

Sampling for EDCs and PPCPs in Pacific Northwest Watersheds

PNWS AWWA Pre-Conference Seminar – May 6, 2009 – Salem, OR
Impacts of EDCs & PPCPs on the Local Drinking Water Community



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Major Drinking Water Sources Pacific Northwest



- **Seattle Public Utilities (140 mgd; 1.35 million served)**
 - Cedar River System
 - Tolt River System
 - Seattle Wells
- **Tacoma Water (60 mgd; 0.3 million served)**
 - Green River System
 - South Tacoma Aquifer
- **Portland Water Bureau (103 mgd; 0.86 million served)**
 - Bull Run System
 - Columbia SS Well Field

Sample Collection

- **Sampling Locations**

- **Protected Watershed**

- Upstream of Treatment
- After Treatment

- **Groundwater Sources**

- Before Treatment
- After Treatment (only PWB)



- **Sampling Events**

- **Seattle Public Utilities**

- Tolt R – Spring 08
- Cedar R – Spring 08
- GW – 12/08

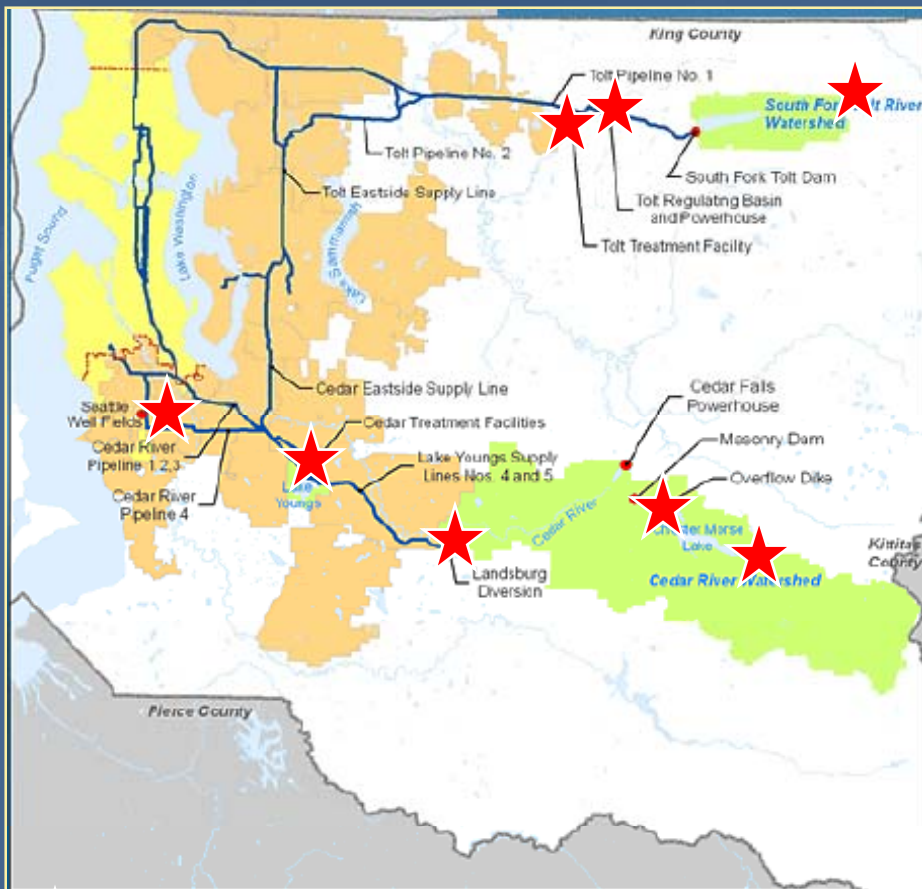
- **Tacoma Water**

- Green R (6/08)
- Aquifer (6/08 & 7/08)

- **Portland Water Bureau**

- Bull Run (8/06, 5/08, 4/09)
- GW (10/07, 4/08, 8/08, 11/08)

