

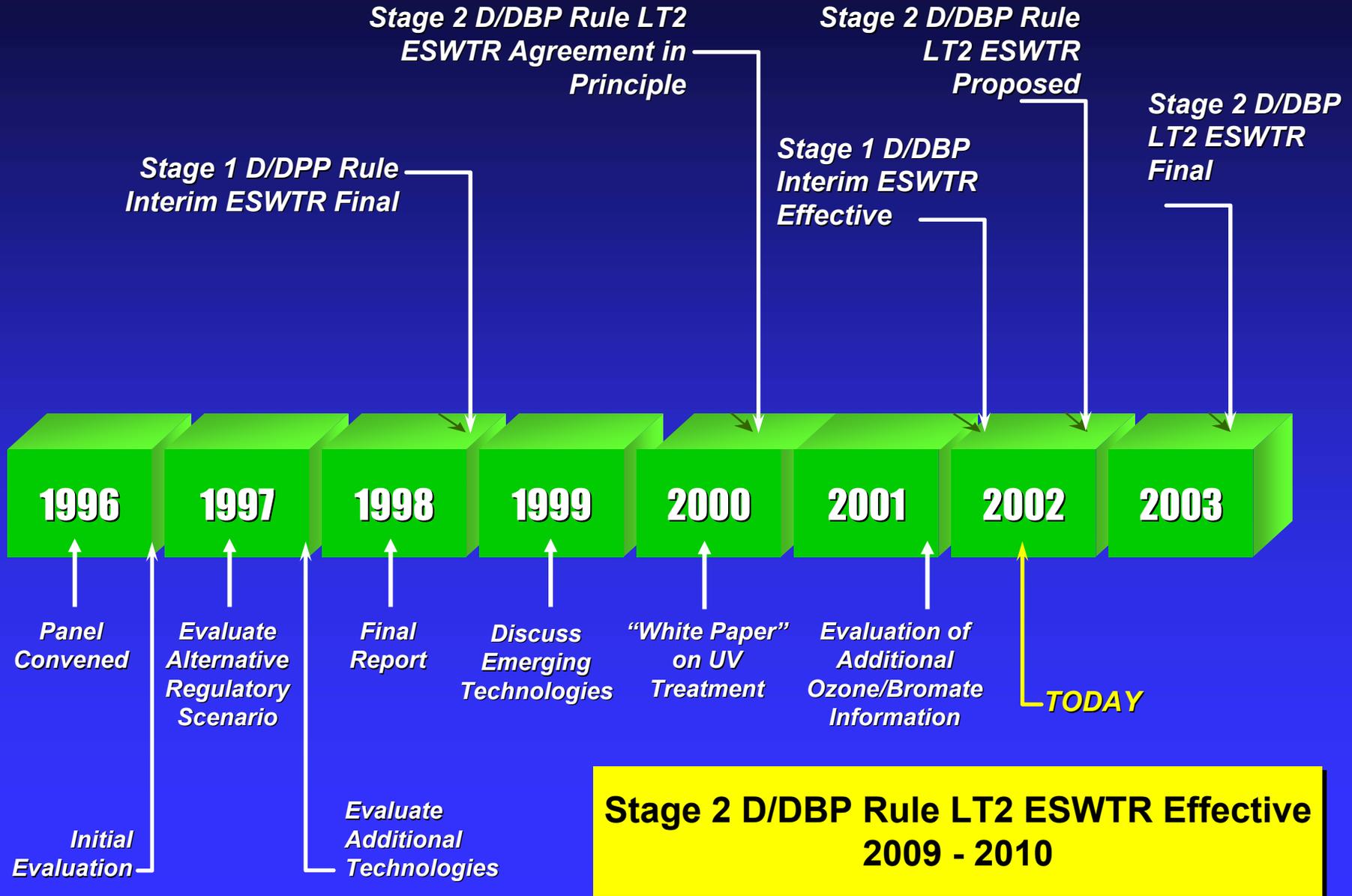
CALFED

Water Quality Targets

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Timeline of the CUWA Evaluation



The Expert Panel's Process



The Panel's Near and Long-Term Regulatory Scenario (1998)

