

# Questions and Answers from the Arsenic Rule Web Cast



December 1, 2004

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**1. Where do you anticipate holding the five regional training sessions this spring?**

EPA has assessed needs of the States through feedback from the EPA Regions as well as through a partnership with ASDWA. EPA and ASDWA identified Regions and States with the greatest need for training in arsenic treatment technology issues for their state staff, design engineers and system managers. We anticipate that the 5 training sessions will be located in:

**Phoenix, AZ** - April 25-26, 2005  
**Sacramento, CA** - April 27-28, 2005  
**Omaha, NE** - May 9-10, 2005  
**South Bend, IN** - May 12-13, 2005  
**Austin, TX** - May 23-24, 2005

If you have any questions or concerns, please contact Jennifer Moller ([moller.jennifer@epa.gov](mailto:moller.jennifer@epa.gov) or 202-564-3891).

**2. If a system has a running annual average (RAA) of less than the MCL, yet the last result is above the MCL, is it a violation? My understanding was that if the RAA was used that one sample would not result in a violation unless it was 4 times the MCL. Please explain.**

That is correct. Any sample can exceed the MCL, as long as that exceeding sample does not cause the running annual average to violate the MCL of 10 ppb. A system determines compliance at each sampling point. If the RAA (of this last result and the previous results of up to one year prior, at one sampling point) is below the MCL, then the system is in compliance (40 CFR 141.23(i)). Additionally, each state has the authority to make compliance determinations that are more stringent than what the federal rule requires.

*For example:* 1st Q = 20 ppb  
2nd Q = 20 ppb  
3rd Q = 10 ppb      **violates MCL** ( $[20 + 20 + 10 + 0] / 4 = 13$  ppb)

**3. What is the arsenic unreasonable risk to health (URTH) level?**

EPA's approach to developing an URTH for arsenic exemptions was based on the time between promulgation of the Rule in 2001 and the compliance date of 2006. As a matter

of congressional policy, exposure at the current MCL of 50 ppb during these 5 years should not pose an URTH. The total exposure above the revised MCL for those 5 years is  $40 \text{ ppb} \times 5 \text{ years} = 200 \text{ ppb} \times \text{years}$ . This “excess compliance-period exposure” was used to determine length of an exemption past the compliance date, so that  $200 \text{ ppb} \times \text{years}$  would not be exceeded. Please refer to these guidance values under Table 1 in Appendix G, pages 13-16, to the Implementation Guidance for the Arsenic Rule. This can be found at [http://www.epa.gov/safewater/ars/pdfs/regguide/ars\\_final\\_app\\_g.pdf](http://www.epa.gov/safewater/ars/pdfs/regguide/ars_final_app_g.pdf). Alternatively, states may use another method to determine URTH for arsenic exemptions.

**4. If there is one entry point for a surface water source and another for a ground water source that has high arsenic, can sampling take place within the distribution system if that is the only place that represents all sources?**

Systems must sample at each entry point to the distribution system (EPTDS). Systems that use more than one source that are combined before distribution must sample at each EPTDS during periods of normal operating conditions. Systems may sample at a more representative sampling point (e.g. distribution system) to satisfy monitoring requirements if the State has determined that conditions make another sampling point more representative of each source (40 CFR 142.11(a) and 141.23(a)).

**5. Generally speaking how small are the systems you are referring to?**

Statistics for arsenic exemption applicants:

Castleford, Idaho - population: 277 residential water customers: 103

East Lizard Butte Water Corporation - residential water customers: 55 (manufactured home community)

New Plymouth, Idaho – population: 1,386 residential water customers: 632

Statistics for Idaho DWSRF loan applicants:

Population range: 64 to 32,000

Median population: 3,954

Customer range: 124 to 5,400

Median customers: 1,946

**6. Can a privately owned PWS get financial assistance in your state?**

All water systems have access to a variety of financial assistance resources. Idaho allows private water systems to borrow funds from the State Revolving Loan fund and uses the strict technical, financial, and managerial (TFM) review criteria for all systems, public and private. Alaska, another state we work with, has offered Drinking Water SRF to investor owned utilities. Private water systems that are able to access their state SRF for funding benefit from the taxpayer subsidy offered through lower interest rates. We believe it is important that the process the state uses for reviewing the TFM of SRF applicants is sufficient to protect these public resources.

