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UCMR3 – What Will It Bring?

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Presentation Outline



Rationale behind the UCMR program

UCMR2 results synopsis

UCMR3 overview of requirements and lab approval

Looking at existing data sets

Predicting the future

Conclusions

Questions

Rationale Behind the UCMR program



Unregulated Contaminant Monitoring Rule

Targets 30 analytes for monitoring per UCMR

UCMR1: 2001-2005

UCMR2: 2008-2012

UCMR3: 2013-2017

UCMR Rationale (continued)



Analytes come from CCLs (plus others...)

Gather occurrence data to determine whether it makes sense to regulate (or not)

Snapshot in time (2X GW, 4X Surface water)

UCMR1 and UCMR2 set reporting limits based on Health Reference Levels (HRLs)

What Did We See in the Past?



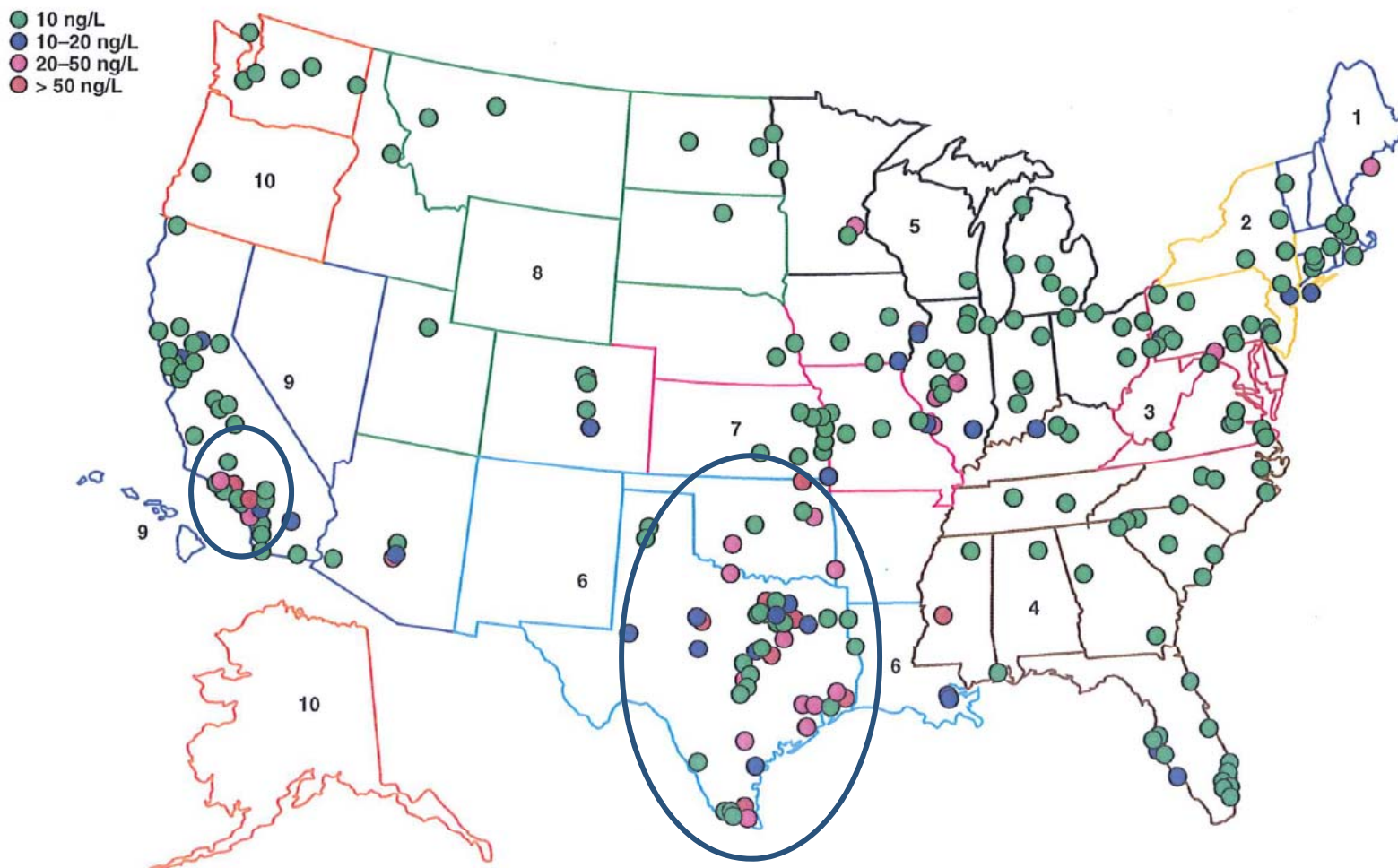
UCMR1 – Only Perchlorate (~ 5% of systems)