Sample Collection Seattle Public Utilities

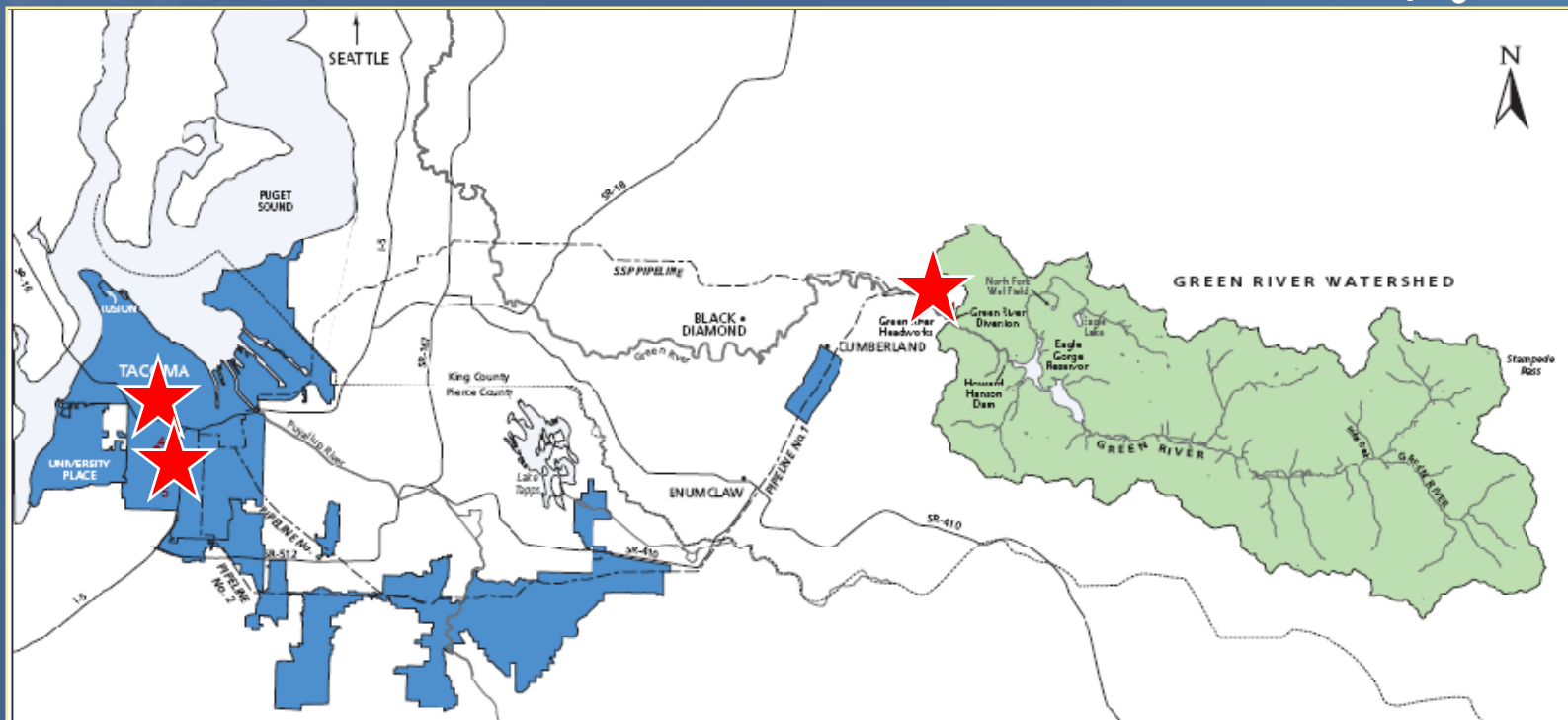


- **Tolt Watershed System**
 - 12,500 acres (70% SPU owned)
 - Before Treatment
 - After Treatment (Filt/O₃ & Cl₂)
- **Cedar Watershed System**
 - 90,638 acres (99.9% SPU owned)
 - Before Treatment
 - After Treatment (O₃/UV & Cl₂)
- **Groundwater Supply**
 - Riverton Well Field
 - Blvd Park Well
 - Before Treatment

