



1,2,3-TCP – What Happens When You regulate something on short notice with Short Compliance Deadlines?

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Outline

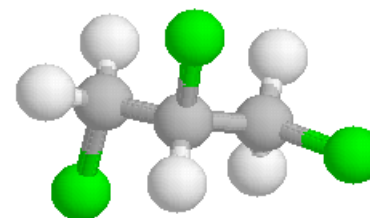
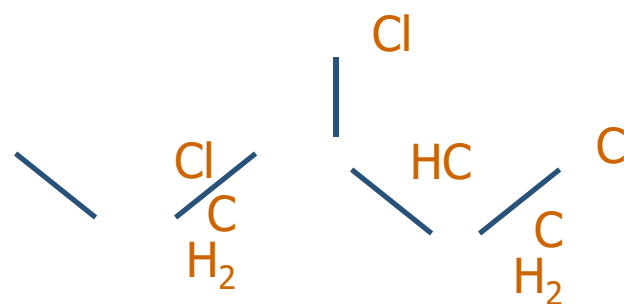


- **A bit about 1,2,3-TCP**
- **TCP regulation**
- **TCP analytical methods for compliance in CA**
- **TCP occurrence in CA**
- **Challenges for laboratories and utilities**

1,2,3-Trichloropropane



Property	Value
Chemical Formula	$C_3H_5Cl_3$
Molecular Weight	147.43
Density	1.4 g/mL
Solubility	1,750 - 2,700 mg/L
Boiling Point	156.8 °C
Henry's Constant	0.34 atm-L/mole
Log K_{ow}	1.98 - 2.27
Log K_{oc}	1.71 - 1.86



What is 1,2,3-TCP?:

Historic uses



- Paint and varnish remover
- Cleaning and degreasing solvent
- Byproduct in manufacturing of epichlorohydrin
- Production of polysulfone liquid polymers, dichloropropene, hexafluoropropylene and polysulfides
- Impurity of D-D, a soil fumigant and nematocide for row crops, orchard crops, and ornamentals that is no longer available in the United States
- Blend of 1,3 dichloropropene and 1,2 dichloropropane
- 'D-D Mixture' replaced chloropicrin (1943-1949)
- Followed by discovery of DBCP (1955)
- EPA health hazard investigation 1977
- Use continued through 1987

12/29/17 the State of CA announced the MCL effective 1/1/18



SWRCB Notification Letter of 12//29/17

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STATE WATER RESOURCES CONTROL BOARD

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1,2,3,-Trichloropropane (1,2,3 - TCP)

Announcements

- [SBDDW-17-001 1,2,3-Trichloropropane MCL - Effective December 14, 2017](#)
- [1,2,3-Trichloropropane Utility Notification for CWS/NTNC](#)
- [Template for Public Notification for 1,2,3-TCP MCL Exceedance is now available](#)

Background

1,2,3- TCP is a chlorinated hydrocarbon with high chemical stability. It is a manmade chemical found at industrial or hazardous waste sites. It has been used as a cleaning and degreasing solvent and also is associated with pesticide products.

Key Points from Draft MCL



SBDW-17-001
February 2017

INITIAL STATEMENT OF REASONS
1,2,3-Trichloropropane Maximum Contaminant Level Regulations
Title 22, California Code of Regulations

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ATTACHMENT A:

DF-131
STANDARDIZED REGULATORY IMPACT ASSESSMENT (SRIA)
DEPARTMENT OF FINANCE COMMENTS
STATE WATER BOARD RESPONSE TO COMMENTS

5 ng/L MCL

**Groundwater
occurrence**

■ **265 sources**

GAC is BAT

Costs

■ **Capital:
\$97M**

■ **20 year O&M: \$24M**

TCP Concentration Objective at Point of Entry?



Objective	Value
Typical	<80% of the MCL
1,2,3-TCP	<80% of the MCL would be <4 ng/L which is ND with approved method

- Consequences of detections >5 ng/L?
 - Running annual average of 4 quarterly samples
 - Non-detects (ND) use 0 for average calculation
- Use other lower detection limit method?

