in pre-1978 homes.[4] EPA developed this document with the United States Consumer Product Safety Commission and United States Department of Housing and Urban Development. Thus, there is a precedent for partnerships with respect to PE. He added that real estate dealings require disclosure of information about lead paint and he questioned what is known about the location of LSLs and goosenecks.

- One member indicated that PE is ineffective unless it tells the individual their specific risk and actions they can take. He thinks this also ties back to the purpose of sampling and after the webinars, he understands how complicated it is to determine risk through sampling.

The LCRWG provided the following comments related to the September webinar on sampling protocol:

- One member indicated that unlike bacteria, the system's response to finding lead in water is unclear. Bacteria can be killed but he does not know what to do with the lead results.

- One member questioned how a water system could have a lead problem in the absence of LSLs. In response, Jeff Kempic (EPA – OGWDW) noted that LSLs contribute the most lead compared to solder and brass fixture/faucets. However, particulates can come from galvanized piping that has picked up lead from any of the following: 1) LSLs (even when the LSLs no longer exist); 2) rusty iron; or 3) particles of leaded solder from aerator grids. Mr. Del Toral added that lead can come from leaded solder and brass. In addition, when water quality changes, aggressive water can cause both high dissolved and particulate lead in homes without LSLs.

Some members provided more general comments about both webinars:

- One noted that more needs to be done to identify who is exposed to lead in drinking water to allow us to find lead sources, fix the problem and communicate about it. We need less lead to get into our drinking water. Some fixes may be through SDWA, but we need other avenues.

- One member reminded the Group that past decisions were based on information available at that time. We know more now, but there are still information gaps. The challenge is using the currently available information to make decisions. For example, using the information we get from sampling for lead may not be the best way to manage treatment. He is not comfortable

[4] Available at http://www2.epa.gov/lead/protect-your-family-lead-your-home-real-estate-disclosure

telling someone what their lead level is based on samples from another site or even their own one-time sample, as lead levels can vary. He suggested that sampling may need to be refocused on treatment and find something else to determine the need for PE.

- Another agreed that the Group should move forward but to be mindful that the rule is dealing with lead, which has serious ramifications. Also, past events have jeopardized public trust (e.g., difficulty and expense of getting information through Freedom of Information Act (FOIA) requests, the effectiveness of partial LSLR).

- One member reiterated the need to remove lead sources and suggested addressing distribution flushing in the LCR or another regulation. She also emphasized the need to remove LSL and for the Group to consider how to do this through SDWA but not necessarily through the LCR.

C. Suggested Revision to the Operational Protocol

One LCRWG member suggested a change to the stated goal in the mission statement in the operational protocol document. She explained that the original goal seems to presume that CCT is the LCR's focus and is a dependable way to minimize lead in water. In her opinion, the suggested changes (shown below in bold) provide a broader goal, recognize the LCR is a public health and shared responsibility rule between the PWS and public and recognize the CCT is an interim measure and not a panacea.

Current Language

"The purpose of the National Drinking Water Advisory Council (NDWAC) Lead and Copper Working Group (LCRWG) is to:

> Provide advice to the NDWAC as it develops recommendations for the U.S. Environmental Protection Agency (EPA) on targeted issues related to long term revisions to the Lead and Copper Rule (LCR) under the Safe Drinking Water Act (SDWA). **EPA's goal for the LCR-LTR** [Lead and Copper Rule Long-term Revisions] **is to improve the effectiveness of corrosion control treatment in reducing exposure to lead and copper and to trigger additional actions that equitably reduce the public's exposure to lead and copper when corrosion control treatment alone is not effective. ...**"

Suggested Revision

"The purpose of the National Drinking Water Advisory Council (NDWAC) Lead and Copper Working Group (LCRWG) is to:

> Provide advice to the NDWAC . . . under the Safe Drinking Water Act (SDWA). **The goal for the LCR-LTR is to improve the effectiveness of the Lead and Copper Rule in reducing equitably the public's exposure to lead and copper.** …**"**

The Group discussed these potential changes and decided that a stated goal was unnecessary and to update the mission statement to reflect this decision.

D. Sampling Protocols: Implications in Context of the Entire Rule

The LCRWG and EPA discussed the implications of the sampling protocol in the context of the entire rule. In addition to some general comments, the Group discussed the purpose of sampling, in-home sampling, first-draw samples, a single prescriptive liter versus sequential samples, tools for monitoring outside the home and other sampling options. Key points from each discussion area are provided below.

1. General Sampling Protocol Comments

The LCRWG and EPA provided the following broader comments related to sampling:

- We should use two different sampling protocols for LSL- versus non-LSL sites. In general, a first-liter sample is fine for non-LSL sites because it is designed to capture the worst-case sites. Mr.Michael Schock clarified that this is generally true and will capture lead for brass and lead solder but in a LSL system with lead IV scale[5], lead levels may be lower in LSLs than in brass.

- We do not know how to account for particulate vs. dissolved lead and how this would translate to decisions about CCT.

- We need a simple protocol with repeatable results and a constant sampling pool to determine a change in water quality as opposed to something that is due to a change in a home, the use of a different sampling location or improper sampling.

- We need multiple samples to understand lead exposure at someone's home. If the results are repeatable and can adequately be explained to the customer, he/she can take action. The information could indicate something about the system (particulate, scale), which could help inform the system about CCT effectiveness but very few people have the expertise to understand how to interpret in-home lead data and to apply it to corrosion control. We need training so more people could gain that understanding.

- We need to do a better job explaining to homeowners that monitoring is under their control.

- We should retain the allowance that systems can collect in-home samples.

One member provided three handouts that served as background for the LCRWG as follows:

- The first (Total Recoverable Metals Analysis) indicates the process for analyzing lead and copper samples with high and low turbidity.

- The second illustrates a PWS's sample collection process starting with identifying and recruiting customer participation through reporting the results to the state. He estimated this process could take 30 to 40 FTE hours per reportable sample result.

[5] **Lead(IV) oxide**, commonly called **lead dioxide,** is a chemical compound with the formula PbO_2. It is an oxide where lead is in an oxidative state +4. Lead (IV) oxide is an insoluble form of lead. This type of scale helps to prevent lead from being released into the water.

- The last (Purpose of Lead or Copper Sampling) is a table intended for the Group to complete when thinking about how to answer key sampling questions (i.e., why sample, what for, where, when, how, who will collect it, data quality, how will the data be used?).

2. Purpose of Sampling

The LCRWG and EPA discussed the purpose of sampling and provided the following input:

- One member indicated that for his water system, sampling is done to: 1) understand how aggressive water is to metals and cement; 2) comply with state and federal regulations; 3) determine whether treatment is operating in compliance with its state permit based on water quality parameters (WQPs) that can include pH and orthophosphate for lead and copper and non-LCR parameters such as chlorine and fluoride.

- Mr. Burneson reminded the Group that the LCR is a treatment technique rule that requires action based on an exceedance of the 90th percentile level. The first action is CCT. Other actions are PE and LSLR. The purpose of a lead or copper sample is to determine whether the PWS should take additional action such as CCT or LSLR, to motivate its consumers through PE and to evaluate their CCT. WQPs such as pH and orthophosphate are used to determine if a system is effectively operating their CCT.

- Another member indicated that monitoring can serve the following purposes: 1) Understand corrosion, which could be through sampling for pH and alkalinity; 2) Establish a technique to minimize corrosion, which could include distribution system metals analysis and research such as coupon testing; and 3) Maintain CCT, which could involve monitoring for optimal water quality parameters (OWQPs) to see if water quality has changed.

- Another noted that the trigger for CCT is a home tap sample, which has limitations (e.g., the homeowner may have improperly collected the sample, the sample may not be indicative of what is going on with the system as a whole).

- One member indicated that sampling the source water was also required to determine its contribution to lead and copper drinking water levels.

- One member asked if WQPs can be used instead of lead and copper tap measurements to understand corrosion. In response, the Group and EPA provided the following comments:

    - Copper is simpler to understand than lead. Lead can occur in different forms, for example, in particulates and scale in the water system and homeowner's plumbing.

    - It is easier to define water that is corrosive than water that is non-corrosive. The answer would be simpler for systems with one water source, but different layers of scales would form if the PWS changed sources.

- What happens in the distribution system makes a difference; there can be wide variability in water quality.

- Mr. Mike Schock (EPA – Office of Research and Development) clarified that there are degrees of corrosivity. Waters that are pH < 7 with very low and high alkalinities are corrosive. In addition, lead can be released via many mechanisms (e.g., interactions of aluminum and calcium scale, very small changes in water quality, corrosion of iron can sorb lead and seed pipes). Scales that are non-corrosive are still 75%-90% by weight lead. Variation in hydraulics can dislodge some of these scales. Regardless, scales can provide useful information. Copper is easier than lead because the action level is two magnitudes higher than lead. Because we are dealing with low parts per billion (ppb), lead levels in drinking water are harder to predict than copper. Two members asked clarifying questions of Mr. Schock.

    1. *Is water chemistry that is non-corrosive for lead easier to predict for a system that never had a LSL?* In response, Mr. Schock indicated that in the absence of a LSL, it is easier to treat for lead and to predict reactions. However, we still have a problem predicting galvanic corrosion from solder and we need to consider lead release from brass plumbing materials.

    2. *Can WQPs be used to make an assessment of what is happening at the tap?* Dr. Schock responded that he had not seen a good correlation between the two types of samples. Also, utilities struggle with the variability at the tap including those with good process control.

3. <u>In-home Sampling</u>

Two members supported the goals of in-home sampling:

- By picking the worst of the worst, we increase the odds of not missing high exposure sites and ensuring CCT is working.

- For small and medium systems, tap samples are best way to determine if they had a problem. These systems are already familiar with the tap sampling techniques.

Some members questioned the ability of in-home testing to inform CCT decisions as follows:

- Several LCRWG members noted in-home sampling represents the conditions for that home but may not be reflective of lead levels at other homes.

- One member noted that to find out about lead exposure for a home would involve a research project specific to that home. He added that if the results could tell him about his system (particulate, scale), it might help assess CCT, but he would need the help of CCT experts to interpret the data.

- Another member pointed out that systems still have problems with customers improperly collecting a first-draw sample. Systems cannot always ascertain if the variation in lead levels at a home over time is due to poor sampling or a change in water quality. The variability of tap sample results raises questions to its usefulness as a basis for making treatment decisions.

Several members noted the difficulty PWSs have getting homeowners to participate in the sampling pool and retaining them. However, one member did not think water systems have maximized all avenues to get homeowners to sample.

4. First-draw versus LSL Sampling

The Workgroup discussed the option of collecting sequential liter samples or a specific liter to capture water in the LSL instead of a first draw sample. Members identified drawbacks to first-draw samples compared to sampling from the LSL, including:

- It is not adequate for sites with LSLs because it will not capture water residing in the LSL.
- With one sample, the system will miss some critical information on LSLs. A homeowner may be willing to collect as many as three samples.
- A first-draw sample or single sample would not account for system variability and a more robust sampling protocol is needed to assess risk.
- Multiple samples that indicate high lead contribution from the LSL may provide incentives for the homeowner to remove his/her LSL.
- Other comments regarding a first-draw sample:
    - One member suggested that the first-draw sample should be from a LSL.
    - One member noted that a first-draw sample with normal household use ahead of it will sometime pick up the faucet, meter, LSL, etc. We have to be careful when thinking about the protocol prior to sample collection.
    - Another member indicated that although the current protocol misses some homes with high lead does not mean we abandon in-home or first-draw testing.

Several members identified the following potential problems with LSL testing:

- Customers may be unwilling or able to properly collect a LSL sample. In addition:
    - The variability will most likely increase and the repeatability will decrease with the added complexity of moving from a first-draw to LSL monitoring. Treatment decisions need to be based on data for which there is a high degree of confidence.
    - Systems already have difficulty obtaining and maintaining customers and the more we require of them (e.g., profile sampling, completing information for additional samples), the likelier they are to refuse to participate.
- As we learned from the webinar, we cannot agree on what bottle should be used to take a sample. There are many places that variability can be introduced and things can go wrong. He would rather have a professional sampler collect the sample.

- Even if customers are willing to collect three samples, this number is unlikely to reach the LSL. Identifying the liter that is representative of a LSL will vary by home due to different plumbing configurations. It will involve proper staffing, money and oversight.

- Shifting to a different approach other than first draw is not feasible for small water systems. States would not be able to verify whether or not they did it correctly.

- LSL testing may require the system to sit down with the homeowner to explain the sampling procedure and/or provide incentives on the water bill for his/her participation. If a single LSL sample is required, systems will need information on each home to instruct them on the correct sample to collect.

- Is testing from the LSL necessary? We already know even systems with CCT can see lead spikes. For example, "If there is a cow in the well, do I need to test for bacteria?"

- Although profile sampling can provide individuals at the sampled home with information on exposure and help them make an educated decision, it does not help with corrosion control decisions.

5. <u>Tools for Monitoring Outside the Home</u>

The LCRWG and EPA discussed alternatives to in-home tap monitoring. Some suggestions included:

- Using a central location in a water system to conduct some routine and frequent sampling for a given set of parameters.

- Improving the effectiveness of WQP monitoring by increasing the representativeness and geographic distribution of the sites and increasing the monitoring frequency. The data could be used for trend analysis.

- Measured parameters could also include disinfection residual. Also making the monitoring program more robust could reduce the chance of having increased corrosivity.

- Using surrogates such as is done with chlorine residual as an indication if treatment as a whole is working. There is precedence in other rules, such as Microbials and Disinfection Byproducts (MDBP) rules in which CT and turbidity are used as surrogates for viruses and bacteria.

- Using coupon tests for larger water systems.

- Using a house-in-a-box plumbing rig setup that simulates a typical residence's plumbing materials, over which the utility has complete control of testing and sampling.