- Originally assumed to be a CA/NV issue....but
- **EPA now proposing to regulate perchlorate**

UCMR2 – Mainly NDMA (~25% of systems)

- Expected it primarily as a DBP
- Highest levels were in parts of Texas
- Generally associated with chloramines
- **EPA likely to regulate either NDMA or nitrosamines as a group**

In UCMR2, There Were “Hot Spots” for NDMA in Parts of the Country



From: Russell et al, JAWWA (2008)

UCMR3 Overview – Types of Monitoring



List 1 – Assessment Monitoring (6 methods)

- Will impact ALL systems serving >10,000 retail population
- ~ 5000 systems nationwide

List 2 – Screening Monitoring (1 method)

- Will impact all systems serving >100,000 retail population and subset of 320 systems serving 10,000-100,000 people

List 3 – Prescreening monitoring (2 methods)

- ONLY 800 small (<10,000) systems with undisinfected groundwater – EPA will pay; microbial monitoring

Entry Points and Distribution System Maximum Residence Time Samples Required



EPTDS Samples

- All tests
- 200.8, 218.7, 300.1, 522, 524.3, 537
- List 2 systems must also sample for 539

DSMRT Samples

- Metals by 200.8 (Cr, Co, V, Mo, Sr)
- Hexavalent chromium by 218.7
- Chlorate by 300.1

There are Some Unique UCMR3 Sample Requirements/Cautions



4 Methods REQUIRE collection of field blanks (FB) with EACH sample

- Volatiles by 524.3 - Metals by 200.8
- PFCs by 537 - Hormones by 539

Field blank collection protocols differs by method (likely to be a source of confusion for utilities)

Any sample with a detect requires analysis of the FB

Positive field blank = resample

UCMR3 Lab Approval Process



ONLY approved labs can perform UCMR3 testing

7 individual methods

(200.8, 218.7, 300.1, 522, 524.3, 537, 539)

Registration → Application → IDC → PT

- Detailed review by EPA at each step

Approval is by method

Final Lab Approval Will Come from EPA



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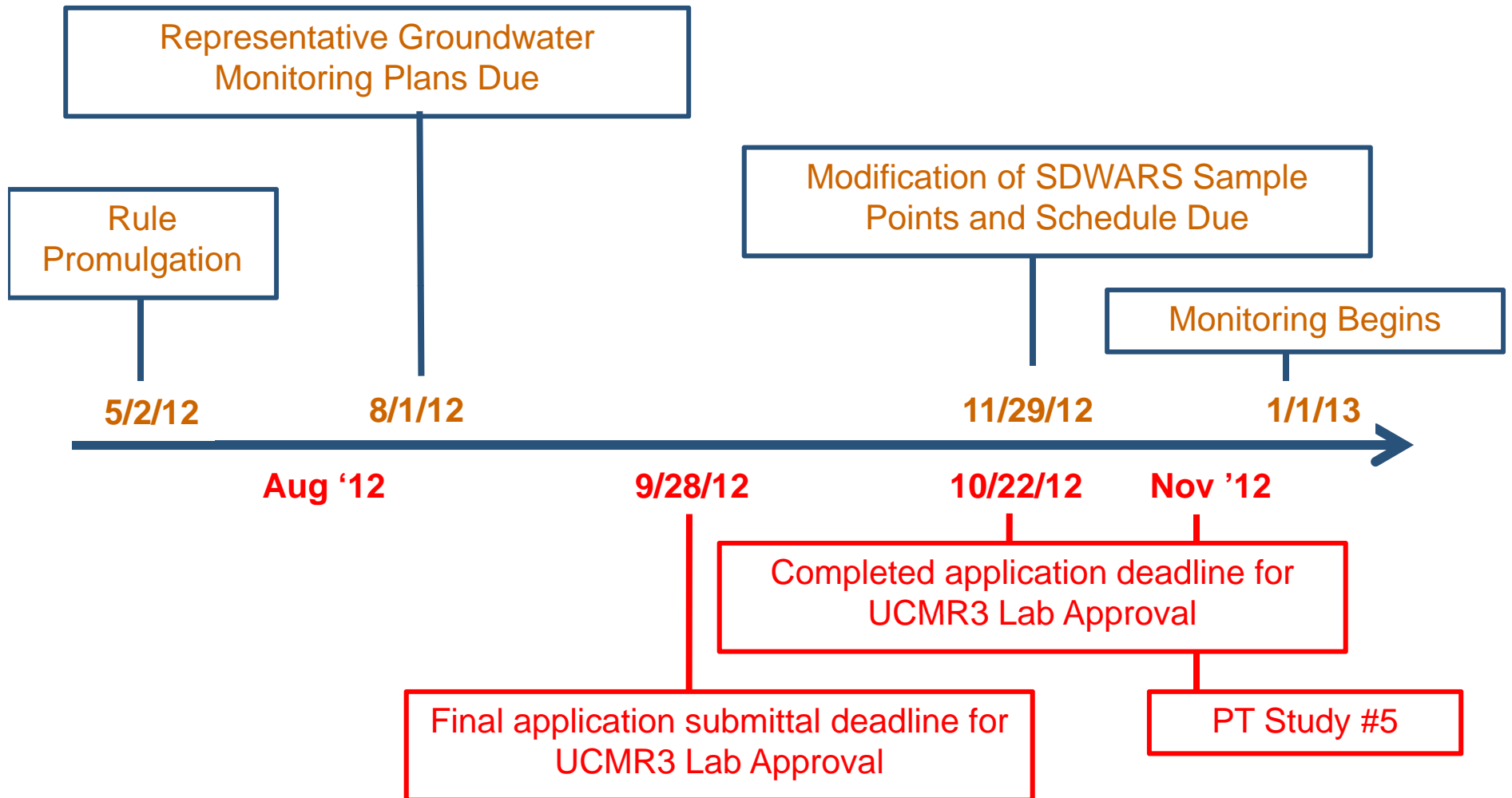
Dear Nilda Cox,