1,2,3-TCP: Regulatory Context



Jurisdiction	Parameter	Value
USEPA	MCL	None
California	Public Health Goal	0.7 ng/L
California	MCL	5 ng/L
Hawaii	MCL	600 ng/L
Hawaii	Possible MCL???	5 ng/L
Minnesota	Health Based Guidance Value	3 ng/L
New Jersey	Drinking Water Quality Institute Health Effects Subcommittee Recommended Health-based MCL	0.5 ng/L
New Jersey	Drinking Water Quality Institute Recommended MCL	30 ng/L

CA Regulation in a Nutshell



Analyte Group	Synthetic Organic Chemical (SOC)
Public Health Goal (PHG)	0.7 ppt
Detection Level for Reporting (DLR)	5 ppt
Maximum Contaminant Level (MCL)	5 ppt
Best Available Technology (BAT)	Granular Activated Carbon
Effective Date of New Regulations	December 14, 2017
Initial Monitoring Start Date	Quarter beginning January, 2018
Public Water Systems Required to Monitor	Community and Nontransient-Noncommunity

Non-Treatment Alternatives



- **Source status change or destruction**
- **Blending**
- **Well modification**
- **Well replacement**

Great to avoid treatment, but must consider practical limitations given low treatment objectives

1,2,3-TCP Treatment



Technology	Benefits and Limitations
GAC Adsorption	Proven technology for TCP, unsteady state process requires GAC replacement.
Packed Tower Aeration and Comparable Processes	Simple steady state process with low operating costs. Not particularly efficient for TCP as compared with other co-occurring contaminants like TCE and PCE.
UV Oxidation	Small footprint, but limited demonstration for TCP destruction.
Ozone Oxidation	Small footprint, but limited demonstration for TCP destruction, AOC & bromate formation.
Advanced Oxidation	Small footprint, but limited demonstration for TCP destruction, must quench residual peroxide. Effective treats 1,4-dioxane if it also co-occurs.
Others?	Biological and chemical reduction, resin adsorbents,

The Law of Unintended Consequences



City Still Searching for Solutions to Discolored, Odorous Water- South Pasadena Review, June, 2018



- City had to take both wells (chlorine) offline due to high TCP (well known).
- GAC takes time and money to install.
- Using MWD water with chloramines in interim
- Chloramines weaker oxidant than chlorine.

So What is the City Doing?



- **Spending \$1M+ on MWD water**
- **Fast tracking GAC installation (luckily they installed connections when they rebuilt the reservoir.**
- **Using breakpoint chlorination to convert MWD water back to chlorine and “rebuild” coatings on pipes (both main lines and in homes).**
- **Still some issues in selected homes with Pb and As, but getting better.**

1,2,3-TCP: How Can You Test?



- **524.3 – VOA Purge and Trap with SIM (30 ppt)**
Not low enough for CA MCL
- **504.1 – Micro LLE with GC (5-10 ppt)**
Not approved for CA MCL
- **525SRL(2002) – Large LLE with GCMS (5 ppt)**
Not approved for CA MCL
- **524SRL (2002) – VOA (25 ml) purge and trap with SIM (0.5 – 5 ppt)**

This is the ONLY official CA approved method

Are Those the Only Options for Testing?



- There are other very sensitive methods in the literature.
 - **Direct injection with GC-MS/MS**
 - **Purge and Trap with GC-MS/MS**
- But these are not “standard” methods with multi-lab validation and therefore not really options for ELAP to approve **(which is too bad, but is another impact of the rapid pace of the regulation)**

Relevant Information for 1,2,3-TCP Analytical Issues for 2018-2019



- The **ONLY** approved method for TCP for compliance monitoring is the 524SRL method.
- There are only 16 labs certified for TCP.
- Some of the labs that are certified are not actually doing the method as yet.
- There are >>50,000 samples needing testing in 2018 (quarterly x 4000 utilities x # of sources).
- If a utility has TCP near 5 ppt, they may want to use a lab that can quantify below 5 ppt.