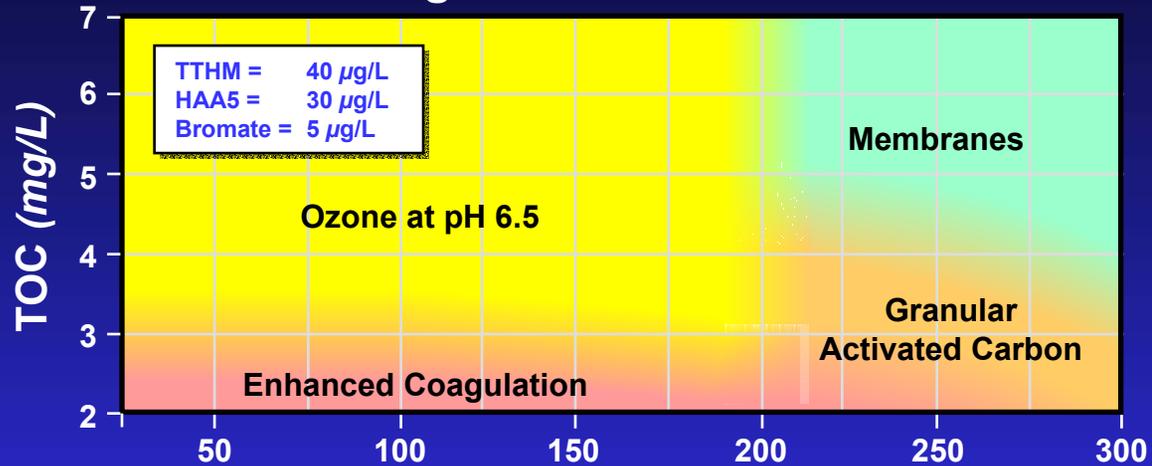
Parameter	Stage 1 D/DBP Rule	Stage 2 D/DBP Rule	Interim ESWTR	LT2 ESWTR
Microbial			Additional 1 to 2 Log <i>Giardia</i> Removal/ Inactivation	Additional 1 Log <i>Cryptosporidium</i> Removal/ Inactivation
THMs	TTHM = 80 µg/L	TTHM = 40 µg/L		
HAAs	HAAs = 60 µg/L	HAAs = 30 µg/L		
Bromate	10 µg/L	5 µg/L		

Defining Treatment Technology, Criteria, Performance

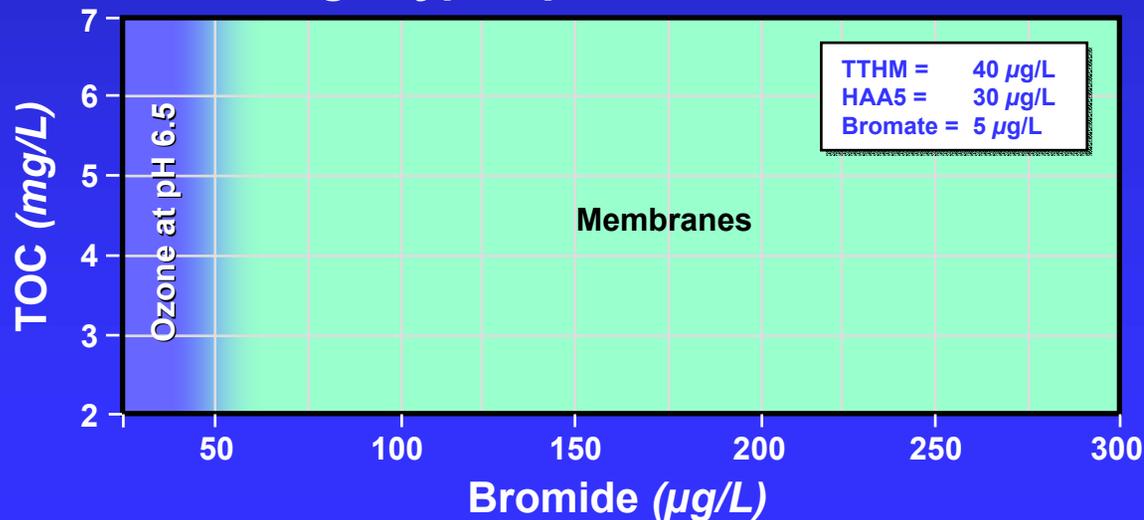
Technology	Source WQ Effects	Finished WQ Impact
Enhanced coagulation (\$-\$\$)	Removes particles, TOC	Lowers THM, HAA
Ozone (\$\$)	Oxidizes/disinfects No removal	Reduces THM, HAA (w/chloramines) Forms bromate
Granular Activated Carbon (\$\$\$)	Removes TOC	Lowers THM, HAA
Membrane Filtration/ Ozone (\$\$\$)	Removes particles Oxidizes/disinfects	Lowers THM, HAA (w/chloramines) Forms bromate
Nanofiltration (\$\$\$\$)	Removes particles, TOC, bromide	Lowers THM/HAA