Based on your application and successful participation in a Unregulated Contaminant Monitoring Rule 3 (UCMR 3) Proficiency Testing (PT) Study for each of the listed methods, EPA has given the status of “approved” to your laboratory for the method(s) listed below. This letter is being issued to reflect the name change for your laboratory. The application and PT criteria are listed in the “UCMR 3 Laboratory Approval Requirements and Information Document, Version 2.0.” Your laboratory continues to be "approved" to conduct UCMR 3 analyses using the following method(s):

LabID: CA00006

Method Name		Approval Date
Hormones by LC/MS/MS	EPA 539	5/2/2012
Perfluorinated compounds by LC/MS/MS	EPA 537	5/2/2012
VOCs by GC/MS	EPA 524.3	5/2/2012
1,4-Dioxane by GC/MS	EPA 522	5/2/2012
Inorganic anions by IC (Chlorate)	EPA 300.1	5/2/2012
Hexavalent chromium by IC	EPA 218.7	5/2/2012
Trace Element Metals by ICP/MS	EPA 200.8	5/2/2012

UCMR3 Key 2012 Dates for Utilities and Laboratories



UCMR3 - What Will We See in Samples and Why?



MRLs are based on lab capability,
and NOT on the (HRL)

- **Much lower RLs = more probability of hits**

There is extensive data available demonstrating potential
high frequency of detection for several analytes

- **Cr (VI) - >70% at 0.03 ppb (UCMR3 MRL)**



MRL Issues - Organic Compounds on UCMR3



7 Volatiles (524.3) by Selected Ion Monitoring

- MRLs at 0.03 ppb to 0.2 ppb

1,4 Dioxane (522) with 0.07 ppb MRL

- Current HRL is in the 1 ppb range

6 Perfluorinated Compounds (537)

- MRLs at 0.010 ppb to 0.090 ppb

7 Hormones (539) – LIST 2

- MRLs at 0.0001 ppb to 0.004 ppb

Such LOW
MRLs
increases the
likelihood of
detects

MRL Issues - Inorganic Compounds on UCMR3



Chlorate (300.1)

- **MRL of 20 ppb**

Metals (Co, Cr, Mo, Sr, V) (200.8)

- **MRLs from 0.2 ppb to 1.0 ppb**

Hexavalent chromium (218.7)

- **MRL of 0.03 ppb**

**Very LOW
MRLs also
increases the
likelihood of
detects**

Existing Data - What Are the Potential Data Sources?