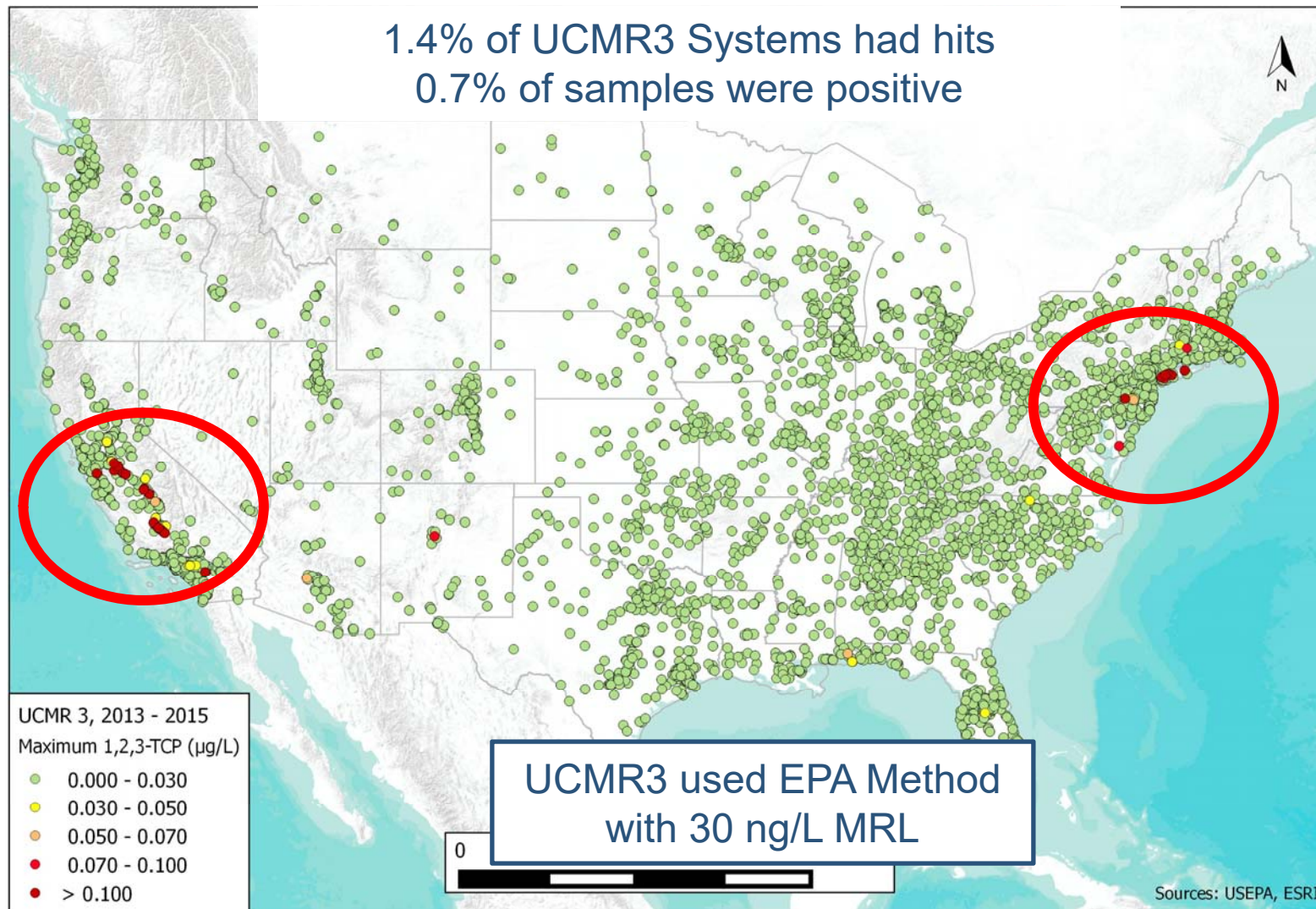
So We Know Monitoring Presents a Challenge



- Large number of samples
- Limited number of labs
- Tight time frame for monitoring
- Most of the work will likely go away after the first year.

So lets look at what we actually have as far as data and how well it is working.