**7. What are the loan default rate differences for state revolving fund (SRF) projects between systems that don't have adequate technical, managerial, and financial capacity vs. those that do, at the time of SRF application?**

To date, we have not worked with any community water systems - municipal, not-for-profit or investor-owned - that were in a loan default condition at the time of their SRF application. Our analysis of their financial records, usually three years of historic data, may indicate trouble spots regarding lack of financial capacity that need correction, but not a condition of default. Nationally, it is extremely rare for a municipality to be in default on a debt issue. It is so rare, that it's pretty big news if it happens.

**8. How do you quantify what is affordable versus unaffordable for a system?**

Affordability is determined by considering current affordability, future affordability, and relative economic status.

The current affordability index measures current monthly residential water rates as a percentage of median monthly household income for the community. The future affordability index measures monthly residential water rates expected after completion of measures to reduce arsenic as a percentage of median monthly household income for the community.

Many states consider an affordability ratio of 1.25-1.75% to be unaffordable. In reviewing cities applying for Idaho DWSRF loans, the EFC uses a standard of 2.0% as the maximum ratio. The U.S. EPA is currently using 2.5% as the threshold for affordability.

Relative economic status is determined by looking at the median household income, poverty rate, and unemployment rate for the community in comparison to county, state, and national data. There is no standard measure for determining whether these socioeconomic indicators suggest that rates are unaffordable for a community, but the analysis provides an overall picture of how the community compares with other regions.

**9. What does EPA consider to be an unreasonable risk to health level for an arsenic exemption?**

See answer to question # 3

**10. In reference to the financial review checklist, what method or formula is used in integrating affordability data to the financial review process?**

There are no specific methodology in terms of "points" or a "formula" in determining whether financial data for a community, in combination with affordability data, indicates that meeting the arsenic standard is unaffordable. It is possible that affordability can be determined solely by looking at measures such as the current and future affordability ratios and relative economic condition (outlined in question 8). However, analysis of

financial condition provides a richer context for understanding the community's overall capacity to fund arsenic improvements. For instance, the financial ratios included in our analysis provide information about whether the system is currently covering the full cost of providing services, and the effect of taking on additional debt. Finally, attitudinal factors can be really important when the public decides what is affordable to them. Giving the public the right kind of information about the health hazard of arsenic, rather than simply defining the arsenic rule as an "unfunded mandate" can help them make a choice that is not based simply on economic criteria.

**11. What is considered "affordable or target" water rate (i.e., 2% MHI? 1.5% MHI)?**

There is no universal standard for an "affordable" or "target" water rate. Different states have different standards, as does EPA (see discussion for question 8 for rates used by various agencies).

**12. What is the bioaccumulation factor for arsenic ?**

At the present time, there are insufficient data to derive a suitable bioaccumulation factor (BAF) for As. There are several reasons for this situation. For example, we used to think that organic As species were relatively non-toxic and that the metabolism of inorganic As to its monomethylarsonic acid (MMA) and dimethylarsinic acid (DMA) derivatives was a detoxification reaction. This appears to be the case to the extent that the pentavalent (+5) metabolites are formed. However, recent research has shown that the trivalent (+3) M.A. and D.M.A. metabolites are usually more toxic in *in vitro* test systems and as enzyme inhibitors than the inorganic trivalent As. We also used to believe that fresh water and estuarine species had similar levels of organic and inorganic As. This has not been shown to be the case. We now know that the levels of organic species in saltwater and freshwater aquatic species are often different. We also need a lot more data on the levels of various inorganic and organic As species in fresh water aquatic organisms and on the toxicities of each species found in significant amounts. (Note - There are still no reasons to doubt that the arsenobetaine and arsenocholine found in salt water aquatic species are toxic to humans.). The Office of Water has summarized its findings in an EPA report entitled "Technical Summary of Information Available on the Bioaccumulation of Arsenic in Aquatic Organisms." It may be found online at: <http://www.epa.gov/waterscience/humanhealth/>.

**13. For Bill, are there other states reaching out to you to get information on how they use capacity development to help potential systems in meeting the standard? Specifically, EPA Region 8 states? Also, how do you see the various EPA regions getting involved in helping the states.**

We are in the process of creating a workshop series for eight locations in the State of Colorado to promote the concept of reinvesting in water system infrastructure for more sustainable water systems. The Environmental Finance Center also worked with the University of Utah this past summer to present a rate setting and capital reinvestment workshop in the Salt Lake City area. We are willing to share our tools and training

techniques with the Region 8 states through train-the-trainer events and direct service to our neighboring states. Our goal is not to reinvent the wheel but to add value to the work of others in their capacity development efforts by sharing what we do best. EPA Regions without Environmental Finance Centers (Regions 7 and 8) can help their states by engaging existing EFCs – like ours at Boise State University – through contracts or grants to provide service in those regions.