In response to these suggestions, some members did not agree that surrogate sampling sites and a more robust WQP monitoring program could replace in-house sampling. In addition, Mr. Schock indicated that what is going on in the distribution system is not always reflective of what is happening in the home and cannot be recreated in a surrogate. To use a surrogate, we need to know the mechanism. For systems

with LSL, there is the potential for a lot of variability in lead levels. However, statistical tools are available to interpret the data.

Other comments included the following:

- One member asked Mr. Del Toral to provide background on the LSL sampling study in Chicago. In response, he indicated that he saw fairly consistent lead levels in this study because of the absence of particulates. However, even for a system that has a lot of variability, the results (possibly minimum, maximum or 90th percentile levels) can be plotted over time to assess trends but the analysis should not include sites from chronic low flow or abandoned homes.

- Another suggested that the Group consider discussing a mechanism to develop trend data to see if the system has a problem. He added that if we want to use tap sample to make CCT determinations then we need another sampling protocol.

6. <u>Other Sampling Options</u>

- Several members suggested using professional sample collectors to minimize first-draw sampling errors introduced by homeowners and to conduct profile sampling. Other comments included:

    - The professional sample collector would be needed regardless of system size and must be trained in pipe diameters volumes to properly collect a LSL sample.

    - Whether resources would allow for a professional sample collector. EPA should explore if funding could be obtained for professional samplers as is done with the Unregulated Contaminant Monitoring Rule (UCMR) program.

    - Professional sample collectors are not a viable option for first-draw sampling because the stagnation requirements necessitate that the sample be collected very early or immediately after work. Thus, it is really only practical to have homeowners collect them.

- One member suggested revising the sampling protocol to conduct monitoring that reflects normal use. He thought that capturing average exposure would be more meaningful, easier to collect, less expensive and more informative for CCT decisions. He acknowledged that this method might miss peak exposure but individuals might not be drinking the water when the peak occurs or consuming their entire daily water intake from their homes. In response:

    - Some members thought that the current first-draw protocol was more likely to find higher lead levels.

    - Mr. Burneson added that this suggested approach is similar to the random daytime sampling (RDS) approach used in the UK, which requires more samples to minimize avoiding peak exposures.

- Another member noted that the UK has laws which allow them access to people's homes, which is not an option in the US.

- One member noted that measuring soluble lead is more reliable than measuring particulates lead. Therefore, should we think about a different sampling protocol that would establish more predictable soluble lead and then look at particulates (e.g., measure the lead from a filter on a tap)?

- Some members indicated that we need to be open to new technologies and innovations that could improve sampling (e.g., a filter that represents a week's worth of use or a smart grid).

- Other suggestions included:

  - Allowing systems that have met their goals of optimizing CCT to use their resources in more effective ways than monitoring triennially (e.g., to replace LSLs and to sample homes where people have lead concerns).

  - Allowing smaller water systems that are optimized but want to do a better job to conduct a desktop or analogous study to help with optimization.

  - Making the LSLR requirement independent from CCT. The requirement for LSLR is currently hinged on a continued lead ALE after CCT. At some point, even with well-controlled CCT, there could be a lead release from a LSL.

  - Providing a clearinghouse for information because expertise is limited to a small number of people.

  - Expanding the role of the lead sampling technician that tests homes for leaded paint to include the collection of water samples.

E. Sampling Protocols: Implementation Questions

The LCRWG and EPA discussed the need for copper sampling based on water corrosivity, sample invalidation, maximum residence time, pre-stagnation flushing and aerator removal. Key points from each of these discussions are provided below.

1. Need for Copper Sampling

One member explained a concept that was discussed during the May LCRWG meeting in which systems would be placed into one of three bins based on their water's corrosivity to copper using WQP data (e.g., pH and alkalinity) from sites in the distribution after treatment[6]. This approach would reduce the need for copper tap monitoring at new homes since these sites might be difficult for systems to find. The proposed bins are as follows:

[6] Refers to the document, "Water Qualities that Would not Require Monitoring for Copper", which is described in in the May LCRWG meeting summary. The summary is available at http://water.epa.gov/drink/ndwac/lcr.cfm

1. Clear bin: System's water is non-corrosive to copper. Copper monitoring is not needed but the system would require periodic WQP monitoring to confirm that the water stays non-aggressive.

2. Blue-green bin: System's water is very corrosive to copper. The system would need to take some action (e.g., treatment, copper PE).

3. Gray bin: System's water corrosivity is uncertain. Copper monitoring could be required to help assess water corrosiveness and to place these systems into either the clear or blue-green bins.

The LCRWG and EPA provided additional comments and suggestions regarding the binning process:

- An advantage of binning is that the monitoring is conducted in the distribution system by trained samplers. This provides more confidence in the data on which to make treatment decisions.

- One member clarified that the binning process will identify and consider pockets or zones with corrosive water.

- One member suggested that systems should be allowed to conduct either copper tap monitoring or WQP monitoring to determine their appropriate bin. Small systems have been conducting tap monitoring for the LCR but may not be monitoring for pH or alkalinity in their distribution system.

- Mr. Schock indicated if we establish the bins to conservatively identify systems with non-corrosive water, the gray bin is not needed. He noted supplemental wells should also be evaluated in the binning process.

2. Sample Invalidation

The LCRWG discussed the current sample invalidation criteria[7] and the requirement that systems include a result in the 90th percentile calculation if it is analyzed by the laboratory. Specific comments included:

- One member disagreed with the current allowance to exclude samples before they are analyzed or to invalidate them after the results are known. She preferred that questions be asked prior to sample collection.

- Another member wanted to avoid unnecessarily requiring a small system to install CCT. He added that having systems question homeowners about their samples might further exacerbate the problem of retaining individuals in the sampling pool.

- Another member described the following checkpoints that can facilitate the decision to invalidate a sample: 1) A state lab accreditation process and sample chain-of-custody; 2) The rule's requirement for a system to submit a sample invalidation justification on which the state

[7] Under the current rule, the State can invalidate a lead or copper sample if: 1) The laboratory establishes that improper sample analysis caused erroneous results; 2) The State determines that the sample was taken from a site that did not meet the site selection criteria of this section; 3) The sample container was damaged in transit; or 4) There is substantial reason to believe that the sample was subject to tampering.

will base its decision; and 3) A customer sample collection questionnaire regarding whether the sample was collected properly.

Other sample invalidation comments included:

- The reason for a high result can be due to a sample with a very high stagnation time. One member indicated that setting a maximum stagnation time could help this issue.
- The use of professional samplers will minimize the instances of improper sample collection.
- The need to allow systems to collect confirmation samples before requiring treatment or other actions. Confirmation samples are used in other rules, e.g., TCR.

3. Maximum Stagnation Time and Pre-stagnation Flushing

Many members supported a maximum stagnation time that would be based on a time that is longer than what a person would typically consume. Suggestions included 36 hours, 3 days or 4 days. One member indicated that establishing a maximum residence time would eliminate the desire for pre-stagnation flushing.

4. Aerator Removal

Many LCRWG members agreed that the aerator should not be removed prior to sample collection and provided additional comments as follows:

- EPA already has guidance not to remove an aerator prior to sample collection and should make this a rule requirement for national consistency.
- We should provide education that the aerators should routinely be cleaned.
- We should consider requiring systems to look at the materials that accumulate on the aerator. If particles are found, the next step could be additional testing. Another member agreed but suggested that it be optional because he did not want failure to conduct this step to be a reason to invalidate a sample.

F. Public Education for Lead

The LCRWG and EPA discussed the roles and objectives of lead PE, the information to be conveyed, delivery mechanisms, the potential to establish an imminent and substantial endangerment level and CCR and other forms of communication. Key points from each of these discussions are provided below.

1. Role and Objectives of Lead PE

The LCRWG provided the following comments regarding the roles and objectives of lead PE.

- One member suggested rethinking the approach to PE to inform people about lead in drinking water and their responsibilities during times of non-crisis. Currently, PE is only required when a

system has a lead ALE. Another member supported communicating at non-crisis times (i.e., no lead ALE) but indicated that his PWS has had trouble getting pediatricians and hospitals to maintain interest in communicating the message in non-crisis times.

- Another suggested broadening PE to include not only lead but copper, plastic and other plumbing materials. In addition, to coordinate the development of PE among EPA, AWWA and other agencies instead of having each develop materials on their own. Another agreed that PE should include other contaminants and not single out lead because it could undermine other efforts for other rules.

- One member suggested tying PE requirements to the presence of LSLs.

- Another stated that PE requirements must be enforceable and within the power of the PWS.

2. <u>Information to Be Conveyed</u>

The LCRWG discussed the current lead PE content requirements that include mandatory health effects language and specific topics that can be customized by systems to fit their situation.[8] Specific messaging suggestions included:

- Explicitly state that there is no safe level of lead.

- Provide a clear message that although a system may be below the AL, some customers may have elevated lead levels in their drinking water.

- Emphasize the importance of removing LSLs and provide specific information about LSLs that include: the prevalence of LSLs in the current US housing stock, information on both partial LSLR and full LSLR, who is responsible for the replacement, how to tell if there is a LSL, who to contact if they choose to replace the LSL and their options for reducing exposure (e.g., does filtering work?). Provide an example of PE language that supports full LSLR.

- Include an explanation of the limits of sampling (e.g., one-time test may not be adequate).

- Provide simple and common sense information that includes non-cost prohibitive measures for consumers to reduce lead.

- Take care that the message does not drive people to use bottled water.

Members also discussed having a national and professionally done brochure(s) by risk communication experts. Other suggestions included:

- Use visuals to convey information rather than relying on text.

[8] These mandatory topics are: Sources of lead, what consumers can do to reduce their exposure to lead in drinking water, why there are elevated levels of lead in the system's drinking water (if known) and what the water system is doing to reduce lead levels and additional information sources.

- Develop brochures with varying levels of information. One version would be brief to catch people's attention and would provide a source for additional information. Another, would be more detailed and could contain information specific to full or partial LSLR, if applicable.

- Utilize EPA and PWS websites to provide more information.

3. <u>Delivery Mechanisms</u>

The LCRWG discussed ways to improve PE delivery, the roles that others organizations could play in delivering PE and the importance of building partnerships.

Some members discussed the limitations of water systems to provide PE that included:

- Water utilities typically do not have the staff to effectively conduct proper PE.

- To be effective, we need to catch people when they care. Teachable moments include a visit to a health care provider for pregnant women or buying a house that has an LSL.

- The requirement for systems serving 500 or fewer people to locate health practitioners, health department and create the materials was very difficult. It put the onus on the state and was difficult to track and to enforce. Water systems have a responsibility to let people know what is going on at their taps, but some of the information would better be conveyed by others.

Several members discussed the need to build better partnerships with public health departments, health care professionals and individuals working in lead in childhood prevention who are in the best position to provide lead PE. Specific comments included:

- We first need to educate these potential partners that there is a risk from lead in drinking water.

- We are more likely to be successful at engaging pediatricians and obstetricians/gynecologists (OBGYNs) if the message comes from someone with more clout than a water system, such as Centers for Disease Control (CDC), Health and Human Services (HHS) or EPA.

- We need a structure to help PWSs leverage the public health message in the community. At first, it may be a forced partnership in which a public health organizations or other potential partners' funding is tied to their assistance in providing lead PE. An example is the Centers for Excellence in which their funding was tied to a requirement to have educational community based research. Now this research is part of their mindset.

- EPA should consider what steps they can take to facilitate communications with needed partners.

- We need a consortium of partnerships that will consider all sources of lead.

Other members suggested a broader distribution that could include:

- Fact sheets and information targeted to school-aged children on EPA's website to alleviate some of the burden on PWSs to get more information out.
- Social media and other outlets such as YouTube.
- Requiring PE to be provided not only to homeowners but to renters.

4. Establishing an Imminent and Substantial Endangerment Level

One LCRWG member suggested that EPA establish an imminent and substantial endangerment level for lead that would trigger immediate and more aggressive notification to the individual whose home was sampled and for people in a similar situation. The notification could also be provided to the health department. He suggested two ways to identify others that need to be notified: 1) Everyone on the same branch if there was a disturbance; or 2) Everyone with a LSL. Some members expressed agreement with notifying individuals in the sampled home and the health department but disagreed with notifying those in similar situations for the following reasons:

- This provision would be hard to implement and enforce because of the difficulty for the PWS to identify those in a similar situation (e.g., they may not know the location of LSL and partial LSLs) and for the state to determine if they notified that group.
- PWSs may have different ideas than the state regarding what is similar.
- We do not want to dilute the effectiveness of PE by overdoing it or informing someone that is not in a similar situation.
- To find out the exact conditions from one address to another takes time and it is difficult to extrapolate a lead result to another home.

Based on this feedback, the LCRWG member who presented the imminent and substantial endangerment concept suggested a default situation in which systems would be required to notify everyone with a LSL unless they could justify to the state another reason for the high result. Another member suggested instead of using a default situation to require the PWS to first investigate the cause of the high level and then investigate other similar situations before notifying other homes.

5. Consumer Confidence Reports and Other Forms of Communication

The LCRWG and EPA discussed the current CCR requirements[9] and suggestions for improvement. Some members suggested language changes to:

- Explicitly state that there is no safe level of lead.

[9] CWSs must provide information in their CCRs on lead in drinking water irrespective of whether the system detected lead in any of its samples. The requirements include a short informational statement, the lead AL, MCLG, the level for 90th percentile, number of sites above the AL and whether there was a violation. The CCR applies to all drinking water contaminants monitored under SDWA.

- Clearly alert people to the fact that even when there is no ALE, they may have lead in their drinking water.
- Include the highest lead level instead of just the 90th percentile level.
- Tie the information to actions people can take.