1,2,3-TCP: Nationwide Occurrence From UCMR 3 Program

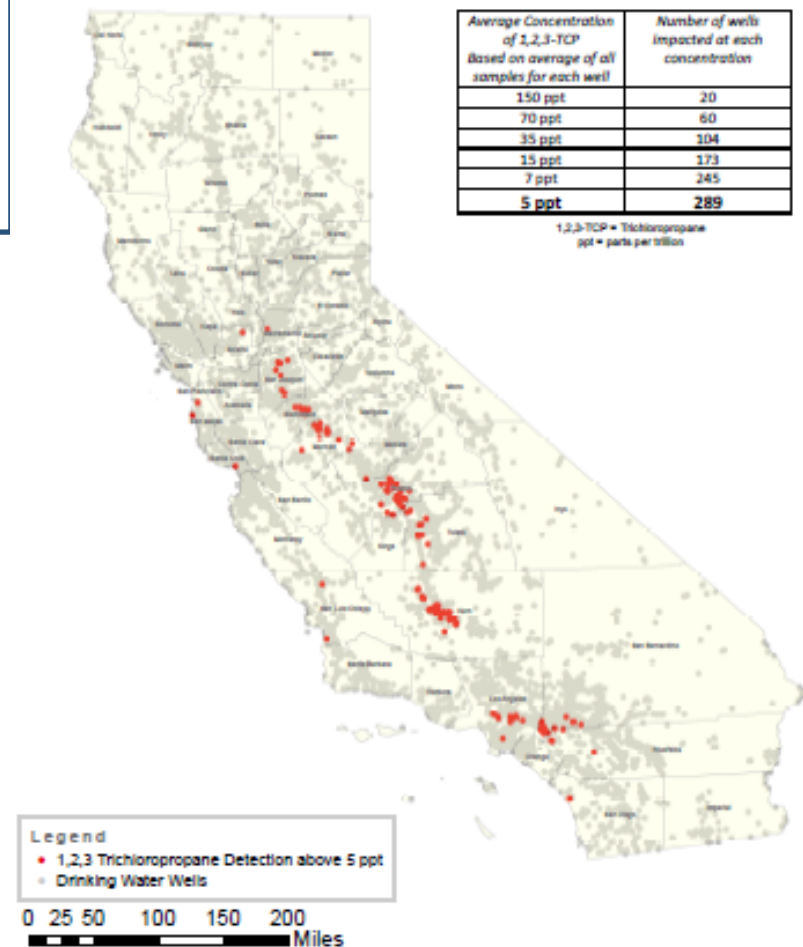