**14. What is the basis for the curves representing Excess Risk vs Margin of Exposure?**

With both, an Effective Dose (ED) for some percent of the study population is calculated. For example, a 1 % calculation would give an ED<sub>01</sub>. The lower 95% confidence level would then yield a LED<sub>01</sub>. This value would be the Point of Departure (PoD) for either excess risk or Margin of Exposure. A straight line from the PoD to the origin would be used to estimate excess risk curve for linear carcinogens or those carcinogens for which there are no known mode(s) of action. If one were dealing with a non-linear carcinogen, then one would employ a Margin of Exposure (MoE) approach. Using the PoD, one would then derive uncertainty factors to arrive at a MoE (cf chloroform).

**15. Why are humans more susceptible to arsenic poisoning than rats or rodents? Does the body remove arsenic or is it cumulative?**

Humans are at least as susceptible and maybe more susceptible to the *acute toxic effects of As (LD<sub>50</sub>)* than rats, mice and/or guinea pigs. The main purpose of that slide was to point out that we had some data that demonstrated that the toxic effects of a chemical, As in this case, in humans were similar to or greater than those demonstrated for some animals species. Since the LD<sub>50</sub> values calculated for humans were from case studies and the exact doses were not known, it is not possible to establish a completely accurate LD<sub>50</sub> for human exposure. The variation in the values for the various animal experiments were probably due to several factors. These most likely included: 1) Differences in research protocols among the various laboratories, 2) The use of different strains of experimental animals, and 3) The use of different formulations of As.

As mentioned in the presentation, humans and most animals excrete most of the ingested As in the urine. However, some As is deposited in various body tissues. It is preferentially bound to hair and skin which contain relatively high levels of sulfhydryl (SH) groups and the trivalent As species will bind to the free SH groups.

**16. Is there inhalation exposure of arsenic (hot water showers, etc.)?**

Arsenic is not volatile and there would be minimal As exposure during showering.

**17. A system uses a seasonal source and uses the weighted averaging scheme for compliance. It uses a source at 40 ppb for one quarter. Given what we know about acute toxicity, is this level safe for children?**

Under the current running annual average monitoring scenario at each EPTDS, a system could theoretically (although, not likely) have a sample at 40 ppb one quarter and still be in compliance with the MCL if the other 3 quarters are zero (RAA = 10 ppb). The more complex question for systems and states is determining a source maximum arsenic concentration that is protective of health, regardless of whether the weighted average is still less than the MCL.

It is conceivable that a source may have very high levels of arsenic, but would only be used for a very short period of time, thus not exceeding a weighted average. EPA does not have the appropriate health effects data to determine a maximum allowable level of arsenic protective of human health, particularly since the time a source may be used will vary from year to year depending on system requirements. Weighted averaging was intended to be an option for those systems who had arsenic levels just over the MCL.

During the Arsenic Rule development stage, occurrence data information indicated that many of the systems that would be impacted by the new rule had arsenic levels between 10-14 ppb. Systems should consult with their primacy agency to determine whether their system would be a good candidate for this alternative monitoring plan.

**18. How would you dispose of the waste product from POU or POE devices? Do you know of any states who do the monitoring themselves that have systems using a POU device to comply with an MCL?**

Systems considering POU and POE devices should consult their primacy agency on required disposal permits. Depending on the volume and disposal method, a permit may be required. The residuals that can be generated by the POU or POE devices are:

1. Solid residuals, such as spent cartridges, media, resin, membranes, bulbs, and filters that require disposal at the end of their useful life. Disposal may occur several times a year or less frequently.
2. Liquid waste streams will be generated by POU RO systems and POE IX, GAC, and adsorptive media systems if backwashed or regenerated. POU RO units produce a waste brine which is characterized by high contaminant concentrations. Backwashing and regeneration, required for proper operation of most POE IX, GAC, and adsorptive media treatment devices, will also result in the generation of intermittent liquid waste.