Existing state monitoring programs

- (e.g. CA UCMR program)

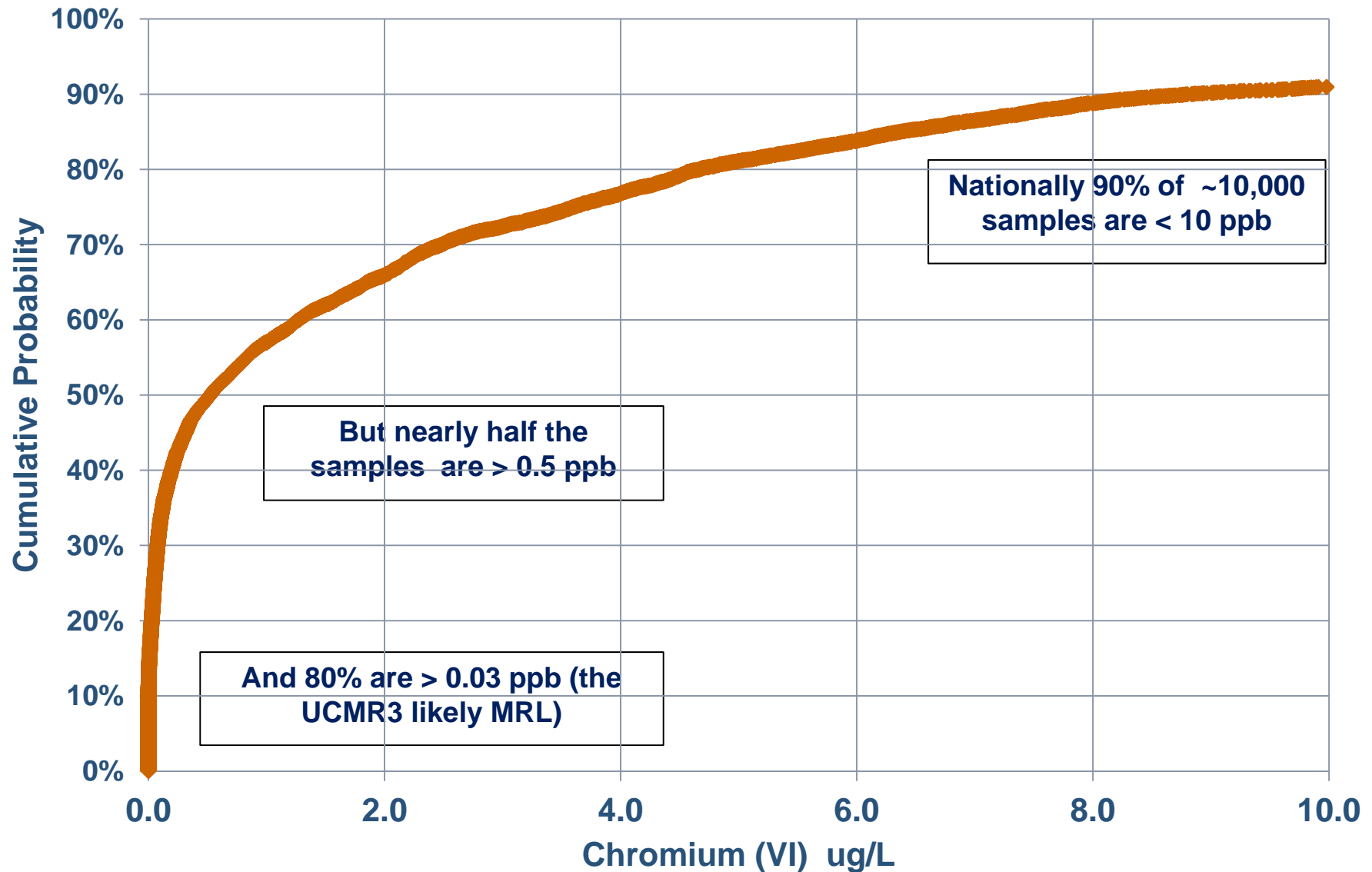
USGS surveys

- lots of metals data and VOCs, less for others

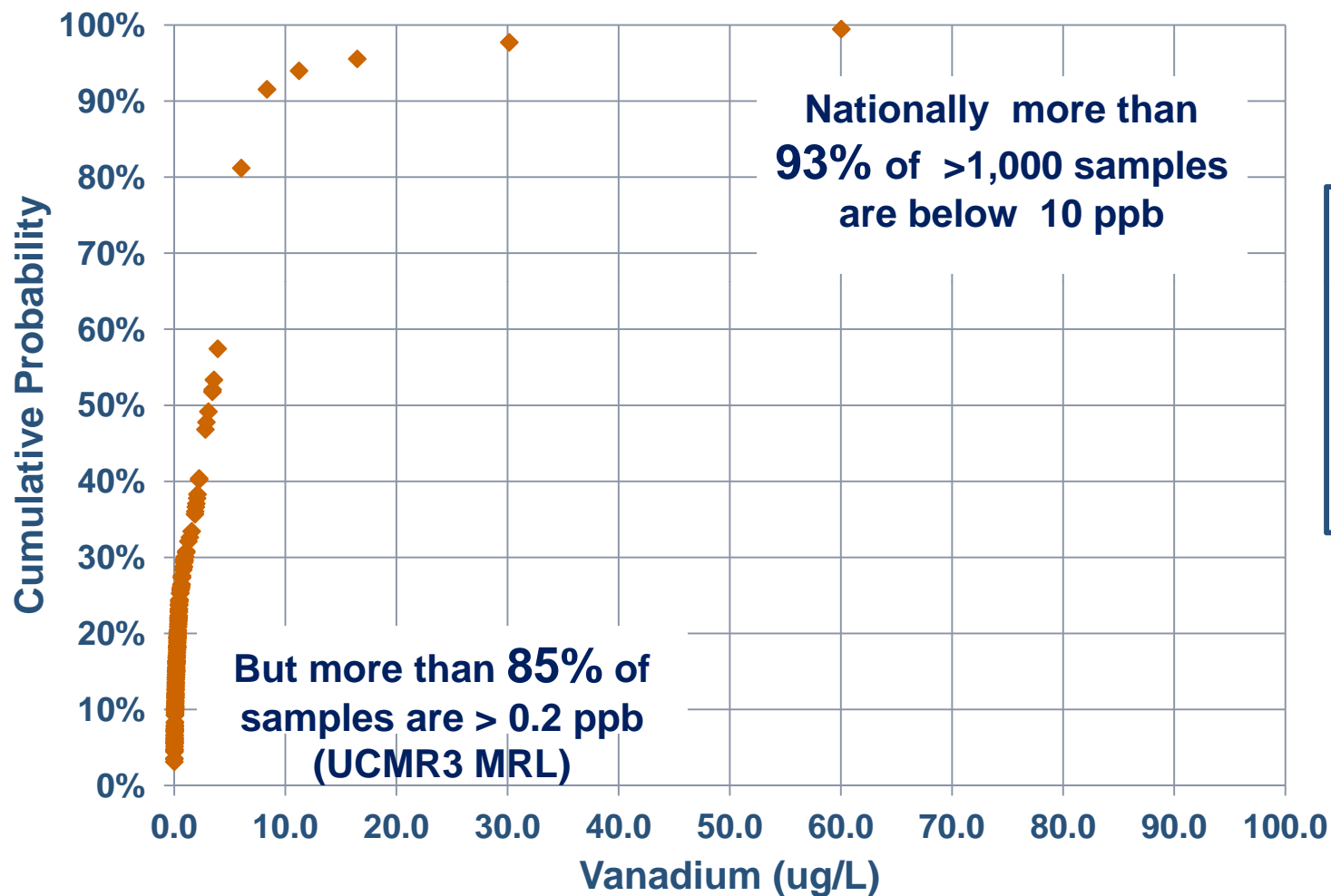
Our database

- Some large data sets
- Some nationwide multi-year monitoring for a subset of sites (allows us to look at some individual states)

Starting With the Largest Dataset – Cr (VI) (our results on >10,000 DW samples)