1,2,3-TCP Occurrence: California 2015 and prior

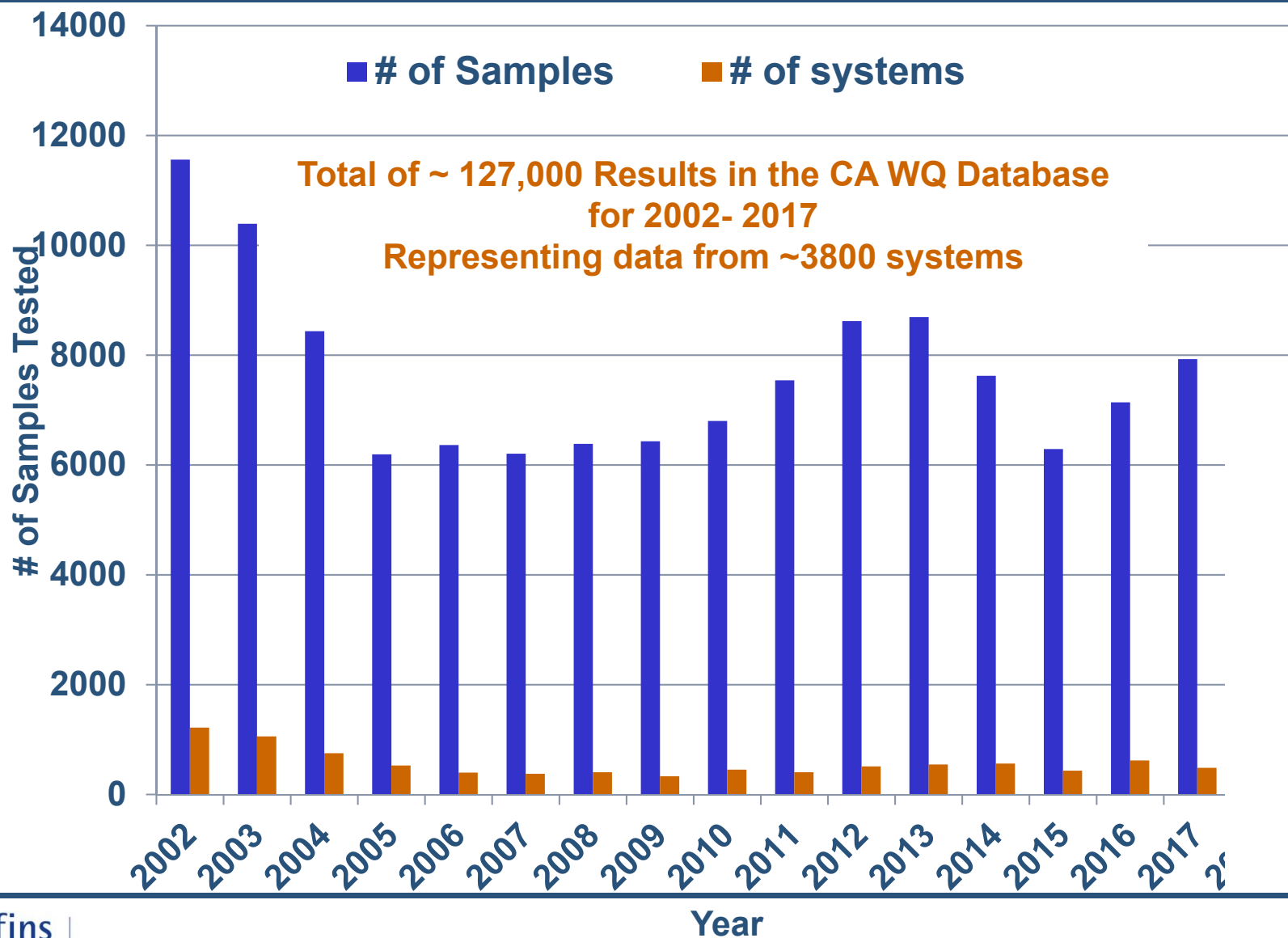


Positive detects for California