One member questioned if the current CCR places too much emphasis on lead because all community water systems (CWSs) must provide lead health effects information regardless of their 90th percentile level. For other contaminants, health effects language is required only when the MCL is exceeded. One member did not think this was an issue for lead because the CCR requires CWSs to provide health information for three contaminants when they exceed ½ the MCL and consumers may have to take actions in their homes in response to high lead levels.

Ms. Christ explained that in addition to PE and CCR, PWSs are required to deliver:

- Public notification (PN) that is triggered when a system has a violation and includes mandatory health effects language for lead and copper.
- Lead consumer notice to all people that had their samples tested within 30 days after the PWS learns of the tap result. In response, one member indicated that some systems have websites where people can look at water quality data.

G. Public Education for Copper

Mr. Burneson summarized the copper discussion from the first three LCRWG meetings. He explained that EPA asked questions about copper site selection, acknowledging that we are not likely to find the highest copper levels at sites selected for high lead levels. If the sampling protocols change, should copper PE requirements be developed? Mr. Burneson asked if we assign systems to bins based on their aggressiveness to copper, what are the monitoring and PE requirements for each bin.

In addition to some general comments, the LCRWG and EPA discussed, copper health effects, the copper PE messaging, how the binning process could be used to determine copper PE requirements, the intended audience, delivery mechanisms and copper PE language in the CCR and PN. Key points from each of these discussions are provided below.

1. General Comments

The LCRWG provided the following general comments.

- Several members did not think that lead and copper PE should have the same structure because for lead there is no safe level and copper has a different targeted audience.

- One member noted that most systems that have corrosion control in place for lead will help minimize copper levels. If systems have truly aggressive water then some of those systems might already be treating their water.

- Dave Cornwell (EE&T)[10] explained that for systems with corrosive water, copper corrosion can go on for a while and thus higher copper levels may not be limited to new houses. One member wanted to revisit at a later meeting his suggestion that local plumbing codes prohibit copper for use in areas with water that is aggressive to copper.

2. Copper Health Effects

The LCRWG and EPA discussed the health effects of copper and the sensitive populations when considering the targeted audience and PE message. Ms. Donohue reiterated the following information from the webinar:

- The incidence rate for individuals that don't know they have Wilson Disease until they die of liver disease is 5% based on two studies.

- People are not usually diagnosed with Wilson Disease until they are in their 30s or 40s because copper takes a long time to build up in the body. These individuals cannot transport copper properly from the liver to their bile. Recent papers suggest some link between Alzheimer's and copper but she is still skeptical of this connection.

- One in 90 people carry a defective gene and will never get Wilson Disease. However, these individuals are more likely to accumulate copper than the average population and more susceptible to liver or brain damage from copper accumulation.

- Individuals with Wilson Disease are the sensitive population, but the general population is subject to gastrointestinal (GI) distress. People can experience rapid onset within the first 15 minutes of consuming high copper levels. Mr. Burneson reported that the maximum contaminant level goal (MCLG) of 1.3 mg/L is based on GI distress.

- The drinking water dietary restriction is 0.1 mg/L according to the Wilson Disease website (http://www.wilsondisease.org/). There are very distinct restrictions for copper intake for those with Wilson Disease. After receiving treatment that helps remove copper, the copper restrictions can be reduced.

- In a categorical regression analysis, the general population is accumulating copper at 2.6 mg/day.

- The recommended dietary allowance for adults is 0.9 mg/day; 1 to 1.3 mg/day for pregnant or lactating women (higher if they are teenagers), 0.2 mg/day for infants from birth to 6 months and 0.22/day for infants 6 to 12 months.

[10] Environmental Engineering and Technology, Inc.

In response, LCRWG members provided the following comments:

- One member asked what the PE message would say for an individual that may someday get Wilson Disease. She assumed that those with Wilson Disease would be educated by a doctor.
- Another member noted that a copper level of < 0.1 mg/L cannot be met in many instances. Instead of telling everyone that they should be worried about copper, he agrees that doctors should provide the education.

3. Copper PE Messaging

LCRWG members provided the following comments regarding the copper PE messaging.

- Many members were unsure how to word copper PE that could explain the health effects and dietary necessity or restrictions for copper to properly inform the population spectrum that includes the general population, those that may carry the defective gene for Wilson Disease, those who are unaware they have Wilson Disease and those with diagnosed Wilson Disease.
- Some members suggested broad categories of information that could be included in the materials such as:
  - Basic education on how to manage copper and what to look for in a home.
  - Potential indicators of high copper levels (metallic taste and copper staining)[11] with recommended actions, such as get the water tested or get tested for Wilson Disease.
  - Health effects language. One member noted that the language should address GI distress; however, this message is complicated by the fact that GI distress can be caused by other sources.
  - Measures to reduce exposure. However, some members noted that flushing was not an option and were unsure what steps to recommend.
  - A clear statement for the 1 in 90 individuals with the defective gene about the simple steps they can take to reduce their exposure.
- One member suggested getting guidance from health care organization to help develop the needed message.
- One member indicated that the message should not contain generic diffuse alarming language that will cause people to use bottled water.

[11] One member provided a handout, which summarized research conducted by Dr. Andrea Dietrich (VA Tech) on the aesthetic issues related to copper in drinking water.

4. Using Binning to Determine Copper PE Requirements

LCRWG members differed in their opinions for which systems education is needed. Specific comments included:

- Some members thought that copper PE should not be required for any system because:
  - Copper will passivate quickly for systems with non-aggressive water.
  - PWSs that have aggressive water to copper plumbing should install CCT and if they fail to, will be required to issue PN, which will inform the systems' consumers including those with Wilson Disease.
  - Systems may not be able to provide PE at "teachable moments".
- One member questioned if some interim education is needed for consumers served by systems that are in the process of installing CCT for copper (which can take years) because unless the system misses its deadline, there will be no PN.
- Other members wanted some basic level of information for all systems regardless of water corrosivity.
- Other members thought copper PE should be restricted to systems with aggressive water. One added that only a limited number of systems will have water that is aggressive to copper. Mandatory copper PE will add more requirements for the state to track, which may not be the best use of state resources. In addition, if information is provided by the system to the building department, how does the state track this (many state drinking water regulators are not connected to that group)?

5. Identifying the Audience/Disseminating Information

Members differed in their opinions regarding who should receive the copper PE. Suggestions ranged from providing general education for all individuals to limiting it to a targeted group (e.g., people with new home construction, those with undiagnosed Wilson Disease, those served by systems with corrosive water).

- Some members suggested that the information about copper should be a public awareness piece that could be disseminated by a health care organization or entities other than the PWS.
- Several group members agreed that similar to lead, copper PE needs to be distributed during teachable moments to be effective. Good teachable moments are when someone is buying a new home or applying for a building or plumbing permit.
- The Group noted that most water systems are not in the position to properly educate consumers on copper health effects and to learn about new construction or homes undergoing remodeling. They provided some suggestions for disseminating copper education that included:

- Using EPA or health departments' websites and enlisting the assistance of doctors who deal with Wilson Disease.

- Enlisting the assistance of trade associations such as National Association of Home Builders (NAHB), National Association of the Remodeling Institute (NARI) and a plumbing council to reach individuals who remodel.

- Providing brochures to local housing authorities and store plumbing departments to reach individuals who are buying or constructing new homes or remodeling.

- Providing standardized visuals in a new home alert.

- One member suggested that EPA develop frequently asked questions (FAQs) related to copper health effects that systems could use to address customers' questions in lieu of mandatory copper PE.

6. Comments Pertaining to Copper CCR and PN Language

Some members noted that the current CCR and PN language for copper[12] is not helpful to individuals that do not know they have Wilson Disease or actions they should take to reduce exposure. Another indicated that individuals served by systems with aggressive water will probably need more information on copper than what is provided in the PN copper language. One member noted that if the CCR language is revised ensure it is "valued added" because the CCR already contains a lot of information.

H. Public Comment

Four individuals provided public comment on the first day of the meeting.

1. Dave Lipsky (New York City Department of Environmental Protection (NYC DEP))

Mr. Lipsky provided comments pertaining to sampling protocols and the rule's objectives at the full NDWAC meeting in December 2013[13]. He reiterated the following key points:

- Some of the difficulties that have been encountered can be resolved by explicitly acknowledging that the rule has two distinct goals and objectives:

    - Objective 1: Demonstrate corrosion control effectiveness using an easily implementable scheme to measure a fixed pool of tier 1 sites.

[12] The current CCR and PN copper health effects language reads as follows: *Copper is an essential nutrient, but some people who drink water containing copper in excess of the action level over a relatively short amount of time could experience gastrointestinal distress. Some people who drink water containing copper in excess of the action level over many years could suffer liver or kidney damage. People with Wilson's disease should consult their personal doctor.*

[13] See pages 112-117 of the National Drinking Water Advisory Council Meeting Summary. December 11-12, 2013. Available at http://water.epa.gov/drink/ndwac/meetingsummaries/upload/ndwacmeetingsummdec122013.pdf

- Objective 2: Provide information for public health protection by working with local health departments to target a larger group of residences. These samples would not be part of compliance pool results but could be used for flexible monitoring protocols.

- NYC DEP offers free residential testing at the tap that:
  - Includes a first-draw sample, a 1- to 2-minute flushed samples and a third sample if any of the prior samples are above the AL.
  - Provides a better picture of exposure than compliance monitoring and much more information than LCR sampling because multiple samples are collected from the same location.
  - Tracks well with LCR compliance monitoring. Any blips in the compliance pool have shown up in the free residential program.
- NYC DEP forwards elevated lead levels in any sample to the city health department, regulators and lead poisoning prevention program staff.
- The LCRWG should keep the following in mind:
  - Flexibility is important to maintain because systems are different.
  - Stagnation times are difficult to control in multi-family residences (MFRs) and apartments (comprise about 40% of the housing in NYC) and should be considered when discussing alternate stagnation times.
  - Whether it is better to have multiple samples from one home or one from multiple sites.
  - Adding more complexity would increase the difficultly of maintaining a sampling pool of customers. NYC DEP lost about 1/6 of their sampling pool this year, although they offer $25 for participation.
  - Sampling directly from a LSL is difficult for the elderly or individuals in MFRs.
  - The current protocol is for CCT decisions and is not a good metric for health risk.
  - There is no upper bound for levels above the 90th percentile.
  - Even profiling sampling provides information only for sites sampled and no information about other sites.
  - Chasing the worst-case flush for compliance monitoring provides information only on those homes.
  - The current rule's construct constrains understanding temporal variation.

- Utilities can control treatment efficiency but cannot force homeowners to take actions.

2. <u>Peter Mott (Private Citizen)</u>

Mr. Mott explained that his twins were born in 2002 and spent a lot of time in the neonatal intensive-care unit. He became aware in 2004 that some of DC Water's in-home tap lead results were 100 ppb; had he known about potential high lead levels, he could have bought filters and bottled water. He emphasized the need for better communication to the public. Other key points included:

- The CCR gives a false indication that everything is okay. Improve the language in the CCR by letting parents know that even if the system has no ALE, there can still be lead at their tap and suggest testing if they have young children and to clean their aerators.
- The LCR addresses the rule as a corrosion problem but it is really a public health problem. Sampling can indicate if pipes are corroding but does not identify health risk.
- The sample size is inadequate. For example, DC Water is required to collect only 100 samples.
- The only way a parent finds out if there is a problem is through their children's blood lead levels.
- The lead issue is not specific to DC. All parents are concerned especially the ones in older homes.

3. <u>Regu Regunathan (Water Quality Association)</u>

Mr. Regunathan served on the NDWAC working group in 2006 that focused on improving lead PE. He wrote a minority report for NDWAC in which he discussed that the working group's recommendations would not result in adequately informing sensitive populations. He wanted a strong, actionable approach in their response that would focus on sensitive populations. The report was not submitted to EPA by NDWAC. He also discussed that although the 2007 PE revisions zeroed in on informing schools and daycares, this revision seems to have been ineffective. He emphasized that the people imparting the information need to be better educated and that PE does not necessarily reach the people who need to take an action such as parents and pregnant women. He discussed a case study in Calhoun, Michigan in which the schools and daycares were at first hesitant to get their drinking water tested because they thought they would be penalized if high lead levels were found. They found a fair percentage of samples was above 15 ppb and very high levels were found in some cases. He is working with CDC and the Ground Water Association to determine if private well homeowners need treatment and whether education is adequately reaching them.

4. Paul Schwartz (Water Alliance)

Mr. Schwartz made the following three points:

1. Although the LCR is called a corrosion control and treatment regulation, it is really a public health rule. Rule revisions should err toward actionable approaches and toward public health. At this point, he is not sure how this translates to what systems can do.

2. Some very simple concepts can have complex concepts imbedded in them ("simplexity"). Getting the lead out is a simple concept, such as removing LSLs. We need to be clearer about the economics of LSLR. If people are thinking that LSLR is cost-prohibitive, it will get in the way of "other things".

3. PE needs to be transparent and we should share the information we have regardless of its limitations. Our delivery mechanisms should include web based, electronic and social media access to get the message out. We need to understand the impediments of the Health Insurance Portability and Accountability Act (HIPAA) to providing needed information.

Three individuals provided public comment on the second day of the meeting.

1. Bob Weed: Copper Development Association

Mr. Weed explained that part of the Copper Development Association's (CDA's) charter is to provide assistance to end users of copper plumbing to use it effectively, sustainably and safely and to consider public health. He provided a PowerPoint presentation[14], which included the following key points:

- Copper release is primarily driven by water quality. He provided a list of conditions in which water would have a higher potential to release copper based on pH, alkalinity and oxidative treatment.

- Pipe age is a secondary factor that is not always universally predictive. Aging refers to the pipe's being in contact with the water. In most situations, copper release diminishes rapidly with age – typically within a couple of weeks. Generally even by the time people move in. But for some low pH/high alkalinity waters, copper release can go on for years.

- LCR is meant to protect public health. To do so, it must reasonably assess risk, minimize monitoring at locations not likely to be at risk and require action to control the situation before it gets to the consumer and not educate them afterwards.