★ EDC/PPCP Sampling Sites

Sample Collection Tacoma Water

- **Groundwater Supply**
 - South Tacoma Aquifer
 - Wells 1B and 11A
 - Before Treatment
- **Green River Distributed**
- **Green River Headworks**
 - 147,394 ac. (10% TPU own)
 - Before Treatment
 - After Treatment (O_3 & Cl_2)



Sample Collection Portland Water Bureau

- Groundwater Supply
 - Columbia SS Well Field
 - Wells 5,7,12,13,15,16,18,19
 - Before & After Treat (NH_2Cl)
- Bull Run Watershed
 - 102 sq-miles (4% Portland owned)
 - Before Treatment (Headworks)
 - After Treatment (NH_2Cl)



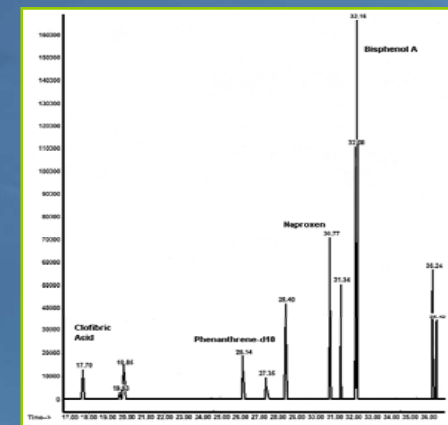
Analytical Methods

- **Selection of Chemicals for Analysis**
 - Chemicals that have been detected elsewhere
 - Broad mix (variety) of chemical compounds
- **Suggested Monitoring Lists**
 - State Agencies (Oregon DHS)
 - Analytical laboratories (USA, Canada)
 - Occurrence data (WRF and news reports)
 - Analogous systems data



Analytical Methods (cont'd)

Utility	Sample Volume	Polar and Non-Volatile Compounds (LC/MS/MS)
Seattle	1-L amber glass bot	✓
Tacoma	1-L amber glass bot (triplicate)	✓
Portland	1-L amber glass jar	✓



LC/MS/MS (Representative Compounds)

Class	Compound	MRL (ng/L)	Use
Pharmaceuticals	Carbamazepine	5.0	Anti-convulsant
	Gemfibrozil	1.0	Anti-cholesterol
	Ibuprofen	1.0	Pain reliever
	Acetaminophen	1.0	Pain reliever
	Sulfamethoxazole	1.0	Antibiotic
Personal Care Products	Triclosan	5.0	Antibacterial
	Caffeine	3.0	Stimulant
	Continine	1.0	Metabolite of nicotine
Hormonal Compounds	Estrone	1.0	Hormone
	Ethinylestradiol	5.0	Birth control
	Progesterone	1.0	Hormone
	Testosterone	1.0	Hormone

Quality Assurance/Quality Control

QA/QC	Seattle	Tacoma	Portland
Sample Collection, Handling, and Transport <ul style="list-style-type: none">• Instructions for personnel• Sampling procedures• Handling, custody & transport	✓	✓	✓
Trip Blanks and Duplicates	✓	✓	✓
Laboratory QA/QC Protocol <ul style="list-style-type: none">• Certified Lab	✓	✓	✓