using method with 5 ng/L MRL

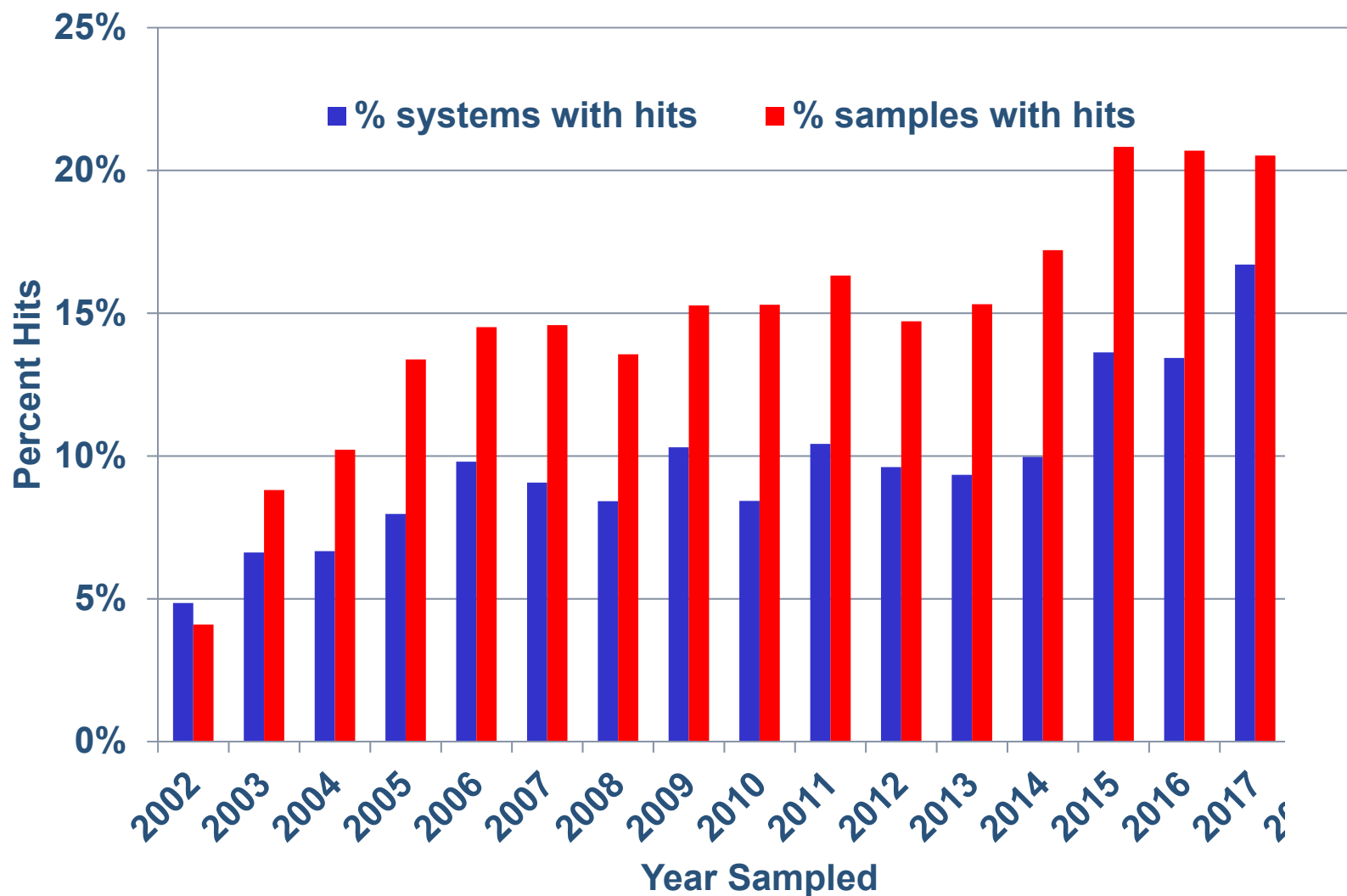
1,2,3-TCP Concentrations Above 5 ppt
Draft