- The current site selection criteria are based on finding lead with little chance of identifying areas where copper control should be initiated. CDA supports a number of suggestions that have come up already including the idea of binning systems based on their waters' corrosivity to copper.

[14] See Attachment G for a copy of Mr. Weed's PowerPoint presentation, "Comments Regarding Considerations for Changes in Copper Provisions within LCR". Copper Development Association Inc. September 19, 2014.

- The current sampling protocols and proposals are driven by lead. First-draw addresses brass fittings and volume-adjusted sampling wastes several liters to reach the LSL. Both miss premise plumbing likely to contain copper.

- Regarding the proposed scheme:

    - Site selection criteria need to be specific to at-risk copper sites.

    - He agrees with monitoring waivers to eliminate unnecessary long-term monitoring.

    - Targeted monitoring in at-risk locations would allow PWSs to address issues with chemistry/system adjustments and to take credit for successful action as well as allow for targeted, meaningful PE.

    - Sampling protocols that target water residing in premise plumbing would be more predictive of copper release and potential/actual water treatment adjustments.

    - PE should be targeted to at-risk locations to eliminate unnecessary fear. The notification needs to provide a balanced message that not only explains the health risks of copper but also includes information about the risks associated with alternate non-copper containing plumbing materials and explains that copper is an essential nutrient.

2. <u>France Lemieux (Health Canada)</u>

Ms. Lemieux worked in drinking water for 20 years, 10 of which has been with lead. She discussed challenges with lead PE and provided the following recommendations:

- The general public health community does not think there is a drinking water lead problem and the challenge is to convince them that relative source contribution (RSC) from lead in drinking water may be greater because lead in other sources has been reduced.

- A study of lead in drinking water in Montreal found lead levels in drinking water similar to lead in paint chips in the US.

- Lead from a public health perspective is viewed as an environmental problem and not a health issue, which hurts EPA's credibility because people do not think of EPA as health experts.

- Most people do not understand how a treatment technique rule works.

- She recommended:

    - Although there will be challenges, EPA should work with CDC to improve PE. As an example, Health Canada and the Canadian Ministry of Health are working together to develop information packages for the health community that will explain risk factors and a recommendation for lowering the blood lead reference level. Similar information could be developed by EPA in cooperation with CDC using CDC's lead reference level.

- Make the message clearer that some people may still have lead exposure although their system meets the AL.

- Remind people that there is no safe level of lead, that the rule is a shared responsibility and that the system can work with the consumer to help them solve their problem.

3. Regu Regunathan (Water Quality Association)

Mr. Regunathan explained that he has helped develop standards for point-of-use (POU) and point-of-entry (POE) for NSF International. He stated that these are credible standards to demonstrate the ability of these units to remove lead and copper, which have led to testing and certification of these products. There are about 700 certified products that range from pour-through pitchers to reverse osmosis units under the sink. These devices have a built-in indicator to show end-of-life so customer knows when to change their filter. He recommended that EPA not require utilities to manage and maintain these units. Instead, it should be a shared responsibility.

I. Wrap-up and Next Steps

1. Summary of the Copper Binning Proposal

Mr. Burneson asked the Group to consider how to integrate all of the copper discussion topics. He summarized his understanding of copper binning proposal as follows:

- Characterize aggressiveness using WQPs (e.g., pH, alkalinity and orthophosphate). Do not require copper tap monitoring, which will eliminate the issue of finding new homes.

- Start with three bins: non-aggressive water to copper, aggressiveness unclear and aggressive water. The systems in the middle category would implement additional testing to determine which of the other two bins to place them in. (Mr. Schock noted earlier that conservative definitions for determining when a water might be aggressive can eliminate the need for the middle category and additional testing.)

- Require CCT based on WQPs for those systems in the aggressive water bin and require copper public awareness for those systems in this category that fail to meet CCT requirements.

In response:

- One member indicated that he would like small systems to retain the option to continue to conduct copper tap monitoring but at new sites. The rationale is that smaller systems may find it easier to continue conducting tap monitoring because they are familiar with the protocol. He stated that copper sampling would not be necessary for gray systems that installed CCT.

- Members also noted that copper problems will be detected by customers (taste or staining) who will call the system or if the utility does not respond, will escalate their complaints to the state.

- One member suggested using Total Coliform Rule (TCR) sites for the water quality monitoring because they are representative of the distribution system and could be coordinated with coliform monitoring, possibly at a frequency of once per quarter.

2. Public Accessibility to Data

One member reiterated that the CCR does not include all of the information that a PWS uses to determine if it is below the AL (e.g., sampling protocol, dates of sample collection). She asked the Group to consider adding a component to PE to require systems to make all sampling information available to interested members of the public. The data could be in an electronic format or scanned. In response, members had the following comments:

- One member indicated that many small water systems do not have a website so this information request would probably fall on the state.
- Some members discussed their states' databases as follows:
  - One member noted that his state developed a portal to respond to the public's request for sampling data.
  - Several members indicated that sampling locations are typically coded in a database for privacy purposes.
  - Another explained that her state's database includes the number of samples, 90th percentile level and number above the AL. Scanned results are also available but the sorting of the information may not be readily available. Also in some states, information may be reported electronically or in hard copy from the lab or the system. Hard copy data are entered into the database by the state.
  - Another noted that the extent of the information for a specific system would depend on if it used the health department laboratory. The health department would report dates, individual results and location in a coded way to the state directly. The state might not have this level of data for systems that use their own or private laboratories.
- Mr. Burneson indicated that systems and states have recordkeeping and reporting requirements for all regulations. FOIA would dictate what records the public would receive directly from the PWS. He added that states only report the 90th percentile levels to EPA.
- One member noted that DC Water displays all sample results on their website.

One member asked about the information that will be accessible from the Safe Drinking Water Information System (SDWIS) Prime. In response, Mr. Burneson explained that SDWIS Prime is the next generation of SDWIS and is designed to be a web-based portal for systems and labs to report their data. Mr. Darryl Osterhoudt elaborated on SDWIS Prime as follows:

- It is a new data system that provides a common database for both EPA and the states.

- The reporting responsibilities would not change and states would still control their data until it's time to report to EPA.
- Even though it's all in one place, different parties have different responsibilities and access.
- It will have better capabilities for states to voluntarily share additional information such all lead and copper sample results.

One member noted that public data are owned by the states and he did not think that EPA could supersede states' regulation. In response to this:

- One member noted that improving public access is not limited to the LCR but will be useful for all regulations.
- Mr. Burneson stated that if all of the data were reported by the states to EPA, the information would then be in the federal domain and EPA in turn would be subject to FOIA. This still places a burden on states and systems to report this information.

Mr. Burneson closed the meeting by expressing his appreciation to the Group for their participation and creative and constructive ways they approached the issues.

The next meeting will be on the LSLR and will be held on November 12 and 13, 2014 in Cadmus' corporate office in Arlington, VA. An informational webinar will precede the meeting on November 5, 2014.

The following table contains action items from the meeting and a list of outstanding action items from the March and May 2014 meetings.

Action Items from the NDWAC LCR Working Group Meetings

Row	Action Item	Responsibility[1]
ACTION ITEMS FROM SEPTEMBER 18 AND 19 MEETING		
1	Incorporate LCRWG comments on May meeting summary and post final summary on EPA's website and on the Google Drive.	RESOLVE/Cadmus/EPA
2	Develop proposal for revising sample invalidation.	RESOLVE/Stacy Jones/Derrick Dennis, Gary Burlingame
3	Revise the operational protocol mission statement per September's discussion.	RESOLVE
4	Determine the extent of EPA's authority to mandate systems to provide public access to monitoring data, possibly as part of PE requirements.	EPA
5	Distribute September meeting summary.	Cadmus/EPA/RESOLVE
6	Send doodle request for fifth meeting for late January or early February.	RESOLVE
7	Consider interim milestones for fifth meeting and how to integrate all of the copper pieces.	LCRWG
8	Provide the LCRWG with a list of information that should be publically available.	Yanna Lambrinidou
9	Provide information on how to get into Google drive.	EPA
OUTSTANDING ACTION ITEMS FROM MAY 29 AND 30 MEETING (Numbering reflects May 2014 Action Item List)		
7	Distribute 1991 Jeff Cohen memo that includes the rationale for the current sampling protocol.	EPA
9	Provide speaker from OECA on Next Gen compliance.	EPA
11	Provide estimate of the number of systems that may qualify for a copper waiver.	EPA

OUTSTANDING ACTION ITEMS FROM MARCH 25 AND 26 MEETING (Numbering reflects March 2014 Action Item List)		
8	Determine whether definition of backsliding on public health is specific to one rule or can apply across multiple rules.	EPA
10	If available, provide additional, existing background materials to LCRWG: Lead level trends for some Massachusetts systems	Steve Estes-Smargiassi
11	Assess availability of other requested information/conduct analysis as needed. 1. National statistics on lead and copper ALEs to answer if there are systems for which CCT is not working? It will be important to distinguish systems that have exceeded the action level for lead versus exceeding the action level for copper. Of those systems that have exceeded action levels, how many have implemented other optimization requirements (or made adjustments in OCCT as required by primacy agencies?) 14. How many large, medium and small systems are estimated to be required to re-optimize (i.e., how many will exceed the lead/copper action level) under new rule?	EPA

Acronyms: µg/L = micrograms per liter; ALE = action level exceedance; CCT = corrosion control treatment; IEUBK model = Integrated Exposure Uptake Biokinetic model; LCR = Lead and Copper Rule; LCRWG = LCR Working Group; LSLR = lead service line replacement; NDWAC = National Drinking Water Advisory Council; OECA = Office of Enforcement and Compliance Assurance; PE = public education.

Notes: [1] Unless otherwise stated, EPA refers to the Standards and Risk Management Division (SRMD) within EPA's Office of Ground Water and Drinking Water.

List of Attachments

- Attachment A – List of Lead and Copper Rule Working Group Members and Meeting Presenters
- Attachment B – List of Attendees
- Attachment C – Meeting Agenda
- Attachment D – Public Education Primer
- Attachment E – Sampling Protocol Primer
- Attachment F – Written statement for the LCR Working Group meeting on September 18-19, 2014 from Three Canadian Universities from Dr. Michèle Prévost and Dr. Elise Deshommes, NSERC Industrial Chairs in Drinking Water. Polytechnique Montreal.
- Attachment G – Comments Regarding Considerations for Changes in Copper Provisions within the LCR. Bob Weed, Copper Development Association Inc. September 19, 2014.

ATTACHMENT A

Third NDWAC Lead and Copper Working Group Meeting

List of Lead and Copper Rule Working Group Members and Public Commenters

September 18 and 19, 2014

NDWAC LCR Working Group
Christina Baker: Deputy Public Counsel, Office of the Public Counsel, State of Missouri
Leon Bethune, Director, Director of Office of Environmental Health, Boston Public Health Commission
Gary Burlingame: Laboratory Director, Philadelphia Water Department
Marilyn Christian: Manager, Environmental Health Programs, Harris County Public Health
Matthew Corson: Manager, Environmental Compliance, American Water
Derrick Dennis: Water Quality Unit Supervision, Office of Drinking Water, State of Washington
Stephen Estes-Smargiassi: Director of Planning, Massachusetts Water Resources Authority
Hector Gonzalez, Director Health Department, Laredo, Texas[1]
Yanna Lambrinidou, Parents for Non-toxic Alternatives
Thomas G. Neltner: Senior Attorney, Natural Resources Defense Council
John Sasur Jr.: Three Rivers Fire District, Massachusetts
Robert C. Steidel: Director Department of Public Utilities, City of Richmond Virginia
June Swallow: Chief, Division of Water Quality, Rhode Island Department of Health
Lynn Thorp: National Campaigns Director, Clean Water Action
Chris Wiant: President, Caring for Colorado
Nse Obot Witherspoon: Executive Director, Children's Environmental Health Network
EPA Office of Ground Water and Drinking Water
Eric Burneson: Division Director, Standards and Risk Management Division
Lisa Christ: Branch Chief, Targeting and Analysis Branch
Public Commenters
France Lemieux, Health Canada
Dave Lipsky, New York Department of Environment
Peter Mott, Public
Regu Regunathan, Water Quality Association
Paul Schwartz, Water Alliance
Robert Weed, Copper Development Association
Meeting Facilitator: Gail Bingham, RESOLVE

[1] Hector Gonzales could not attend.