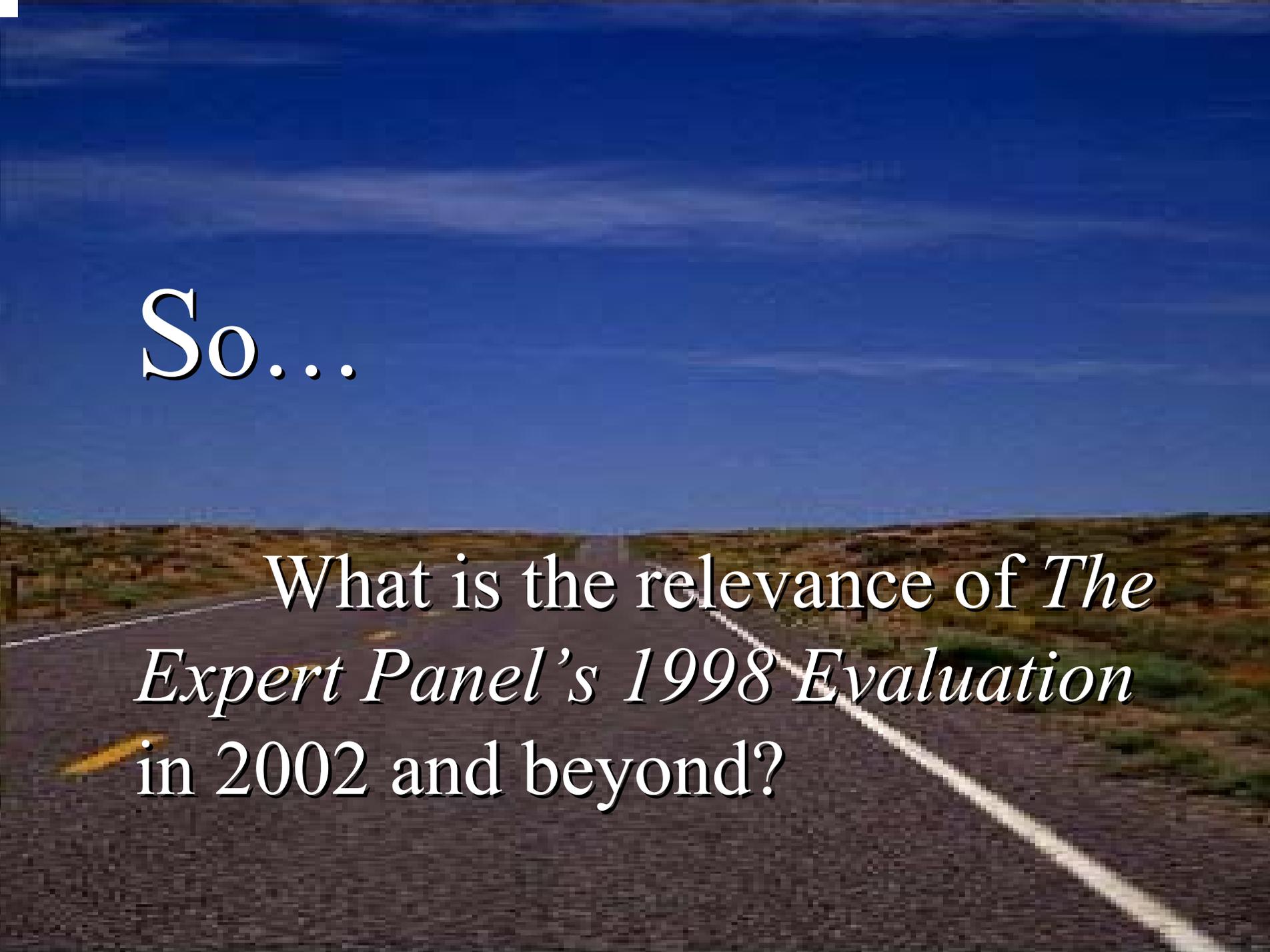
Develop Source Water Quality Criteria

1 Log Giardia Inactivation



1 Log Cryptosporidium Inactivation



A long, straight road stretches into the distance under a clear blue sky. The road is flanked by dry, scrubby vegetation. The text "So..." is written in a large, white, serif font in the upper left quadrant of the image.