Sampling Results - Seattle

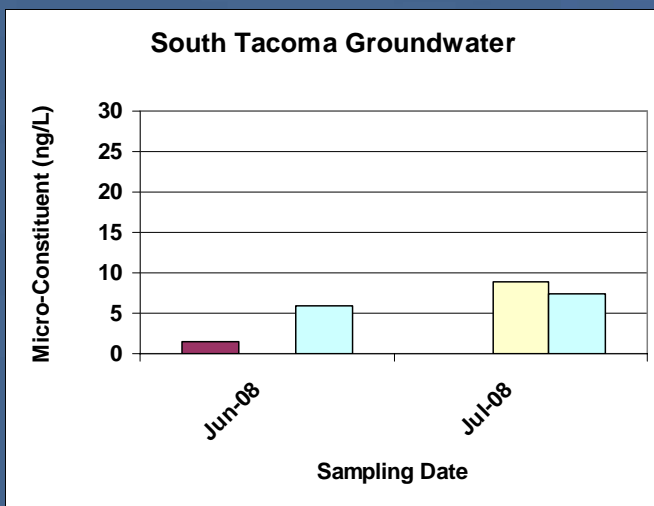
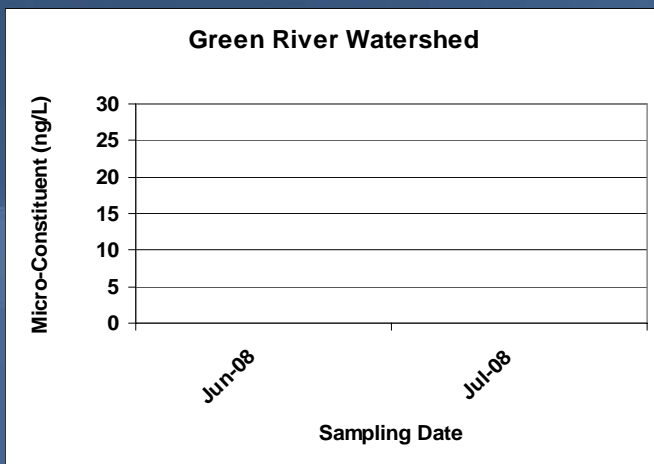
- **Tolt River Watershed**
 - No known sources of EDC/PPCP
- **Cedar River Watershed**
 - No known sources of EDC/PPCP



- **Seattle Wells**
 - No known sources of EDC/PPCP

- **Results**
 - No detects in samples with acceptable QA/QC
- **QA/QC**
 - DEET detected in all samples (7-26 ng/L) by Lab-1 (MRL 5 ng/L)
 - No DEET detected in split sample (<9.2 ng/L) by Lab-2
 - DEET suspected to be associated with human and/or lab contamination

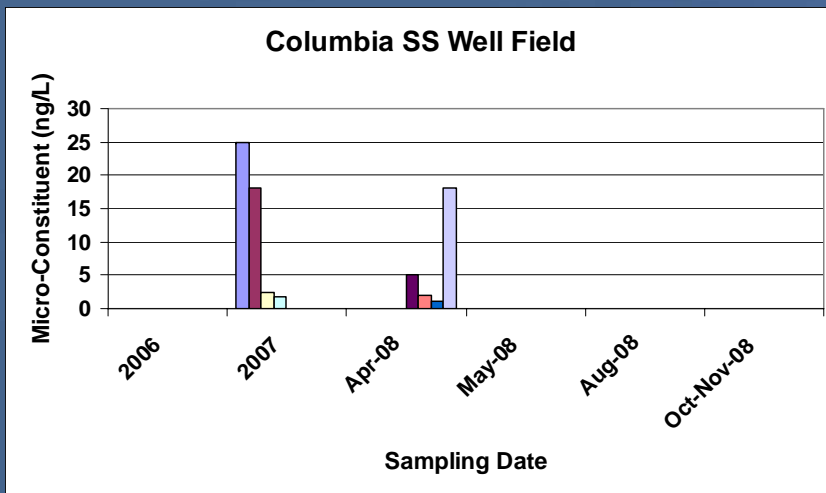
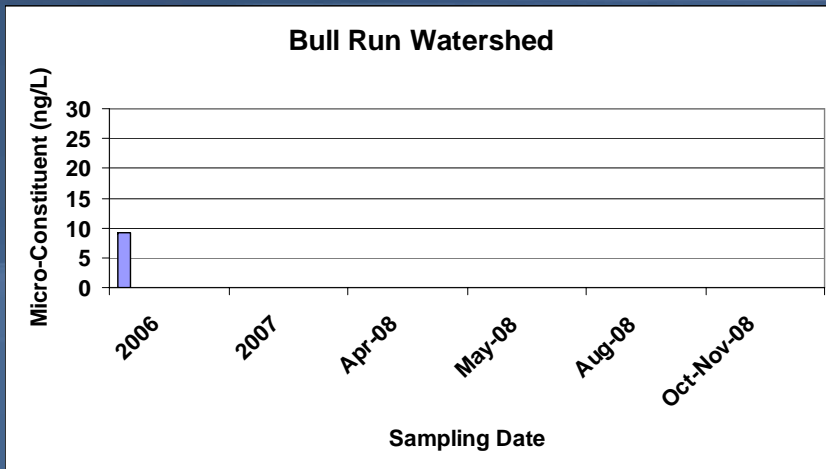
Sampling Results - Tacoma