ATTACHMENT B

Third NDWAC Lead and Copper Working Group Meeting

List of Attendees

September 18 and 19, 2014

First Name	Last Name	Affiliation
John	Arnett	Copper & Brass Fabricators Council
Christina	Baker	State of Missouri
Leon	Bethune	Boston Public Health Commission
Scott	Biernat	Association of Metropolitan Water Agencies
Gail	Bingham	RESOLVE
Charles	Brunton	EPA
Gary	Burlingame	Philadelphia Water Department
Eric	Burneson	EPA
Lisa	Christ	EPA
Marilyn	Christian	Harris County Public Health
Matthew	Corson	American Water
David	Cornwell	EE&T
Leslie	Darman	EPA
Miguel	Del Toral	EPA
Carol	DeMarco King[1]	EPA
Derrick	Dennis	State of Washington
Lisa	Donahue[1]	EPA
Joyce	Donohue	EPA
Laura	Dufresne	Cadmus
Jerry	Ellis	EPA
Stephen	Estes-Smargiassi	Massachusetts Water Resources Authority
Peter	Grevatt[1]	EPA
Chris	Fultz	EPA
Erik	Helm	EPA
Jeff	Hennapel[1]	The Policy Group
Yanna	Lambrinidou	Parents for Non-toxic Alternatives
France	Lemieux	Health Canada
Dave	Lipsky	New York Department of Environment
Anne	Jaffe Murray	Cadmus
Stacy	Jones	IN Dept of Environmental Management
Jeff	Kempic	EPA
Andy	Kireta Jr.	Copper Development Association
France	Lemieux	Health Canada
Frank	Letkiewicz[1]	Cadmus

First Name	Last Name	Affiliation
Christopher	Lindsay	IAMPO
Dave	Lipsky	New York City Dept. of Environment
Suril	Mehta	EPA
Peter	Mott[2]	Public
Thomas	Neltner	Natural Resources Defense Council
Darrell	Osterhoudt	Association of State Drinking Water Administrators
Lisa	Ragain[2]	Metropolitan Washington Council of Governments
Regu	Regunathan	Water Quality Association
Alan	Roberson[1]	American Water Works Association
Matt	Robinson	EPA
Stephanie	Salmon[1]	Plumbing Manufacturers International
John	Sasur, Jr.	Three Rivers Fire District, Massachusetts
Maureen	Schmelling[1]	DC Water
Mike	Schock	EPA
Paul	Schwartz	Water Alliance
Nicole	Shao	EPA
Lameka	Smith	EPA
Francine	St. Denis	EPA
Robert	Steidel	City of Richmond Virginia
June	Swallow	Rhode Island Department of Health
Jim	Taft[1]	Association of State Drinking Water Administrators
Lynn	Thorp	Clean Water Action
Steve	Via	American Water Works Association
Robert	Weed	Copper Development Association
Chris	Wiant	Caring for Colorado
Daniel	Wilson	North Carolina Rural Water Association
Nse Obot	Witherspoon	Children's Environmental Health Network

[1]Attended the September 18, 2014 session only.

[2]Attended the September 19, 2014 session only.

ATTACHMENT C

U.S. Environmental Protection Agency

NDWAC LEAD AND COPPER WORKING GROUP

The Cadmus Group, Inc.
1555 Wilson Blvd., Suite 300 | Arlington, VA 22209
703.247.6161

September 18-19, 2014

Agenda

Meeting Objectives/Desired Outcomes:

- **Share follow up ideas and questions concerning webinars;**
- **Provide input on what cost effective sampling protocols that achieve public health improvement might look like;**
- **Provide input on questions related to public education;**
- **Consider a proposal to modify the work group charge and**
- **Plan next steps.**

Advance materials: LCR White Paper; Sampling and Public Education Primers; see also technical references and other materials on Google Drive: https://drive.google.com/folderview?id=0B-3D2NT30pQDaFlGTTJnTWxmZ0k&usp=sharing#list

Thursday September 18th, 2014

8:45-9:00 Informal gathering

9:00-9:45 Welcome, Introductions, Meeting Objectives/Agenda, Materials and Logistics and

Approve May Meeting Summary

Advance materials: Proposed agenda, May meeting summary

Welcome: Peter Grevatt, Director, Office of Groundwater and Drinking Water
Introductions: Gail Bingham, *facilitator*

9:45-10:45 Discussion: Follow up on Key Points from Webinars

Objectives: Recap topics covered by speakers on sampling protocols and public education webinars. Address any unanswered or follow up questions. Share "take-aways."

Highlights: Lisa Christ, Office of Groundwater and Drinking Water

Discussion

10:45-11:00 BREAK

11:00-12:15 Discussion: Sampling Protocols: Implications in Context of the Entire Rule

Objectives: Provide initial input on questions posed in the white paper and on the webinar about how to construct sampling protocols. Initial ideas will be included in the meeting summary for members to reflect upon and consider for inclusion in final report.

Suggested Discussion Questions:

- What is (are) the purpose(s) for sampling, i.e. what questions is sampling seeking to answer? What are the implications for what should be sampled, when, where, how and by whom? *[The second question can be addressed in the context of the more detailed questions that follow.]*
- What are the pros and cons of taking a first draw sample?
- What are the implications of shifting from first draw samples to another type of sample, such as a lead service line sample?
- What are the advantages/disadvantages of a single prescriptive liter versus a site-specific sequential sampling approach?
- What are the pros and cons of other options (from the webinar and/or as suggested by members)?

12:15-1:30 LUNCH *[on your own]*

1:30-1:45 Public Comment

1:45-3:00 Discussion: Sampling Protocols: Implementation Questions

Objectives: Provide initial input on questions posed in the white paper and on the webinar. Initial ideas will be included in the meeting summary for members to reflect upon and consider for inclusion in final report.

Suggested Discussion Questions:

- What is an appropriate number of samples to be collected by a water system to capture the highest risk lead and copper sites in the distribution system and, where CCT is in place that will indicate if the corrosion control is effective in reducing lead? In reducing copper?
  - How important is the size of the PWS population in determining this number?
  - How much does geographic distribution of samples matter, particularly with respect to non-homogenous water quality and non-homogeneous construction distribution?
- What are the implications of invalidation criteria for the number of samples needed?
- What are the implications of adding a maximum residence time for tap samples?

- Other questions from the webinar?

3:15-3:30 BREAK

3:30-4:30 Discussion: Sampling Protocols: Implementation Questions *[continued]*

Objectives: Provide initial input on questions posed in the white paper and on the webinar. Initial ideas will be included in the meeting summary for members to reflect upon and consider for inclusion in final report.

Suggested Discussion Questions:

- Who should collect samples? The PWS? The homeowner/resident? If the latter, how can the procedure be reliably executed? How can instructions to homeowners/residents be as clear and easy to follow as possible?
- What are the pros and cons of addressing pre-stagnation flushing of pipes? How should this issue be addressed, if at all? What is the best way to represent the water in the service line?
- Should aerator removal be addressed? If so, how?
- Looking ahead to the public education discussion, what are the limitations in what sampling can accomplish that should be conveyed to the customer?

4:30-5:00 Open Discussion

- Proposal to modify work group charge
- Other topics suggested by work group members

5:00 ADJOURN FOR THE DAY

Friday, September 19th, 2014

8:45-9:00 Informal gathering

9:00-9:15 Review Day Two Agenda

Objective: Reflections from Day One and confirm agenda for today.

9:15-10:45 Discussion: Public Education for Lead

Objectives: Provide initial input on questions posed in the white paper and/or by NDWAC WG members. Initial ideas will be included in the meeting summary for members to reflect upon and consider for inclusion in final report.

Suggested Discussion Questions:

- What should be the role/objectives of lead PE in the context of a treatment technology rule in which customers have shared responsibility?
- What information, at a minimum, should PE convey in order to help consumers protect their health and be informed participants in the process? Is there information currently provided that should or could be conveyed in other ways?
- What information should be provided (and by whom) when the PWS's monitoring results are under the lead action level and what should be provided when the lead action level is exceeded? e.g. content, strength, method and frequency of delivery
- What should be the scope under the SDWA for what utilities should communicate to their consumers and what communications might be others' responsibility?
- What are the pros and cons of the 2007 changes to lead public educations? What other suggestions do members have for improvement?
- Other questions from the webinar?

10:45-11:00 BREAK

10:45-12:15 Discussion: Public Education for Copper

Objectives: Provide initial input on questions posed in the white paper and on the webinar. Initial ideas will be included in the meeting summary for members to reflect upon and consider for inclusion in final report.

Suggested Discussion Questions:

- Are there aesthetic warning signals of copper corrosion in drinking water and, if so, what are they and what recommendations should be given to consumers to help them avoid the health effects of copper through consumption of drinking water?
- Should copper public education materials be included in the LCR using the same basic structure as the public education materials for a lead action level exceedance?
- Should different types of outreach materials to consumers with different content be required depending on whether or not the copper action level is exceeded? If so, what information should be included (e.g., public education for an action level exceedance, informational statement about copper if an action level is not exceeded)?

12:15-1:30 LUNCH *[on your own]*

1:30-1:45 Public Comment

1:45-2:45 Discussion: Public Education for Copper *[continued]*

Objectives: Provide initial input on questions posed in the white paper and on the webinar. Initial ideas will be included in the meeting summary for members to reflect upon and consider for inclusion in final report.

Suggested Discussion Questions:

- If copper public education materials or informational statements are required, what should the delivery frequency be?
- If public education is not required for copper action level exceedances, should EPA require systems to deliver outreach materials/informational statement to consumers who visit or live in a newly/recently built or renovated building/dwelling with new copper piping?
  - Should systems be required to identify newly/recently built or renovated building/dwelling with new copper piping?
  - Should systems be required to work with local inspection services to incorporate the outreach materials or informational statement into building/dwelling occupancy permits?
  - How much and what kind of direction should be provided by EPA with respect to public education materials or informational statements?
- If a water system demonstrates water quality aggressive to copper, should those consumers receive informational statements about copper? If so, what information should be included?
- Other questions from the webinar?

2:45-3:00 Wrap up and Next Steps

3:00 ADJOURN MEETING

ATTACHMENT D

Public Education Primer

I. Regulatory History

When the Lead and Copper Rule (LCR) was promulgated in 1991, implementation of a public education (PE) program was established as a requirement when a water system exceeds the lead action level. The purpose of the public education program is to notify water system customers of the elevated levels of lead in drinking water, advise customers of the actions the system is taking to reduce lead levels and prevent known or anticipated adverse health effects by providing information on ways consumers may reduce their exposure. The 1991 LCR did not include copper public education requirements.

In 2004, EPA began a wide-ranging review of the LCR with the intent of identifying areas of the rule that needed updating and improvement. During this national review, EPA identified public education as a topic for discussion with stakeholders. In September of 2004, EPA held a Public Education Expert Workshop with representatives from water utilities, State primacy agencies, the Centers for Disease Control and Prevention and non-governmental organizations. The purpose of the workshop was to discuss public education requirements under the LCR, drinking water risk communication and effective communication with the public. Some stakeholders at the workshop stated that the mandatory PE language in the rule was too long, cumbersome and complex.

In June of 2005, EPA's National Drinking Water Advisory Council (NDWAC) voted on and approved the formation of a Working Group on Public Education (WGPE) to provide recommendations on the public education requirements of the LCR. EPA selected 16 members that represented utilities; consumers; regulators; public health organizations; and risk communication experts. Four members of the NDWAC served on the working group to facilitate the flow of information between the two groups. The charge for the WGPE was to (1) review the current public education requirements on lead in drinking water to identify and define the need for improvements and to provide input to the NDWAC; (2) develop language for communicating the risk of lead in drinking water and a suggested response to the public; and (3) define the delivery means to the public. In June of 2006 the working group presented a report summarizing its input to the NDWAC; the NDWAC then provided recommendations to the EPA Administrator.

Utilizing the NDWAC's recommendations with some modifications, the EPA promulgated new public education requirements in the 2007 Lead and Copper Rule – Short Term Revisions. The 1991 LCR required the mailing and/or distribution of written materials consisting of over 1,800 words describing health effects, the levels of lead in drinking water, steps to reduce exposure and how to obtain additional information. The written materials required by the 2007 rule are more concise and encourage the public to take appropriate courses of action to reduce their exposure to lead. The 2007 rule requires water systems to target at-risk populations (e.g., children and pregnant women). In addition, a new provision was added that requires water systems to provide the results of lead testing to the persons served by the water system at the site where the sample was collected.

Prior to the 2007 LCR revisions, community water systems (CWS) were required to include an informational statement on its Consumer Confidence Report (CCR) if the lead action level was exceeded in more than 5% and up to 10% of samples. The 2007 rule now requires all CWS to include an informational statement on lead in its CCR every year regardless of lead levels found in sampling.

II. Public Education Program for Lead

A. Content and Language for Public Education Materials

Water systems exceeding the lead action level must provide public education materials that meet the EPA's mandatory requirements for content and language. Each notice consists of six sections, some of which can be customized: 1) Informational statement; 2) Health effects of lead; 3) Sources of lead (systems are allowed to customize this section); 4) Steps individuals can take to reduce their exposure to lead in their drinking water (systems are allowed to customize this section); 5) What happened and what is being done to correct the problem? (Systems are allowed to customize this section); and 6) Who to call and how to get more information. Community water systems are also required to tell consumers how to get their water tested and discuss lead in plumbing components and the difference between low lead and lead free. Water systems have the flexibility to tailor some educational statements to fit their community's situation, such as providing specific directions on flushing the tap before drinking or using water. For systems that serve a large proportion of non-English speaking consumers (as determined by the primacy agency) the materials must contain information in the appropriate languages regarding the importance of the notice or contain a telephone number or address where persons served may contact the water system to obtain a translated copy of the materials.

B. Delivery Requirements

In general, the delivery of materials must occur within 60-days following the end of the monitoring period in which the action level was exceeded. Delivery must be repeated once every 12 months for as long as the water system exceeds the lead action level. Community water systems are required to deliver public education materials to all bill paying customers. Non-transient, non-community water systems are required to post informational pamphlets and/or brochures in a public place or common area in each of the buildings served by the system and to distribute informational pamphlets and/or brochures to each person served. If water systems have initiated the public education program prior to the 60-day deadline but need more time for delivery, an extension may be given which must be approved in writing by the primacy agency.

As long as the water system exceeds the lead action level, it must provide specified information on or inside each water bill and this type of notification must occur no less than quarterly. The message on the water bill must include the following statement exactly as written except for the text in brackets for which the water system must include system-specific information: **[INSERT NAME OF WATER SYSTEM] found high levels of lead in drinking water in some homes. Lead can cause serious health problems. For more information please call [INSERT NAME OF WATER SYSTEM] [or visit (INSERT YOUR WEB SITE HERE)]**. The message or delivery mechanism can be modified in consultation with the primacy agency. The primacy agency may allow a separate mailing of public education materials to customers if the water system cannot place the information on water bills.

To reach more at-risk populations, EPA requires community water systems to deliver the materials to the following facilities or organizations[1]:

[1]Water systems must deliver these materials to all local public health agencies, even those outside the water system's service area. For systems that serve more than 3,300 people, the materials must be delivered to those facilities or organizations that are located within the service area, along with a cover letter encouraging distribution to all potentially affected customers or users. For systems that serve 3,300 or fewer people, the materials must be delivered to those facilities or organizations that are served by the system and most likely to be visited regularly by pregnant women and children.