Lots of Historical 1,2,3-TCP Data in the WQ Database



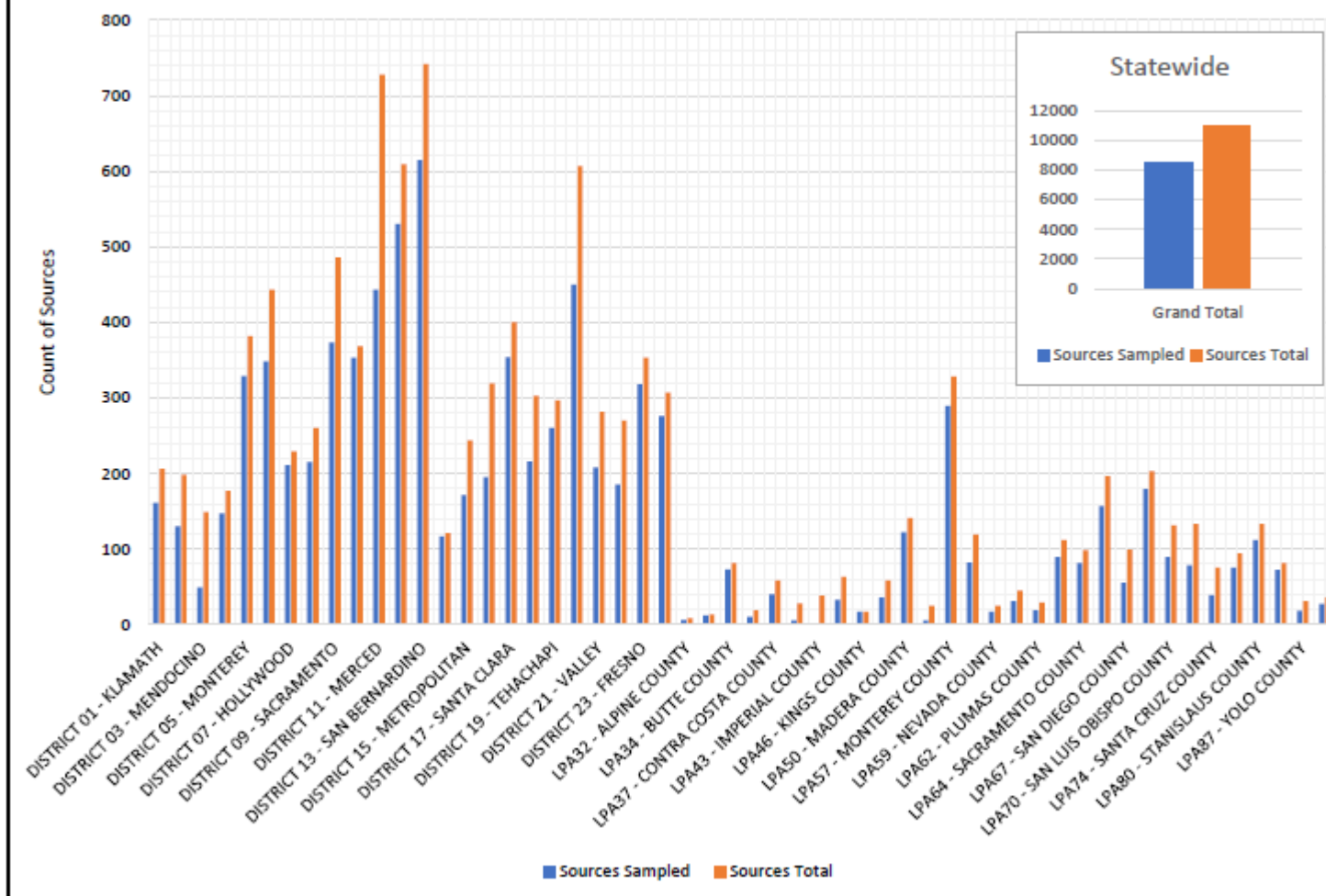
So How Often Did We See 1,2,3-TCP? (through 2017)