So...

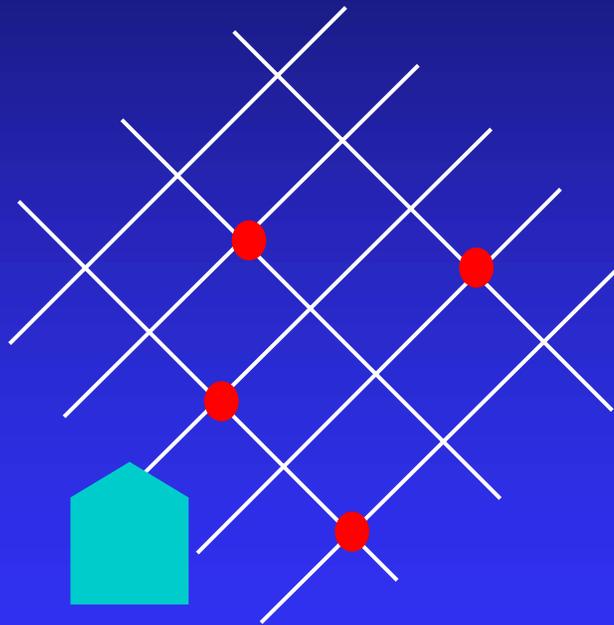
What is the relevance of *The Expert Panel's 1998 Evaluation* in 2002 and beyond?

Comparison of Long-Term Regulatory Scenarios

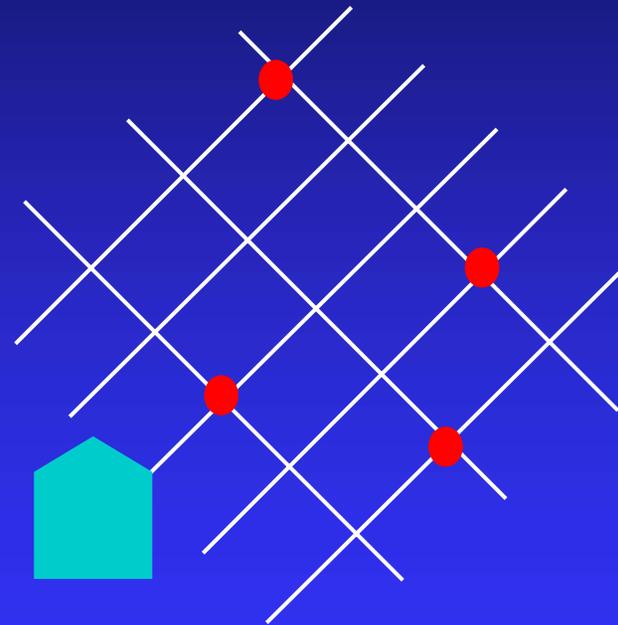
Parameter	Expert Panel (June 1998)	Stage 2 Agreement in Principle (Sept. 2000)
Microbial	Additional 1 Log Cryptosporidium removal/inactivation	Additional Cryptosporidium removal/inactivation based on Source WQ (0-2.5 logs)
THM	TTHM = 40 $\mu\text{g/L}$, RAA (1)	TTHM = 80 $\mu\text{g/L}$, LRAA (2)
HAAs	HAAs = 30 $\mu\text{g/L}$, RAA (1)	HAAs = 60 $\mu\text{g/L}$, LRAA (2)
Bromate	5 $\mu\text{g/L}$	10 $\mu\text{g/L}$

1. RAA = Running annual average of all system samples
2. LRAA = Locational running annual average, compliance at each location

