

Achieving Arsenic Treatment Optimization

Stephen Baker
Office of Drinking Water

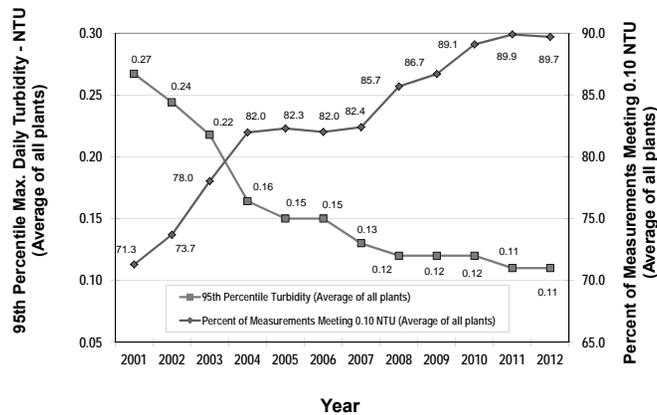


Our Mission

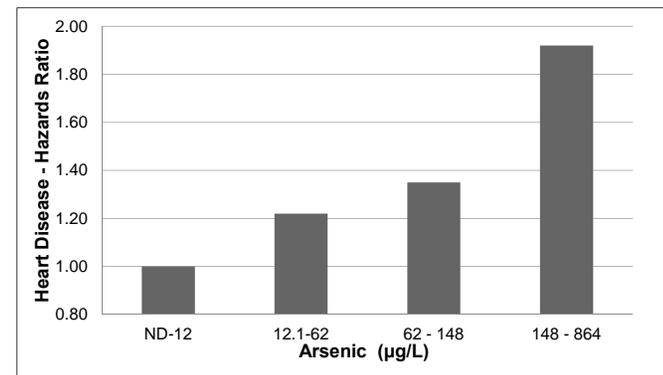
To protect the health of the people of Washington State by ensuring safe and reliable drinking water.



WA State Rapid Rate Treatment Plant Performance Trends



Arsenic and Heart Disease

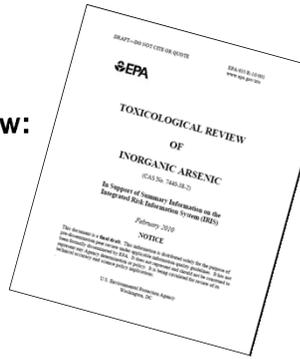


Ref. British Medical Journal 2/2011

Recent Health Findings

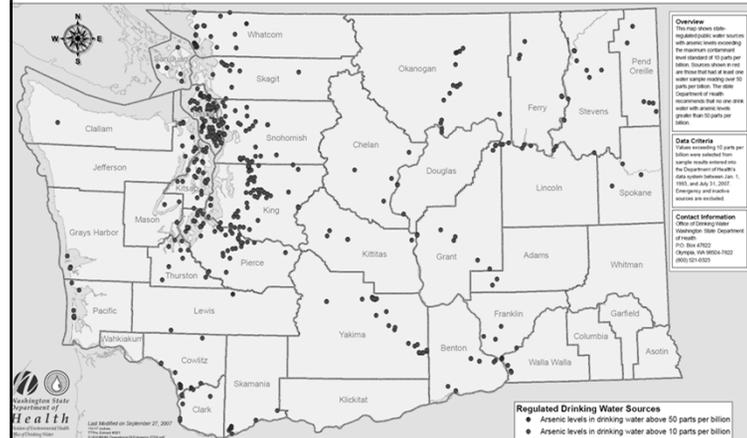
Cancer

- Current 1/10,000 health risk is at 2 ppb
- New toxicological review:
 - Cancer rates 17 times higher than previously thought
 - Issued too late for 6-year EPA rule review
 - May be included in 2016
 - Could lead to lower MCL (eventually)



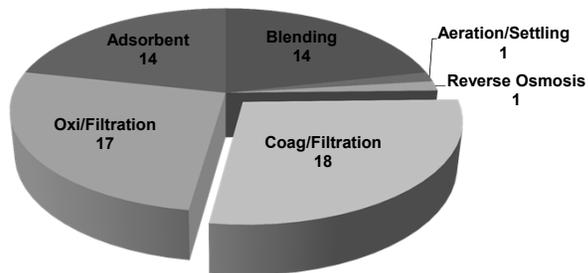
Arsenic Detections in Washington Public Water Supplies

Sources Above Arsenic Drinking Water Standard of 10 ppb



Arsenic Treatment in WA

Number of Systems by Technology Type



Some Tools for Success

- ◆ Assessment of performance
- ◆ Technical assistance (CTA)
- ◆ Training (PBT)
- ◆ Changing culture
 - Communication tools (posters, Office of Drinking Water website, "Water Tap" articles)
 - Recognition (awards program, newsletters, and public media)



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Arsenic Treatment Optimization Program

The Arsenic Treatment Optimization Program (ATOP) is an effort to improve performance of arsenic treatment facilities. ATOP focuses on effective arsenic removal to maximize public health protection.



The Washington Department of Health promotes performance and monitoring goals for water treatment plants treating arsenic-contaminated sources.

Optimization Goals for Treatment

Performance

- ☞ Running Annual Average (RAA) 5 ppb, or less, and never exceeding 8 ppb for treated water total Arsenic (prior to blending).

Monitoring

- ☞ Treated water Arsenic is monitored at least monthly. Samples are taken prior to blending.
- ☞ Systems using oxidation/filtration treatment – monitor raw and finished water iron levels at least weekly.
- ☞ Systems that adjust pH – monitor pH continuously.



For more information about ATOP, please contact Stephen Baker at (509) 236-5138 or stephan.baker@doh.wa.gov

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Arsenic Coagulation/Filtration (Ox/Filt)

- ◆ **Design and operational variables**
 - Filter media – type and depth
 - Oxidant dose and contact time
 - Coagulant dose and contact time
 - Filter loading rate, run length, backwash

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Possible Process Adjustments

- ◆ (Re)evaluate water quality
 - pH, Phosphorus, Silica, Total Organic Carbon...
- ◆ Increase pre-oxidation time ($As^{+3} \rightarrow As^{+5}$)
 - Free chlorine 1 mg/L, 30 to 60 seconds
- ◆ Add more iron/coagulant ($FeCl_3$)
- ◆ Increase coagulant contact time
- ◆ Add calcium
- ◆ Lower filtration rate
- ◆ Lower pH

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Test Your Assumptions

- ◆ Arsenic treatment can be challenging
- ◆ Each application is unique
- ◆ Full-scale failure is not uncommon
- ◆ Optimization tools
 - Jar testing
 - Dose control
 - Monitoring

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Hilltop – Lessons

- ◆ Multiple possible issues
- ◆ A curious operator can really help the plant optimize
- ◆ Ultimately, Hilltop required only minor operational adjustment
- ◆ Success involved cooperation – public water systems owners and operators, and our staff

Summary

- ◆ It IS possible to meet optimization goals
- ◆ Important to characterize raw water
- ◆ Pilot testing is appropriate
- ◆ Minor process “tweakings” may yield significant performance improvements
- ◆ Process for a revised Arsenic MCL starting in 2016?

Questions / Comments

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