Official State Data for Samples Analyzed in Q1 2018



Figure 1. Drinking Water Sources Sampled during Q1 2018 for 1,2,3-TCP



CA MCL Exceedances Q1-2018



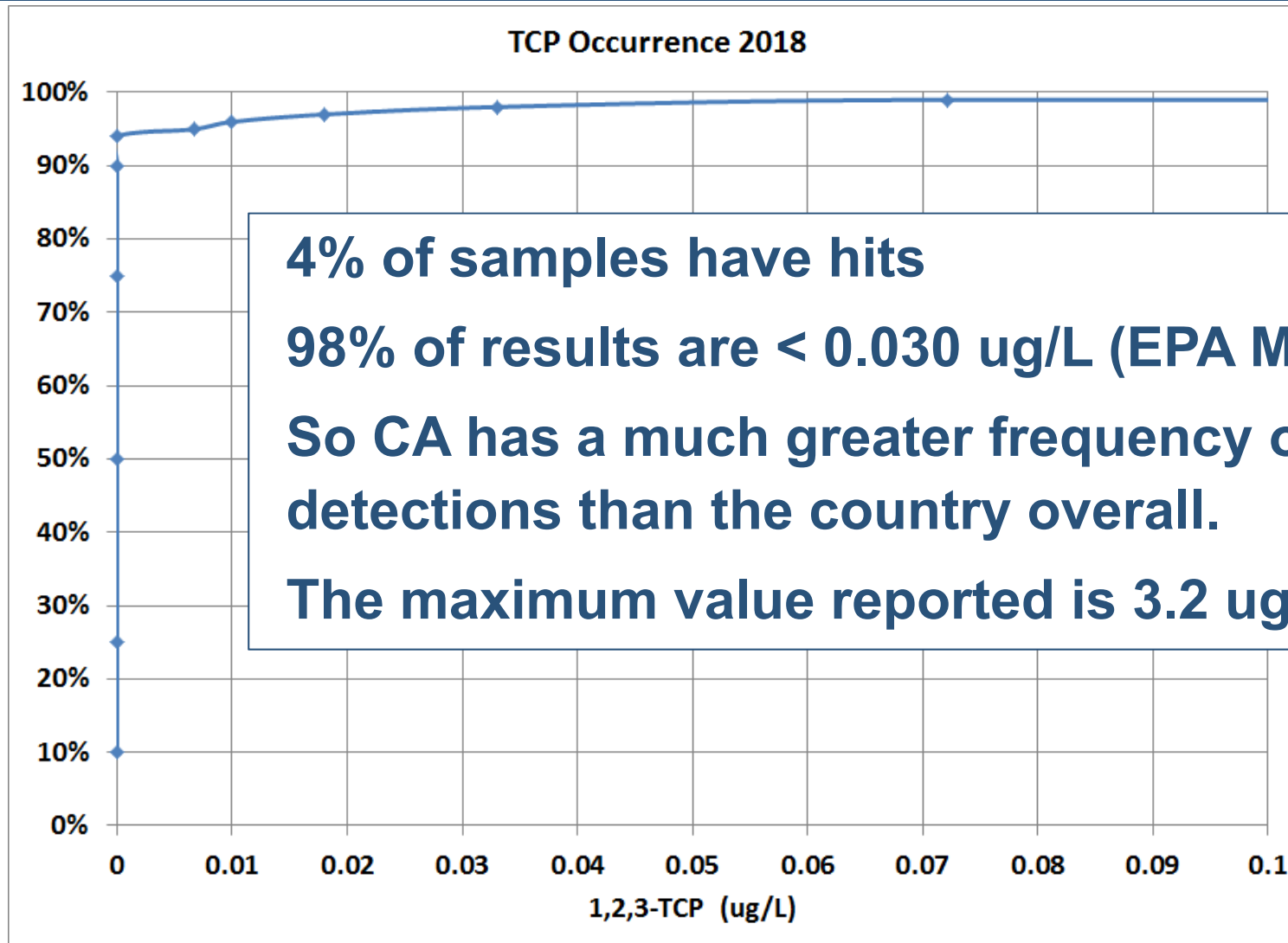
- 388 sources exceed the MCL, based on Q1-2018 data (>> number estimated in regulation).
- Are there more that will exceed in Q2 or as we get more data?

2018 Compliance Data Through Most of Q2



- So far data on ~3700 systems (out of >4,000)
 - So more than 90% have sampled at least once.
 - Most labs are running at capacity because the Rule kicked in quickly, but apparently there is enough capacity.
- ~17,000 sample results reported, representing ~ 10,000 sources and ~3700 PWS.
 - Only a few reported values below 0.005
 - 96% of samples are ND

Sample Results: A Deeper Dive Into 2018



2018 Data By System (Q1 vs Q2)



- ~3700 Systems Tested
- 272 have positive results for 1,2,3-TCP (7%)
- Of those 272 systems, the maximum detected level ranged from 0.005 to 4.1 ug/L
- 24 of the systems with hits in Q2 either had no hits in Q1 or were not previously sampled.
- Median values in “new system” detects ~0.01 ug/L

So as more systems are tested, we may see more hits, which = more monitoring and treatment.

2018 Data By Site (Q1 vs partial Q2)



- ~10,000 Sites Reported
 - 9600 in Q1: 600 additional sites in Q2
 - 4% of sample sites exceed the MCL
- 88 sites had no detect in Q1 and had detects > MCL in Q2
- 41 of those sites were not tested in Q1
- The median new detect level was 0.020
 - **So again we see more detects as we monitor more**

Conclusions



- It looks like lab capacity is able to meet demand, but that does not include treatment studies.
 - **ELAP should look at ways to expedite approval of new certifications for 1,2,3-TCP**
- Most of the detections are above the DLR (e.g. not much potential for false positives).
- Given the likely frequency of new detections, there will be a lot of additional monitoring (and of course need for treatment).

Any Questions?



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