The quantity and characteristics of the residuals will vary based on the treatment technology used, contaminant(s) being removed, source water characteristics, and other site-specific operational conditions. In order to properly assess the quantity and quality of the residuals, pilot testing should be done. Because the residuals generated by POU and POE units installed in residences are collected from individual households, these household wastes *will* be exempt from Federal regulations as hazardous wastes under RCRA. However, State regulations and each State's implementation of Federal regulations can vary. Solid residuals produced by these treatment systems often can be disposed of like normal household waste, delivered to a local landfill or regenerated.

Liquid residuals may usually be discharged to POTWs (upon approval from the POTW), on-site septic systems (may require a permit from the State or local agency), or dry wells (may require a permit). In the case of liquid residuals, POTWs may issue their own limits for the discharge of certain contaminants, such as copper and TDS. However, waste that contains high concentrations of certain contaminants may require special handling and disposal.

POU and POE devices installed in commercial or business establishments may also be exempt from RCRA if the quantity of waste generated is considered small (defined in 40 CFR Section 261.5 as generating no more than 100 kilograms of hazardous waste in that month). For these types of installations, the system should contact the appropriate State or local regulatory personnel to assess proper classification and disposal of waste.

**Do you know of any states who do the monitoring themselves that have systems using a POU device to comply with an MCL?**

No, EPA is not aware of any state performing monitoring of POU devices.

**19. Do you need to go through the variance or exemption process to be able to use POU/POE devices?**

A system is allowed to use POU/POE devices as part of a compliance strategy and is not limited to using POU/POE devices under a variance or exemption. For instance, the Radionuclides Rule and Arsenic Rule both list POU devices as small system compliance technologies for compliance with MCLs. Please refer to Exhibits 1 and 2 at the end of this document for a full listing of POU and POE devices that EPA has listed or is considering as small system compliance technologies.

**20. For Janet, What were the arsenic levels at the Fallon Airforce base and was there a high level of silica in the water?**

The arsenic level in the water was about 0.100 mg/L. Information on the silica levels could not be located, but the following reference may contain more detailed information on the influent water quality:

Rubel, F. 1985. Pilot Study for Removal of Arsenic from Drinking Water at the Fallon, Nevada, Naval Air Station. Document #EPA/600/2-85/094.

**21. Is there cost data available associated with the POU/POE case studies?**

The following costs are available for Fallon Naval Air Station:

For 4-stage POU RO (sediment and GAC pre-filters, RO filter, GAC polish filter, with in-line TDS sensor), the purchase and installation cost per unit was \$303. Installation

averaged about one hour per unit. O&M costs were \$129 per year per unit. This cost included replacement of sediment pre-filter and both GAC filters every 9 months and replacement of the RO filter every 27 months. Disinfection of the unit was performed every 9 months, also.

**22. How many states today allow the use of POU/POEs for arsenic treatment? How many systems use this option?**

About half the states listed POU as a SSCT for arsenic in their primacy packages. EPA does not know how many systems are considering this option, but some states are seriously evaluating a POU strategy for their smaller systems.

**23. What are the methods that systems use to maintain control of individual POU devices? How do systems maintain control if they have no control over the individual home?**

Some systems have passed ordinances that grant the system ownership and control of the POU devices, in addition to granting the system access to the units. Other systems have made the use of water contingent on the residence allowing the installation and maintenance of POU devices. In a trailer court setting, the trailer court owner could require installation of a POU device as a condition in the lease agreement.

**24. Inclusion of most POU requirements in part 142 leaves another regulatory gap for our regional Tribal programs. Will Headquarters close this gap by putting more detailed POU regulations in part 141?**

EPA is currently assessing the regulatory needs for POU.

**25. Are there organizations other than NSF that list approved POU/POE devices? (e.g., Underwriters Labs, Water Quality Association)**

Yes, the following organizations, in addition to NSF International ([www.nsf.org/Certified/DWTU](http://www.nsf.org/Certified/DWTU) or call 877-867-3435), are currently accredited to perform independent ANSI certification:

- 1) Underwriter Laboratories (UL) at [www.ul.com](http://www.ul.com) or call 877-854-3577
- 2) Water Quality Association (WQA) at [www.wqa.org](http://www.wqa.org) or call 630-505-0169
- 3) CSA International at [www.csa-international.org](http://www.csa-international.org)

**26. Use of bottled water to meet NPDWRs is currently prohibited. Is EPA considering allowing use of bottled water as an alternative to POU treatment?**

In order to provide additional mechanisms to achieve compliance, EPA lifted the ban on POU devices as compliance technologies in 1998. However, a special prohibition limited bottled water for use on a temporary basis in order to avoid an URTH. It may not be used to achieve compliance with the arsenic MCL. EPA believes that the accepted POU/POE



devices are lower cost alternatives to traditional treatment and when used according to EPA recommendations, provide suitable protection against the adverse effects of arsenic. At this time, EPA does not support bottled water as an appropriate long term compliance strategy.