- Local welfare agencies
- Public and private schools or school boards
- Women, Infants and Children (WIC) and Head Start Programs
- Public and private hospitals and medical clinics
- Pediatricians
- Family planning clinics

All community water systems must make a good faith effort[2] to locate the following organizations within the service area and deliver the educational materials along with an informational notice that encourages distribution to all potentially affected customers or users:

- Licensed childcare facilities
- Obstetricians-Gynecologists and Midwives
- Public and private preschools.

In addition to targeting certain facilities or organizations, community water systems are required to conduct activities within the following categories[3]:

- Public Service Announcements
- Paid Advertisements
- Display Information in Public Areas
- Email to Customers
- Public Meetings
- Delivery to Every Household
- Provide Materials Directly to Multi-family Homes
- Other Methods Approved by the Primacy Agency

Educational materials must be posted on a publicly accessible website for all systems that serve greater than 100, 000 individuals. Community water systems must submit a press release[4] to newspaper, television and radio stations.

[2] The good faith effort to contact at-risk customers may include requesting a specific contact list of the organizations from the local public health agencies, even if the agencies are not located within the water system's service area.
[3] Community water systems that serve 3,300 or fewer customers must conduct one activity from one of the categories. Community water systems that serve more than 3,300 customers must conduct three activities from one, two or three of these categories.
[4] For systems that serve 3,300 or fewer customers, the requirement may be waived by the primacy agency as long as the information is distributed to every household served by the system.

C. Supplemental Monitoring and Customer Notification Requirement

Systems are required to provide the results of lead testing to residents or occupants of sites where samples were taken to compute the system's 90th percentile. The system has no later than 30 days from the time it learns of tap monitoring results to provide the results to the residents/occupants.

When water systems exceed the lead action level, they must offer to test samples for lead for any customer who requests it. The system is not required to collect the sample itself or pay for the collection or analysis of the sample.

III. Possible Public Education for Copper

A. Introduction

Currently, there are no public education materials or informational statements provided on the health risks of copper exposure or steps consumers can take to reduce their risk of exposure. The distribution of public education materials for copper could allow consumers to make personal decisions to reduce their exposure to copper based on their individual health needs. EPA is seeking input on whether materials should be provided to consumers to address potential exposures to copper in premise plumbing and identifying the target audience. The Agency is considering requiring copper public education materials for systems exceeding the copper action level and/or a brief informational statement to consumers served by systems which have water quality aggressive to copper.

B. Copper Health Effects

Acute ingestion of excess copper in drinking water is associated with adverse health effects, including acute gastrointestinal (GI) symptoms such as abdominal discomfort, nausea and vomiting (NRC 2000; USEPA 1991). These symptoms result from the irritant effects of inorganic copper ions on the gastric and intestinal mucosa (NRC 2000; Fukui et al. 1994). For both humans and animals, gastrointestinal symptoms tends to occur within a very short time period after the liquid with elevated copper concentration is consumed, typically within an hour for humans (Wang and Borison 1951; Pizarro et al. 1999; Araya et al. 2001, 2003b; Olivares et al. 2001). The amount of copper in water ingested at one time appears to be of greater importance than the amount of copper consumed over the day (Donohue 1997; NRC 2000). The more copper in the stomach at one time, the more likely GI symptoms will occur in sensitive individuals (Pizarro et al. 1999a; Araya et al. 2001, 2003 a,b,c, 2004; Olivares et al. 2001). GI symptoms have occurred in sensitive individuals from drinking water and other fluids with copper concentrations greater than or equal to 3 mg/L (Pizarro et al. 1999a). In other studies, GI symptoms have also been observed with copper concentrations greater than or equal to 4 mg/L (Araya et al. 2001, 2004; Pizarro et al. 2001; Olivares et al. 2003). Nausea typically occurs at lower copper concentrations than vomiting (Pizarro et al. 1999; Araya et al. 2001, 2004; Olivares et al. 2003). Among individuals who took part in controlled studies of exposure to 4 mg/L copper in about 7 fluid ounces of solution, less than 10% experienced nausea, indicating a range of sensitivity in the population (Araya et al. 2001; Olivares et al. 2001). Subject response was variable with the same subject having a positive response during one test episode but failing to confirm the response when given the same dose on a separate occasion (Olivares et al., 2001). In the Olivares et al. (2001) study about 76% of those tested confirmed their threshold; confirmation was more likely at the higher copper doses than at the lower doses. A controlled, household-based, population study (Araya et al., 2004) suggests adaptation to the low concentrations of copper (range 4-6 mg/L) with an increased duration of exposure. Human gastrointestinal response to copper in water can be influenced by individual sensitivity, acclimatization, the amount of solution ingested per exposure and the presence or absence of copper-binding food

materials in the stomach. These confounding factors make it difficult to adequately determine the minimum dose that causes an acute gastrointestinal response (Donohue 1997).

While, for the majority of the population, the GI symptoms are not severe or life-threatening, chronic ingestion of copper can lead to liver toxicity and/or effects on the nervous system in sensitive populations such as those with Wilson's disease or one of the rare, often fatal, infant idiopathic copper toxicosis (NRC 2000). Copper drinking-water concentrations of approximately 3 mg/L and greater have been associated with some cases of idiopathic copper toxicosis, suggesting that levels above the copper MCLG of 1.3 mg/L might cause an increase in liver problems in genetically susceptible populations (NRC 2000). For this reason, in 2000, the NRC recommended that the copper MCLG not be increased.

Infants may be sensitive to elevated copper in water for both exposure and genetic reasons. Infants fed formula prepared with tap water consume a higher amount of tap water on a per body weight basis than adults (NRC 2000; Knobeloch et al. 1994). Infants also have a reduced capacity to excrete copper relative to older individuals, which increases their copper retention (NRC 2000). Controlled studies investigating infants did not show any significant increase in gastrointestinal symptoms at 2.0 mg/L copper concentration (Olivares et al. 1998). Cases of 3severe liver cirrhosis in infants resulting from elevated copper in drinking water, formula or milk, appear to have a genetic basis which contributes to their sensitivity (NRC 2000). The NRC (2000) commented that while the available data were plagued by imprecise exposure measurements, there was some indication that sensitive infants might be at risk for liver toxicity at copper concentrations of approximately 3 mg/L of drinking water (NRC 2000). It is challenging to link illnesses directly to individual copper exposures. Likewise, there is a range of sensitivity within the population (NRC 2000), meaning various individuals can experience differing physiological responses to copper exposure. In reviewing the scientific literature, the Agency identified two U. S. studies (Knobeloch et al. 1998, Spitalny et al. 1984) that demonstrated a gastric response such as nausea or vomiting after exposure to drinking water from the tap with elevated copper levels (children and adults). In all of these examples, water quality was found to be aggressive to copper.

C. ***Options for a Public Education Program for Copper***

The Agency is considering requiring copper public education materials for systems exceeding the copper action level and/or a brief informational statement to consumers served by systems with water quality aggressive to copper. Public education materials may be delivered to all consumers when the public water system exceeds the copper action level. The content and mechanism of delivery could be similar to the way consumers are educated about lead after a lead action level exceedance. Informational statements refers to educational materials that could be delivered to consumers when systems have water quality that is aggressive to copper, it would not be based on exceeding the copper action level.

The following are elements EPA is considering for a public education requirement for copper in the event of a copper action level exceedance:

(1) An explanation of what copper is, the possible sources of copper in drinking water and how copper enters drinking water;
(2) An explanation of copper health effects;
(3) Steps consumer can take to reduce their exposure to copper in drinking water;
(4) An explanation of why there are elevated levels of copper in the system's drinking water (if known) and what the water system is doing to reduce the copper levels in homes/buildings in the area
(5) A description of the likelihood of copper leaching from copper pipes in homes/buildings in the area.
(6) An explanation of what other plumbing materials are available for use in areas where the water quality is aggressive to copper.

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ATTACHMENT E

Lead Sampling Protocol Primer

Lead Sampling Protocol Primer

Introduction

The goal of the Lead and Copper Rule's (LCR) sampling protocol is to have a clear method for cost effectively collecting samples to assess the effectiveness of a public water system's corrosion control treatment and trigger additional actions to reduce exposure when necessary. Public water systems (PWS) must compare sampling results to an Action Level (AL). The AL for lead is 0.015 mg/L and the AL for copper is 1.3 mg/L. If more than 10 percent of the individual sample results exceed the AL, the PWS is required to undertake specified actions, such as optimization of corrosion control, provision of public education requirements and implementation of lead service line replacement requirements. Both contaminants have maximum contaminant level goals (MCLG) based on established health effects. For lead the MCLG is zero and for copper the MCLG is 1.3 mg/L, the same as the action level. Changes to the sampling protocol may affect the sampling results and change the number of systems that must undertake additional actions to reduce drinking water lead exposure.

The Current Rule

The LCR applies to community water systems (CWS) and non-transient, non-community water systems (NTNCWS). The current sampling protocol for lead and copper samples is to collect a one-liter first draw sample from a kitchen or bathroom faucet with a minimum 6-hour stagnation time that is then analyzed for both lead and copper. A first-draw sample is the first liter of water out of the tap with no wasting of water from the tap prior to collection. The 6-hour stagnation time applies to water use in the entire residence – no water use for at least six hours. To enable water systems to meet the challenge of a first draw after a stagnation time, the LCR allows water systems to rely on residents to collect the samples. Systems must provide sampling instructions to help residents, such as suggesting the samples be taken in the morning or upon returning to the residence in the evening after work. There is a minimum stagnation time in the LCR however, there is no maximum stagnation time for the first draw samples. If a system allows residents to perform the sampling, the system may not challenge, based on alleged errors in sample collection, the accuracy of the sampling results.

The current rule does not address recommended actions in the sampling instructions prior to the start of the stagnation period, such as aerator removal or pre-stagnation flushing. In 2006, the Environmental Protection Agency (EPA) identified some inconsistencies in its own guidance on the issue of aerator removal and became aware of recommendations for the removal and cleaning of the aerator in sampling instructions being provided by systems to resident samplers. In an October 20, 2006 memorandum from the Office of Ground Water and Drinking Water entitled "Management of Aerators during Collection of Tap Samples to Comply with the Lead and Copper Rule" (EPA, 2006) EPA stated that

public water systems should not recommend that customers remove or clean aerators prior to or during the collection of tap samples for lead. The current rule does not address pre-stagnation flushing (instructing samplers to run water from the sample tap for a period of time prior to the stagnation period), however, some public water systems include pre-stagnation flushing recommendations in their sampling instructions.

The standard monitoring frequency under the current rule is every six months; both initially and after an action level exceedance. Lead and copper monitoring may stop when systems are evaluating corrosion control treatment options and installing treatment. The follow-up monitoring after treatment is installed is also every six-months. Lead and copper monitoring may be reduced to once every year or once every three years. States make this determination based upon the lead and copper results and if necessary, the system's water quality parameter monitoring. Systems conducting lead and copper monitoring on a reduced frequency must collect samples between June and September or the consecutive four month period likely to produce the highest lead and copper levels at the tap. PWSs on reduced monitoring may also collect samples at a reduced number of sampling sites. The LCR does not specify which of the standard sampling sites must be used when on reduced monitoring beyond the site selection criteria outlined in the rule.

Stagnation Time and Service Line versus First Draw Samples

The 1988 Proposed Lead and Copper Rule would have required systems to collect either a 1-liter morning first draw (MFD) and/or a 1-liter service line (SL) sample. A MFD sample was defined as a sample collected at a consumer's tap that has been standing in the interior plumbing for 8 to 18 hours and was collected without prior flushing. The SL sample was defined as a water sample that has been standing for 8 to 18 hours in a lead service line and collected in any one of the following ways: (1) direct sampling of the service line, (2) tap sampling based on a temperature change in the water or (3) a tap sample after flushing a volume of water equal to that contained in the pipes leading from the tap to the service line.

The Environmental Protection Agency (EPA) received numerous comments critical of the stagnation time range and the difficulty to meet it without any water use overnight. EPA agreed that the 8 to 18 hour stagnation time requirement may have made it more difficult for some systems to collect samples and thus reduced the minimum required stagnation time to 6 hours. This was based on data received that showed a negligible difference in lead levels at the tap between standing times of 6 and 8 hours (AWWSC, 1989) and that lead levels show a rapid increase in the first few hours of standing in the pipes and then a slower increase until equilibrium solubility is reached (Kuch and Wagner, 1983; Schock and Wagner, 1985).