Comparison of Long-Term Regulatory Scenarios *(continued)*

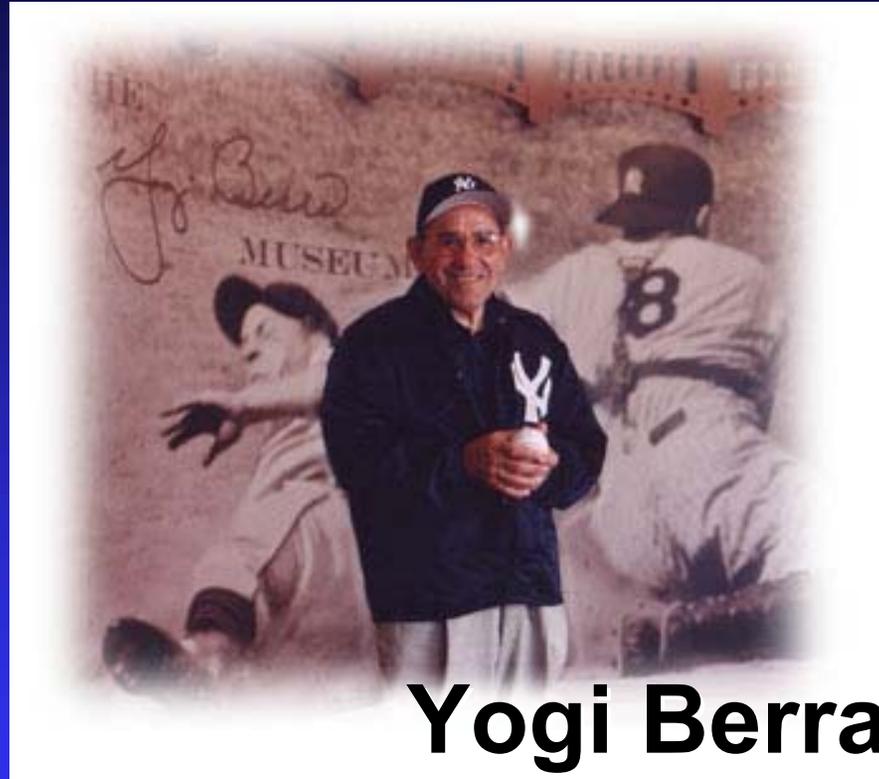


Expert Panel (RAA) –
Compliance of System
(3 avg, 1 max)



Stage 2 – D/DBP Rule (LRAA)
Compliance at *every* location
(1 avg, 3 max)

It ain't over.....till it's over



**[And this regulatory agenda is not over ...
neither are customer concerns]**

A Regulatory Outlook for Bromate

- 10 $\mu\text{g}/\text{L}$ based upon ensuring adequate disinfection is provided with current technologies
- EPA has stated that 5 $\mu\text{g}/\text{L}$ is more consistent with their risk analysis
- Subject to review every six years

There will be continued focus on bromate reduction

There are many regulatory futures beyond 2010...

Lower MCLs for TTHM and HAA5 (9?)

Decrease source WQ range and variability

MCLs for Individual DBP Species

Lower bromide

Reproductive Health Effects Endpoint

Decrease source WQ range and variability

Minimizing Total Risk, The "*Risk Bubble*"

More flexibility in technology use

The Expert Panel Attempted to Balance

1. Known, near-term regulatory outcomes
2. Potential longer-term (2010) regulatory outcomes
3. Overall health effect trends as expressed by DBP classifications

The 1998 Long-Term Scenario Reflects This Balance

Developments in Technology

Technology	Developmental Future
Enhanced coagulation	Little
Ozone	Some efficiency (mature), bromate reduction?
GAC	Relatively mature
Membranes	Lower pressures, higher recovery, larger applications
UV	Efficiency, larger applications

Application of Treatment for Multiple Objectives

Technology	Particle Removal	Disinfection		Organic Removal	Taste/Odor	Oxidation
		Protozoan Cyst	Virus			
Enhanced coagulation	✓✓	✓	✓	✓	✓	
Ozone		✓	✓✓		✓✓	✓✓
GAC				✓✓	✓✓	
Membrane	✓✓	✓✓	UF/NF	NF		
UV		✓✓	✓			

Some concluding remarks . . .

- The regulatory/public health agenda will continue to evolve
- A technological solution requires multiple technologies (complex treatment) or quantum steps
 - ◆ *UV is a “silver bullet” for one class of contaminants*
- Bromide will continue to be problematic from regulatory and customer perspectives