**27. Does EPA provide any guidance on monitoring strategies for POU/POE?**

Monitoring of POU and POE devices should be conducted in a manner to substantiate the device performance and compliance with MCLs. The system must have a monitoring plan approved by the State for POU treatment strategies used under a variance or an exemption and for all POE treatment strategies. The goal of the monitoring plan is to ensure coverage, either complete or representative, that will quickly identify units that are not providing an adequate level of protection to customers. Results of the pilot study should be used to develop the monitoring schedule. Systems should contact the State or other appropriate regulatory agency to develop an approved compliance monitoring schedule. Also, States may have specific monitoring requirements depending on the particular situation.

EPA will have a guidance manual available in August 2005 entitled, "Guidance Manual for Implementing a Point-of-Use or Point-of-Entry Treatment Strategy for Compliance with the Safe Drinking Water Act." This guidance manual will contain additional information on monitoring of POU and POE devices.

**28. Allowing POU for arsenic treatment - does that mean that POU can be used for MCL compliance for other inorganics/rads?**

Please refer to Exhibits 1 and 2 at the end of this document.

**29. I thought that 100% participation was required? It appears it is not in this example. Is 100% required or, if not, what is the minimal cooperation rate necessary?**

Current regulations in 40 CFR do address participation. If POE devices are used for compliance, 40 CFR 141.100 (e) requires that all consumers shall be protected. If POU or POE devices are used under a variance or exemption for inorganics, organics, or radionuclides, 40 CFR 142.62 (h) (6) requires that all consumers will be protected. Some states have indicated to EPA that 100% participation should be required, but difficult to achieve. Some states have suggested to EPA that the State have the discretion on a case-by-case basis to allow less than 100% participation.

EPA will have a guidance manual available in August 2005 entitled, "Guidance Manual for Implementing a Point-of-Use or Point-of-Entry Treatment Strategy for Compliance with the Safe Drinking Water Act." This guidance manual will contain additional information on participation.

- 30. If a performance indicator device (PID) causes the POU device to shut off, where are people supposed to get their water? Wouldn't it be better to merely alert customers that the device is nearing the point where it needs servicing?**

Some states are opposed to automatic shutoff devices for this very reason. However, the SDWA does not specify the manner in which people are alerted to a problem, so automatic shutoff devices could be acceptable. The system should check with their primacy agency on this issue.

- 31. Is the minimum requirement to install only one POU per residence?**

The SDWA and 40 CFR do not address a minimum number of installations for POU devices within a residence. However, some states are concerned with this issue and have required systems to make sure all water dispensed in the kitchen, including the cold water tap, ice makers, and water dispensers on refrigerators, receive treated water such that all water consumed is treated. The system should contact their primacy agency on this issue. If multiple POU devices are required per residence, POU may no longer be a cost-effective treatment strategy.

- 32. What was the reason for 3 homeowners not participating?**

Two homeowners felt that this was just government intrusion. They didn't think there was anything wrong with their water. The other homeowner simply wouldn't open his door or even come to the door to discuss it. One of the two who didn't think POU was necessary has since moved and the new owner is installing a system. The health department was threatening to evict another.

- 33. Grimes Study - What is potable water (arsenic treated) usage per home, and is this as expected for the number of residents?**

Mean gal/home/day = 1.26 Range 0.04-2.79

Mean gal/person/day = 0.49 Range 0.01-2.79

The 2.79 number is for a restaurant

- 34. What does the automatic shut-off close -- water to device or water to house?**

The shut off device turns off the treated water tap. It does not affect the rest of the water to the home.

- 35. For Gordon, what did you mean at the end of your presentation that things can get messy?**

When compared to central treatment, a POU system will likely have more issues. We certainly did in the Grimes project. If a regulatory agency is willing to accept POU treatment they shouldn't expect that everything will be perfect every day. Perfection doesn't occur with central treatment either.

What this means to me is that if the question is asked whether someone will drink from a bathroom tap or hose bib, the answer will most likely be yes. Will someone's system shut down and leave them without treated water for a day or two until a replacement is installed? Yes, this will probably happen. If the condition for accepting POU is that these things never happen, POU will never happen. Central treatment is certainly better than POU, but POU is better than no treatment which is what could happen when variances and exemptions drag on forever.