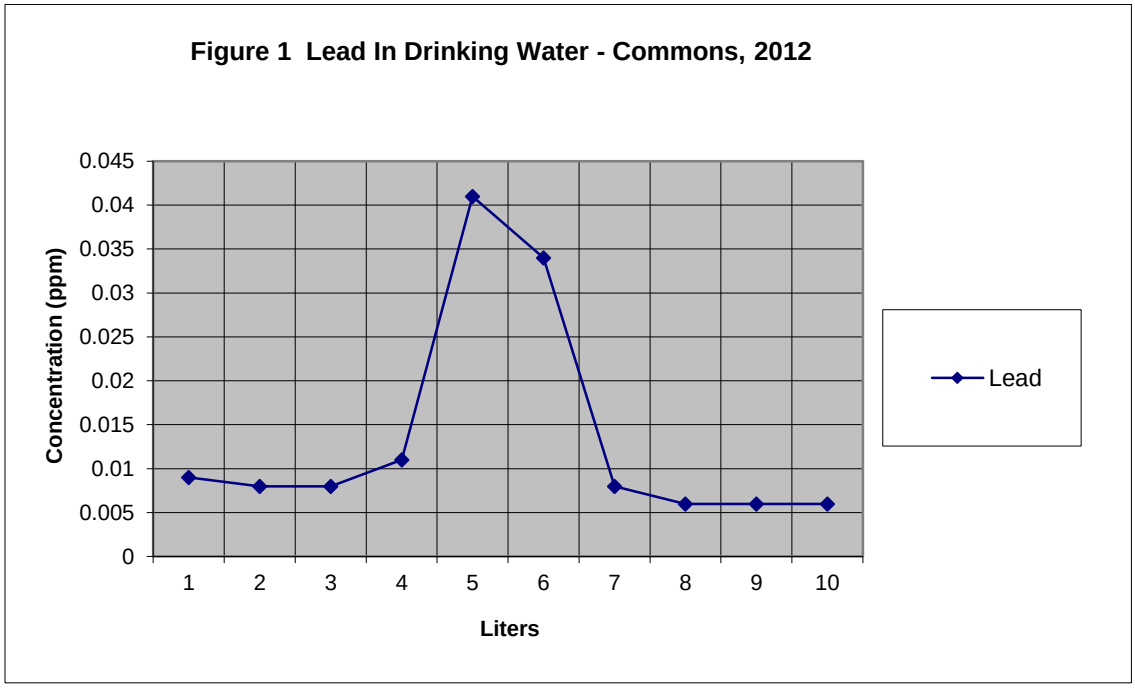
EPA also received comments on the practicality of the lead service line sampling protocols in the proposed rule. EPA had proposed that service line samples be used for lead service line sites using one of three protocols – temperature change, flushing a specified volume or tapping directly into the line. Some comments stated that the temperature change method was a crude method with only limited application (i.e., the method is unreliable during warmer seasons and in warmer climates; unheated or

cold basements with exposed plumbing would also introduce error). Some comments also stated that it would be difficult for residents to calculate the volume of water that would need to be flushed to reach the service line and that tapping directly into the line may not be feasible as it would still require digging and could introduce lead at the connection. EPA agreed that there could be problems with collecting service line samples and eliminated the requirement that systems initially collect service line samples along with first draw samples in the final 1991 rule. EPA believed that it would make sample collection easier and allow residents to more readily participate in the sample collection while still ensuring that systems with lead or copper problems are identified. In establishing that first draw samples would be used in the final rule for lead service line sites, EPA examined data comparing first draw and lead service line samples. Data from systems with lead service lines indicated that the first draw samples were as high or higher than the service line samples in the majority of systems with lead service lines (EPA, 1991; Marcus, 1990). Some examples cited in the final rule preamble include the following: In Louisville, KY the 90th percentile lead level in first-draw samples was 0.013 mg/L while the 90th percentile lead level in service line samples was 0.012 mg/L. In Bennington, VT, the 90th percentile lead level in first draw samples three years after installation of corrosion control treatment was 0.026 mg/L while the 90th percentile lead level in service line samples was 0.021 mg/L. In Boston, MA, the 90th percentile lead level in first draw samples three years after installation of corrosion control treatment was 0.047 mg/L while the 90th percentile lead level in service line samples was 0.038 mg/L. Data also showed that first draw samples at sites with lead service lines were higher than those that are not served by a lead service line (EPA, 1991). Thus, it appeared that contributions from lead service lines were reflected in first draw samples. Because of this and because first draw is logistically more practical, EPA required that the action level be triggered based on first-draw samples. First-draw samples would provide an indication of whether lead levels were above a level of concern and whether lead service line replacement was warranted.

The lead service line sample data cited in the final rule preamble were typically collected using the temperature change protocol, which has its limitations. Data from more extensive profile studies and LSL sampling over the past ten years has shown a different trend regarding first draw and service line samples at sites with lead service lines (Commons, 2012; Del Toral et al, 2013; Giani et al, 2004; HDR Engineering, 2009; and Sandvig et al, 2008). In profile studies, rather than trying to estimate water in contact with the service line, successive liters of water are taken and analyzed for lead. For some sites, this can be as many as 15 to 20 liters to reach water that is representative of the water main.

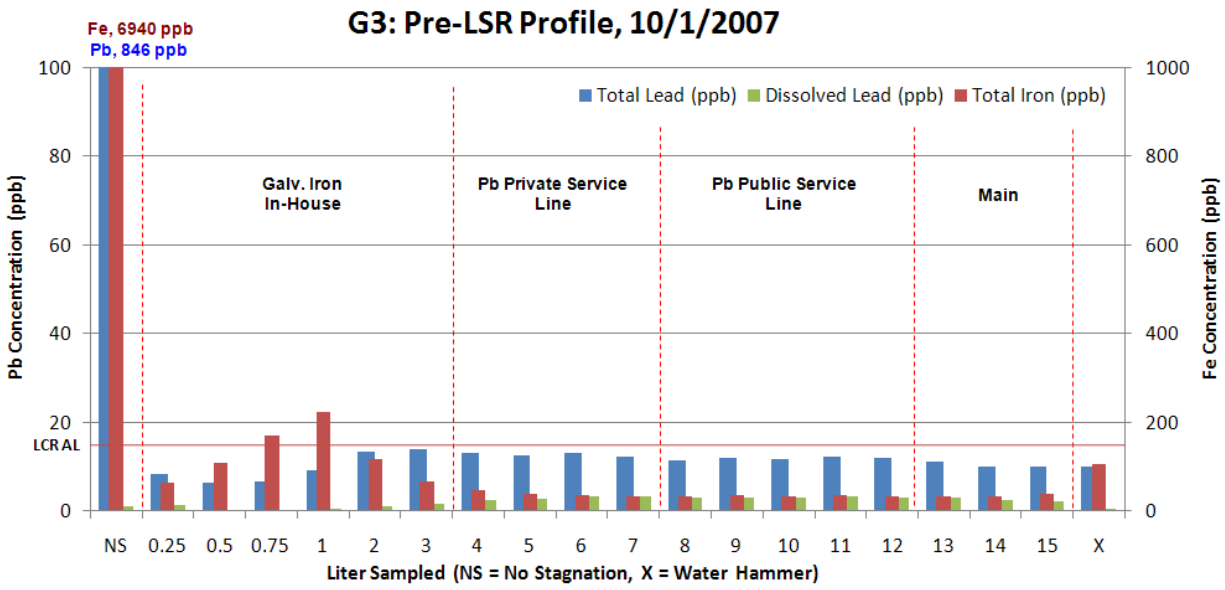
An example taken from the Commons, 2012 study is shown below. The first draw sample (Liter 1) is just under 0.010 mg/L, which is below the action level of 0.015 mg/L. The lead concentration in liter #5 is just over 0.040 ug/L, which is well over the action level. This is an example of a profile where there is a lead peak (highest lead concentration for a sample) due to lead from the service line; although in this case the peak is after the measured volume of the service line (which would end at Liter 3). This trend has been observed in other profiles where elevated lead levels often occur after the measured volume of the service line. Sometimes as in this example, the lead peak occurs after the measured volume of the service line. "High lead levels continuing past the calculated volume of the home's internal plumbing and service line is important when considering how to collect a good service line sample. In

many cases, the peak lead concentration values occurred well beyond the calculated volume. One explanation is that water flow is turbulent, so service line water is mixing with fresh water from the main as it travels through the home's internal plumbing, thus diluting the highest concentrations and showing lead in a much greater volume of water" (Commons, 2012). Another reason is that the relatively clean water from the water main can also pick up lead from the LSL and other lead sources as the water flows through them.



A second profile is presented below has a much different look (HDR Engineering, 2009). This is from a house that had galvanized iron interior plumbing, but the galvanization layer has worn off and exposed iron. This profile shows an iron/lead particulate (spike) in the no stagnation sample collected following a 5-minute flush. This sample had a lead concentration of 0.846 mg/L with iron at almost 7 mg/L. The samples collected the following day after a minimum six hour stagnation time all had lead levels below the action level of 0.015 mg/L.

Figure 2: Lead and Iron in Drinking Water – HDR Engineering, 2009



Aerator Removal and Pre-Stagnation Flushing in Sampling Instruction for Residents

EPA issued guidance in an October 20, 2006 memorandum from the Office of Ground Water and Drinking Water entitled "Management of Aerators during Collection of Tap Samples to Comply with the Lead and Copper Rule" (EPA, 2006) stating that public water systems should not recommend that customers remove or clean aerators prior to or during the collection of tap samples for lead. This guidance was issued because aerators can capture lead-bearing particulate material from corrosion of lead materials in the distribution system. EPA did recommend that residents regularly clean their aerators to remove particulate matter. However, if residents were only encouraged to remove and clean aerators prior to collecting a sample to test for lead, the public water system could fail to identify the typically available contribution of lead from the tap and thus fail to take additional actions needed to reduce exposure to lead in drinking water.

One of the issues with pre-stagnation flushing is whether the first draw sample represents water that was in contact with the faucet and interior plumbing or with the lead service line. Some systems' sampling instructions recommend flushing the tap for an extended period of time (5 minutes or longer) prior to the start of the minimum six-hour stagnation time. Concerns about this practice include whether it leads to biasing the sample downward (e.g. by limiting the contact time of the water in the service line).

The impact of pre-stagnation flushing was evaluated in a recent study (Del Toral et al, 2013) by conducting two rounds of monitoring at the same sites using a normal household use (NHU) protocol and a pre-stagnation flushing (PF) protocol. Under the PF protocol, the tap was flushed for at least 5 minutes prior to the start of the stagnation period, while there was no pre-stagnation flushing of the tap

in the NHU protocol. In the first round of sampling, each resident collected a NHU first-draw sample and then a second-draw sample after allowing the water to run for 45 seconds. On day two, residents collected a PF first-draw sample and then another sample after the tap ran for 45-seconds. This sampling occurred in the March/April 2011 timeframe and data were collected at 32 sites. Another round of NHU and PF first draw samples was also collected in September/October 2011 with data from 28 sites. This evaluated whether the 5-minute pre-stagnation period flush limited the contact time that water in the resulting first-draw PF sample had in contact with the lead service line and may be more representative of the tap than the service line. Water in the second draw samples may have been in contact with the lead service line for the entire stagnation period, depending upon the plumbing configuration at the house, so there could be differences in the impact of pre-stagnation flushing.

The PF first-draw protocol produced lower individual results than NHU first-draw protocol in 23 of 32 sample pairs in March/April and 20 of 27 sample pairs in Sept/Oct sampling. To limit the impact of analytical variability, the data were analyzed to focus on sites where the difference between the lead levels in NHU and PF samples was such that the PF result was outside the range of ± 20% NHU value. In the March/April sampling, for sites where the difference between the NHU and PF results was greater than +/-20%, the NHU concentrations were higher than the PF concentrations at 9 of 12 sites. For those sites where there was more than a +/-30% difference in lead concentrations, 8 of 10 sites had NHU concentrations greater than PF concentrations. A similar trend is observed in the Sept/Oct sampling where NHU was higher than the PF by more than the specified percentage at: 11 of 15 sites with at least 20% difference and 4 of 6 sites with at least 30% difference.

The March/April second draw results from 32 sites show a different trend regarding pre-stagnation flushing. The results from the normal household use are typically lower than the results from pre-stagnation flushing in the second draw samples. Among the sites where the difference between NHU and PF samples was greater than ± 20%: 6 of 17 sites had higher lead levels in NHU samples. Among those sites where the difference was more than +/- 30% only 5 of 14 sites had higher lead levels for NHU samples.

Potential Modifications to the Lead and Copper Rule Sampling Protocol

Maximum Stagnation Time

The 1988 Proposed Lead and Copper Rule had an 18-hour maximum stagnation time for lead and copper tap samples that was not included in the final rule. Under the current rule, there is only a minimum stagnation time of 6 hours, there is no maximum stagnation time. EPA is considering adding a maximum stagnation time of 24 hours for lead and copper tap samples as part of the long-term revisions. States could invalidate the sample results from sites where the stagnation time exceeded the maximum of 24 hours.

Lead Service Line Sampling

EPA is considering different sampling procedure options for sites with a partial or fully intact LSL to better assess the amount of lead contributed by lead service lines and, thus, whether further action is needed.

One potential service line sampling approach is to collect and discard a specific number of liters prior to taking (using a fresh bottle) a one-liter sample representative of the service line. The sampling instructions would be the same for all sites in the sampling pool. A challenge to this approach is determining the specific number of liters to collect and waste prior to collecting samples that would be representative of the lead levels within all of the LSLs, since plumbing configurations and service line lengths will vary across sites.

Another potential service line sampling approach is to collect a series of sequential samples at each site in the sampling pool to identify the liter containing the highest lead at the site (an initial profile) and use that site-specific identified liter for subsequent monitoring and compliance purposes. In subsequent monitoring periods, the number of liters to get to that sample would be wasted before the one-liter service line sample for that site would be collected in a new sample bottle. The volume of water being wasted prior to sample collection will vary among sites under this approach. This approach seeks to balance obtaining site-specific samples while reducing analytical costs since sequential sampling to identify the liter containing the highest lead would be conducted one time at each location and when new sampling sites were added to the pool. The number of initial samples in the profile could be limited to 10 samples, since most peak lead levels occur before the 10th liter. An important consideration with this approach would be whether the added complexity could be appropriately managed by the public and drinking water utilities to ensure reproducible results.

The following table summarizes lead service line profile data from six water systems in four studies. This table compares several sampling options to represent the service line: first draw (current), the sixth liter for intact LSLs and the highest result from a profile and shows how many sites can meet the action level (AL) using that criterion. The data from these profiles shows that the concentration in the sixth liter was higher than the first draw in 90 percent of the sample pairs.