- **Green River Watershed**
 - No known sources of EDC/PPCP
 - No detects in 2008
- **South Tacoma Wells**
 - Low-level PPCPs near MRLs in 2008
 - Results vary

■ Acetaminophen ■ Triclosan ■ Sulfamethoxazole

Sampling Results - Portland



- **Bull Run Watershed**
 - No known potential sources of EDC/PPCP
 - Caffeine in 2006 likely human contamination
- **Columbia SS Wells**
 - PPCPs in field blanks (April 2008)
 - No detects in repeats



Summary of Sampling Results

Utility (Sampling Date)	Protected Surface Water Source	Ground Water Source
Seattle (2008)	Initial sampling – no detects No repeat sampling DEET – QA/QC issues	No detects
Tacoma (2008)	No detects	Initial sampling – 2 v low levels Repeat sampling – 2 v low levels Results vary No other detects
Portland (2006 – 2008)	Early sampling – 1 PPCP Repeat sampling – none detected No other detects	Early sampling – 8 v low levels Repeat sampling - none detected No other detects

Conclusions

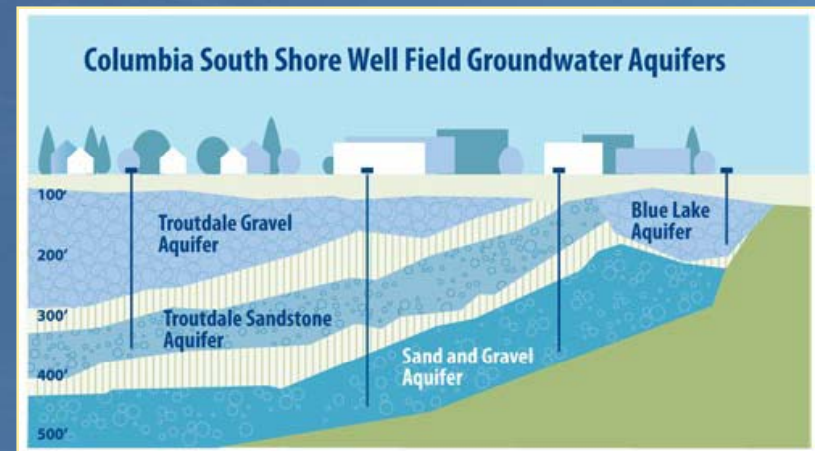
Protected Watersheds

- Effectively protects supply from risk of EDC/PPCP contamination



Groundwater Sources

- Occurrence – few PPCPs - v low levels
- Risks are v low



Lessons Learned

- **EDC/PPCP Testing**
 - QA/QC very important
 - Sampling & handling protocols
 - Collect field blanks and duplicates
 - Ask questions before selecting analytical laboratory
- **Utility Networking**
 - Communicate with other utilities about
 - Testing methods
 - Communication with public & news media
- **Communication & Outreach**
 - Collaborate with stakeholders to protect sources (e.g., WHP, Drug Take-Back Programs)
 - Continually provide public with updated information

Next Steps



- **Monitoring**
 - Collect quality data (QA/QC, field blanks & duplicates)
 - Frequency and location
 - Sampling protocol
 - Reliable analytical results
- **Utility Network**
 - Share data & information
 - Leverage efforts
- **Effective Communication**
 - Develop suitable message
 - Communicate level of risk
 - Control vs. reactive mode

Acknowledgements

- **Staff at Seattle Public Utilities**
 - Wylie Harper
- **Staff at Tacoma Water**
 - Eric Johnson
- **Staff at Portland Water Bureau**
 - Dave Peters, Dan Hooker & Marsha Farooqui
- **Staff at HDR Engineering, Inc.**
 - Cathy Chauvin & Brett Stark
- **Laboratories**
 - MWH Laboratories, CA
 - Hygienic Laboratory, Univ. of Iowa