**36. We know that the use of bottled water is not allowed - the question is, why and does EPA plan to change this determination in the future?**

See answer to question # 26

**37. What is the useful life of the typical POU device?**

The filters within the housing units are changed frequently- anywhere from once per month to once every two years. The frequency will depend on the device and contaminant(s) being removed. Other components of the POU device may also require replacement (flow meter or TDS monitor, for instance). The housing for the filters typically lasts 7 to 10 years.

**38. Arsenic is a hazardous substance. Many small systems use individual septic tanks. With many POU devices there will be a "flushing" of concentrated arsenic to the septic tank. The system must own the POU devices, so do they also "own" the residual? Does the residual become commercial waste? Will this change the classification of an ISDS system (now exempt) under the UIC program?**

Please refer to the answer for question 18 that addresses how household waste is exempt from RCRA

**Exhibit 1: POU Treatment Technologies**

Treatment Technology	Contaminant										
	As	Cu	Pb	Fl	NO3	SOCs	VOCs	Ra	U	Rn	Microbial
Activated Alumina (AA)	AR			UI					x		

Aeration: Diffused Bubble or Packed Tower											
Distillation	x	x	x		?	x		x	x		
Granular Activated Carbon (GAC)						SSC T					
Ion Exchange (IX)											
Anion Exchange (AX)	x			SSC T	SFI				RR		
Cation Exchange (CX)		SSC T	SSC T					RR			
Ozonation											
Reverse Osmosis (RO)	AR	SSC T	SSC T	SSC T	SFI			RR	RR		
Specialty Media	x	x	x		?			x			
Ultraviolet Light (UV)											

**SSCT** = Treatment technology has been identified by EPA as a SSCT (*Federal Register*, Volume 63, No. 151, August 6, 1998).

**SFI** = Treatment technology has been suggested to receive further investigation for the listed contaminant (*Federal Register*, Volume 63, No. 151, August 6, 1998).

**UI** = Treatment technology is being investigated by EPA for the listed contaminant (*Federal Register*, Volume 63, No. 151, August 6, 1998).

**AR** = Treatment technology is identified as an SSCT in the final Arsenic Rule.

**RR** = Treatment technology is identified as an SSCT in the final Radionuclides Rule.

**x** = Treatment technology can remove the noted contaminant, but is not listed as an SSCT in the *Federal Register* or in a rule.

**?** = Treatment technology is questionable for the listed contaminant.

**Exhibit 1 (continued): POU Treatment Technologies**

Treatment Technology	Contaminant						
	Antimony	Barium	Beryllium	Cadmium	Chromium	Selenium	Thallium
Activated Alumina (AA)						UI	
Aeration: Diffused Bubble or Packed Tower							
Distillation							
Granular Activated Carbon (GAC)							
Ion Exchange (IX)							
Anion Exchange (AX)	SSCT				SSCT	SSCT	
Cation Exchange (CX)		SSCT	SSCT	SSCT			SSCT
Ozonation							
Reverse Osmosis (RO)	SSCT	SSCT	SSCT	SSCT	SSCT	SSCT	SSCT
Specialty Media							
Ultraviolet Light (UV)							

SSCT = Treatment technology has been identified by EPA as an SSCT (*Federal Register*, Volume 63, No. 151, August 6, 1998).

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x = Treatment technology can remove the noted contaminant, but is not listed as an SSCT in the *Federal Register* or in a rule.

? = Treatment technology is questionable for the listed contaminant.

## Exhibit 2: POE Treatment Technologies

Treatment Technology	Contaminant										
	Arsenic	Copper	Lead	Fluoride	Nitrate	SOCs	VOCs	Radium	Uranium	Radon	Microbial
Activated Alumina (AA)											
Aeration: Diffused Bubble or Packed Tower											
Distillation											
Granular Activated Carbon (GAC)						UI				PR	
Ion Exchange (IX)											
Anion Exchange (AX)											
Cation Exchange (CX)											
Ozonation											
Reverse Osmosis (RO)											
Specialty Media											
Ultraviolet Light (UV)											

UI = Treatment technology is being investigated by EPA for the listed contaminant (*Federal Register*, Volume 63, No. 151, August 6, 1998).  
 PR = Treatment technology is identified as an SSCT in the proposed Radon Rule.