Table 1: Comparison of First Draw, Sixth Liter and Highest Liter Options for Intact LSLs

Source	Total Sites	% First Draw <= AL (0.015 mg/L)	% Sixth Liter <= AL (0.015 mg/L)	% Highest Liter <= AL (0.015 mg/L)
Washington, DC [1]	14	93%	79%	50%
Washington, DC [2]	3	100%	33%	0%
Madison, WI [2]	4	100%	25%	25%
Toronto, Canada [2]	3	100%	67%	67%
Chicago, IL – Jun [3]	28	100%	64%	54%
Chicago, IL – Sep [3]	29	97%	69%	45%
Providence, RI [4]	8	50%	25%	0%
TOTAL	89	93%	61%	43%

[1] [HDR Engineering, 2009]
[2] [Sandvig et al, 2008]
[3] [Del Toral et al, 2013]
[4] [Commons, 2012]

This table shows the reduction in the percentage of samples meeting the action level using either the sixth liter or the highest sample compared to the first draw. Systems with greater than 90% of sample results less than or equal 0.015 mg/L meet the action level. Only Providence exceeds the action level using first draw samples whereas all of the systems would exceed the action level using either the sixth liter or the liter with the highest sample result. The Providence data were collected during the timeframe when Providence had elevated pH, but corrosion control was not optimized.

Another way to look at the data is to calculate a 90th percentile for the larger Chicago data sets for first draw, sixth liter and highest liter data sets. That is presented in the following table.

	90th Percentile Value (mg/L)		
Sampling Period	First Draw (FD)	Sixth Liter (L6)	Highest Liter (High)
June	0.0087	0.0238	0.0271
September	0.0092	0.0200	0.0304

The 90th percentile based on first draw samples is below the action level in both sampling periods whereas the 90th percentiles for the sixth liter or highest liter were well above the action level in both periods. The 90th percentile more than doubled by selecting the sixth liter compared to the first draw and the highest sample is more than triple the first draw.

The logistics of any sampling protocol present other challenges, e.g. in working with residents to collect service line samples. The more complex the sampling protocol, the more difficult it may be to train residents to take the samples and maintain their participation in subsequent monitoring periods.

Sampling Instruction Language: Aerators and Flushing

EPA is considering prohibiting language in the sampling instructions for residents recommending the removal and cleaning of aerators prior to the collection of lead and copper tap samples. EPA is also considering prohibiting language in the sampling instructions for residents recommending pre-stagnation flushing, if first draw samples are retained for lead service line sites. Systems would not be prohibited from generally advising their customers to remove and clean aerators and to flush the tap prior to use, however they would be prohibited from including those recommendations in the instructions they provide to their samplers.

Tap Monitoring Frequency

EPA is considering reducing the standard monitoring frequency to annual (with a June through September timeframe). As was discussed in the first NDWAC Working Group meeting, EPA is considering a re-optimization approach where systems would re-evaluate their corrosion control process prior to lead service line replacement. Unlike the current rule, EPA is considering that the annual tap monitoring be conducted during the re-optimization process to provide additional

information for systems and States to better inform the treatment installation and post-installation evaluations.

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ON DRINKING WATER

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ATTACHMENT F-Prevost Written Statement:
September 11, 2014

ENVIRONMENTAL PROTECTION AGENCY
National Drinking Water Advisory Council (NDWAC)
Lead and Copper Rule Working Group
Office of Water (4100T)
1200 Pennsylvania Avenue, N.W.
Washington, D.C. 20460

Subject: Written statement for the LCR Working Group meeting on September 18-19, 2014

In the framework of the Lead and Copper Rule revisions, we would like to draw your attention to the existence of scientific and field validated results collected by our research group. Our research team joins the efforts of researchers from 3 Canadian universities: Polytechnique Montreal with Dr. Prévost as project leader, Dalhousie University with Dr. Gagnon, and the University of Toronto with Dr. Andrews. Since 2006, we have completed several bench-scale, pilot-scale and full-scale studies on lead in tap water funded by the Canadian Water Network (CWN), in collaboration with five utilities.

We are currently carrying out a long-term full-scale study to validate the occurrence of severe lead release following partial lead service line replacements and completing in parallel pilot-scale testing using 5 different water qualities and 4 different treatments addressing various aspects of this issue. While many of our research results have been published or presented, we believe that some of our research findings are directly pertinent to the topics that are identified for discussion during the September 18-19th LCR Working Group meeting (lead sampling protocols and public education requirements for lead and copper). More specifically:

- **Different sampling protocols should be used to detect lead service lines (LSL) and to assess exposure.** We compared sampling protocols after random daytime stagnation, 30 minutes of stagnation and 5 minutes of flushing. Although we did not conduct the regulated 6 hours stagnation protocol prescribed by the LCR, the findings are directly relevant as they highlight the advantages and limitations of these protocols and the importance of selecting a protocol adapted for the required purpose (Cartier et al. 2011, Deshommes et al. 2010a).

- **The 30-minute stagnation protocol is best suited to assess lead exposure.** This was demonstrated using several full-scale datasets and validated with measured and modeled blood lead levels (BLLs). The 30-minute sampling results from a utility were applied in IEUBK and were good predictors of the BLLs of young children from the same utility, which were measured during an epidemiological study on lead exposure in 306 households with or without a LSL (Deshommes et al. 2013, Ngueta et al. 2014).

- **LSL households should clearly be prioritized for sampling as they correspond to potential repeated exposure to elevated concentrations of lead at the tap. This raises the issue of utilities being able to detect sites with an LSL.** Field measurements of lead at the tap after 5 minutes of flushing or after a short stagnation using a portable measurement device are able to detect with reliability the presence of a LSL. Although a field protocol including a short stagnation (15-30 minutes) can be used with success, a low cost and easier approach would be using the 5-minute flushing protocol in reference to lower threshold values than the references values of 10-15 µg/L. We validated these results at full-scale in 676 households and the utility is now using every year this procedure to detect LSLs. The threshold used for validating the presence of a LSL in this utility is 3 µg/L after 5 minutes of flushing (Cartier et al. 2012b).

- **Single-family detached homes are sites at highest risk for children exposure compared to multiple dwelling homes** and should be prioritized for lead samplings and corrective actions (Deshommes et al. 2013). Indeed, we measured water lead levels in various types of households and found significantly higher lead concentrations in the tap water of detached single-family homes. We also demonstrated using IEUBK that these differences in water lead levels have an impact on young children BLL and validated the IEUBK predictions with field-measured children BLL in the same utility (306 homes).

- **Sampling protocols and analytical laboratory protocols should take into account particulate lead in water** considering its occurrence at full-scale in households with a LSL and considering the acute particulate lead levels measured in problematic large buildings (Cartier et al. 2012b, Deshommes et al. 2010a, Deshommes et al. 2012). This is also justified by the demonstrated fact that lead particles from tap water are bioavailable and can contribute to children BLLs (Deshommes and Prévost 2012). To take into account particulate lead in tap water, sampling should be conducted at a flow rate consistent with regular water usage, using wide-mouth bottles, and laboratory procedures should include sufficient acidification and digestion time to avoid underestimation of particulate lead.

- **Relying on the first draw for the detection of LSLs or the evaluation of exposure may be misleading as it represents distal contribution of the faucets and its connecting piping.** This is especially relevant if small sample volumes (250 mL) are prescribed for monitoring. Investigations on the contribution of faucets have demonstrated that faucet specific characteristics and water quality determine lead release from the faucet (Cartier et al. 2012c). Although limiting lead release from faucets is important, it is device specific, restricted to a relatively small volume (as compared to volumes from LSLs) and should be interpreted as such.

- **Industry certified point-of-use devices are efficient as a temporary measure to reduce consumers' exposure to soluble and particulate lead release in presence of a full LSL, or following a PLSLR.** We tested 7 types of point-of-use devices over long-term and validated their performance for soluble and particulate lead removal. We additionally tested one device over 1 year in a large building with acute particulate and soluble lead release (Deshommes et al. 2012, Deshommes et al. 2010b).

In addition, although not published yet, the current study conducted at full-scale over long-term (6-20 months) has already revealed interesting findings regarding the selection of sampling sites and sampling protocol:

- **A wide variety of premise piping and LSL configurations exists in dwellings of multiple types, and even in single-family homes. These variations significantly impact lead concentrations and the probability of a given protocol to indicate maximum and average lead concentrations to which the consumer is exposed.** Repeated profiling sampling was conducted in multiple types of households using profiling sampling after 30 minutes of stagnation (8 to 16 liters consecutively collected after 30 minutes of stagnation). Premise plumbing piping and service line volumes were estimated by detailed measurements of pipes lengths and diameters. The estimated volumes of premise piping varied widely from 0.5 to 9 liters, and the volume of LSL ranged from 2 to 10 liters. Similar variations were found for the subset of single-family homes studied. The varying volumes of premise piping determine in which volumes the peak lead concentrations will be found in the lead sampling profile results. These results concur with other recent profiling sampling reports and suggest that it is neither feasible nor desirable to prescribe volumes after the second liter to evaluate lead concentrations in the service line. In terms of exposure, understanding the total volume with elevated lead concentrations seems more useful as it determines the probability of the consumer being exposed to the maximum concentrations found in the LSL. The volume in the LSL piping determines the number of liters with high concentrations of lead after stagnation. These aspects are important to consider when selecting a regulated sampling protocol after stagnation.

- **Extensive flushing at the tap just after a partial lead service line replacement (PLSLR) can reduce particle lead release following PLSLRs.** Such flushing could be carried out at the exterior tap to avoid any particles accumulation in the premise piping and behind the tap aerator. If flushing the exterior tap is not possible, flushing the kitchen tap and cleaning the aerator would be an adequate procedure to implement.

As future meetings may cover the issue of partial lead service line replacements (PLSLRs), we will be happy to share with you our recent findings on full-scale and pilot-scale results on corrosion control and PLSLRs. Earlier results from work conducted in 2010-2012 at pilot-scale studies showed significant and persistent lead release following PLSLRs and limited potential of corrosion control to mitigate this release (Cartier et al. 2012a, Cartier et al. 2013, Doré et al. 2012). The continuation of this pilot study over long-term (now 3 years) shows persistent lead release by these connections and no attenuation over time. PLSLRs do not reduce efficiently lead release, and can result in acute lead release especially with orthophosphate dosing. More importantly, the persistent and transient acute release of lead observed at pilot scale in our work and reported by several other researchers is not observed in our ongoing full-scale intervention studies. Acute adverse effects of PLSLRs have not been observed to date raising the issue of the ability of pilot studies to predict full-scale lead release (study ending in May 2015). At full-scale, lead concentrations are reduced following PLSLRs, however lead concentrations measured in households remain still close to regulated levels if corrosion control is not present. Therefore, PLSLRs do not appear to be a cost-benefit advantageous solution for utilities to reduce lead unless it can be demonstrated that PLSLRs will be sufficient to reduce lead levels to regulated levels.

Please find in appendix the list of publications from our research group cited in this letter. We also enclose the pdf versions of these publications for your convenience.

We hope that our findings will be useful for your needs and remain available if any additional information is needed.

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Appendix G: Comments Regarding Considerations for Changes in Copper Provisions within LCR

Bob Weed

Copper Development Association Inc.

September 19, 2014

Copper Release

- Copper release to water is primarily driven by water chemistry
  - Actual corrosion chemistry is complicated, but from a copper release screening standpoint can be simplified to a few significant variables
    - Water chemistry
      - pH
      - Alkalinity
    - Treatment Process(es)
      - Disinfecting/oxidizing treatment (chlorination, chloramination)
      - Corrosion control treatment (orthophosphate dosing)
  - Considering only these variables waters with a higher potential to release copper could be characterized as:
    - pH < 6.5
    - 6.5 < pH ≤7.0 with disinfection/oxidative treatment
    - 7.0 < pH ≤ 7.5 with disinfection/oxidative treatment and alkalinity > 200 mg/L
    - pH > 7.5 with disinfection/oxidative treatment and alkalinity > 250 mg/L
  - If the system utilizes orthophosphate dosing for corrosion control with a PO_4 residual > 3.3 mg/L the above would no longer be suspect for copper release

Copper Release

- Pipe age is a secondary factor that is not universally predictive
  - Copper release will nearly always be highest in newer copper piping (no aging)
  - In most water chemistries, copper release diminishes rapidly with age
  - In some water chemistries (low pH, high alkalinity waters with no oxidative treatment or corrosion control) copper release can persist with aging

LCR is Meant to Protect Public Health

- To do so, it must reasonably assess lead/copper release in at-risk locations
- To do so economically, it must minimize monitoring at locations not likely to be at-risk
- To do so realistically, it must require actions at the point of control/decision, not educate afterwards

Implications of Current Scheme Regarding Copper

- Site selection criteria leads to copper monitoring at locations not likely to be at-risk for copper – driven by lead chemistry and history
  - Little chance of identifying areas where corrosion control should be initiated to address copper
  - Requires continued sampling without acknowledging water chemistry/treatment success

Implications of Current Scheme Regarding Copper

- Sampling protocols and proposals are driven by lead
  - first draw addresses brass fittings (lead)
  - volume adjusted sampling (wasting several liters) addresses the service line (lead)
  - both miss sampling the premise plumbing likely to be copper

Comments on Proposed Scheme

- Site selection criteria specific to identified at-risk locations for copper would be more protective, economical, addressable
  - Acknowledge water chemistry/treatment controls and copper sampling already in place
    - Copper monitoring waivers to eliminate unnecessary long-term monitoring
    - Targeted monitoring in at-risk locations would allow water systems to address the issue with chemistry/system adjustments and take credit for successful action
    - Targeted monitoring in at-risk locations confirming copper exceedance would allow for targeted, meaningful public notification

Comments on Proposed Scheme

- Sampling protocols designed to address water resident in the premise plumbing would be more predictive of copper release and potential/actual water treatment adjustments
- Targeted public notification in systems shown to be at-risk eliminates unnecessary fear or poor decisions with regard to:
  - plumbing material usage
  - balancing the message regarding copper as an essential micronutrient and copper as a drinking water issue