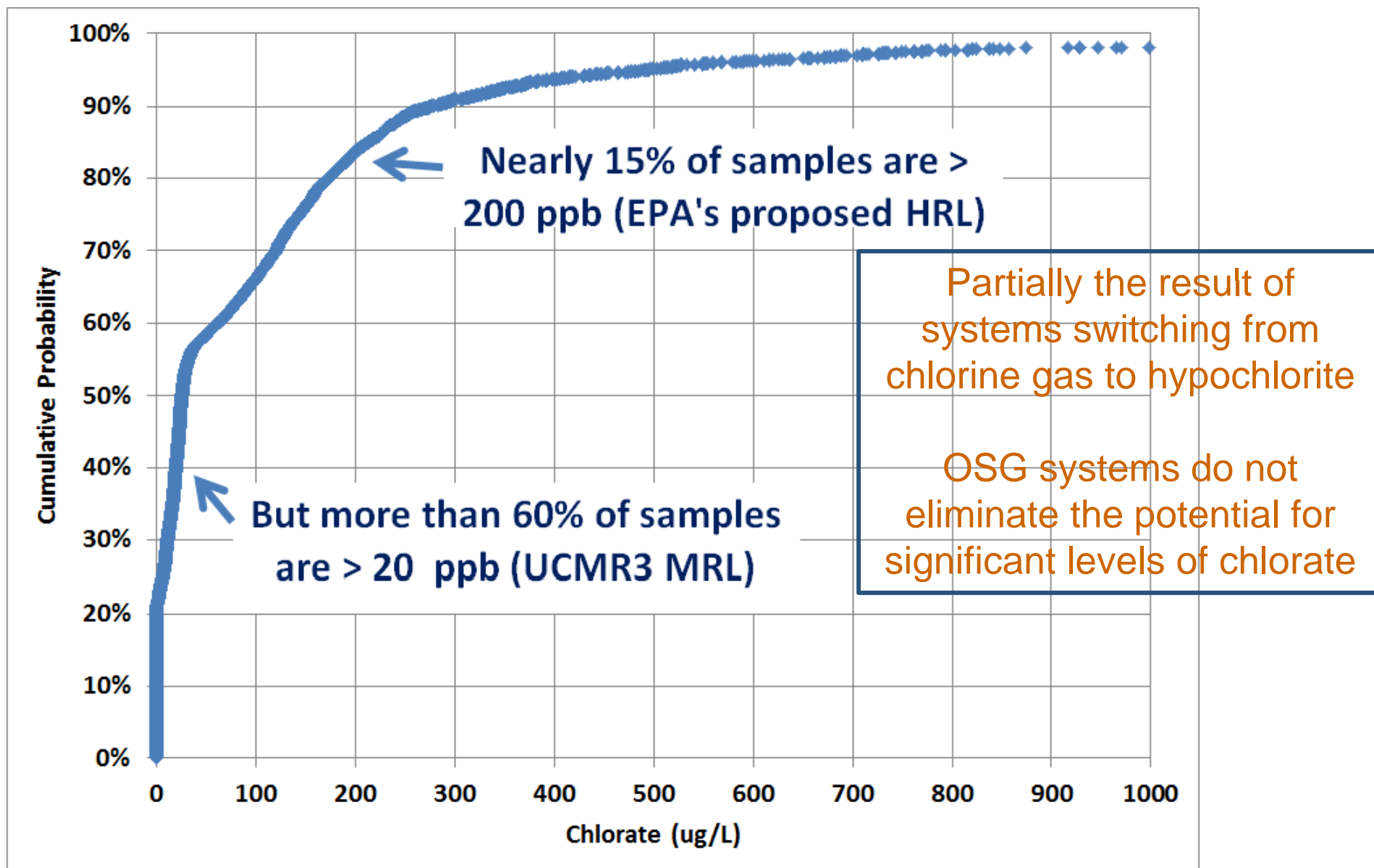


Similar Patterns are Expected for Other UCMR3 Metals (e.g. Vanadium)



In California, which required monitoring for Vanadium in the early 2000's, 3% of samples are >50 ppb

Chlorate Will Also Have Widespread Detection



Inorganics – Here is our Crystal Ball



We predict frequent (up to >50%) detections for Cr, Mo, Sr, V, and Cr(VI) due to low UCMR3 MRLs and natural abundance, coupled with high aqueous solubility for anionic type metals

Systems using GW will have greater frequency of detection than SW

Cobalt will be less frequently detected (less natural occurrence and slightly higher MRL)

Chlorate will also be detected >50% of the time

Organics Are A Bit Harder to Predict



There is less historic database information for “brand new” analytes.

Even when there are data, the “low MRL” conundrum makes estimates tentative.

But there are still some “tools” to help predict what will be seen

Factors to Consider in Predicting Detection



Treatability of the compound

- **PTA (some VOCs), GAC (VOCs, PFCs, hormones), AOP (1,4-dioxane)**

Types of treatment that are already in place in many systems

- **PTA and/or GAC common for known VOC sites**

Nature of potential sources

- **Industrial (PFCs, 1,4-Dioxane, VOCs)**
- **Airborne (PFCs)**
- **Wastewater influence (Hormones)**

Predicting Volatiles by EPA 524.3



UCMR3 MRLs range from 0.03 to 0.2 ppb!

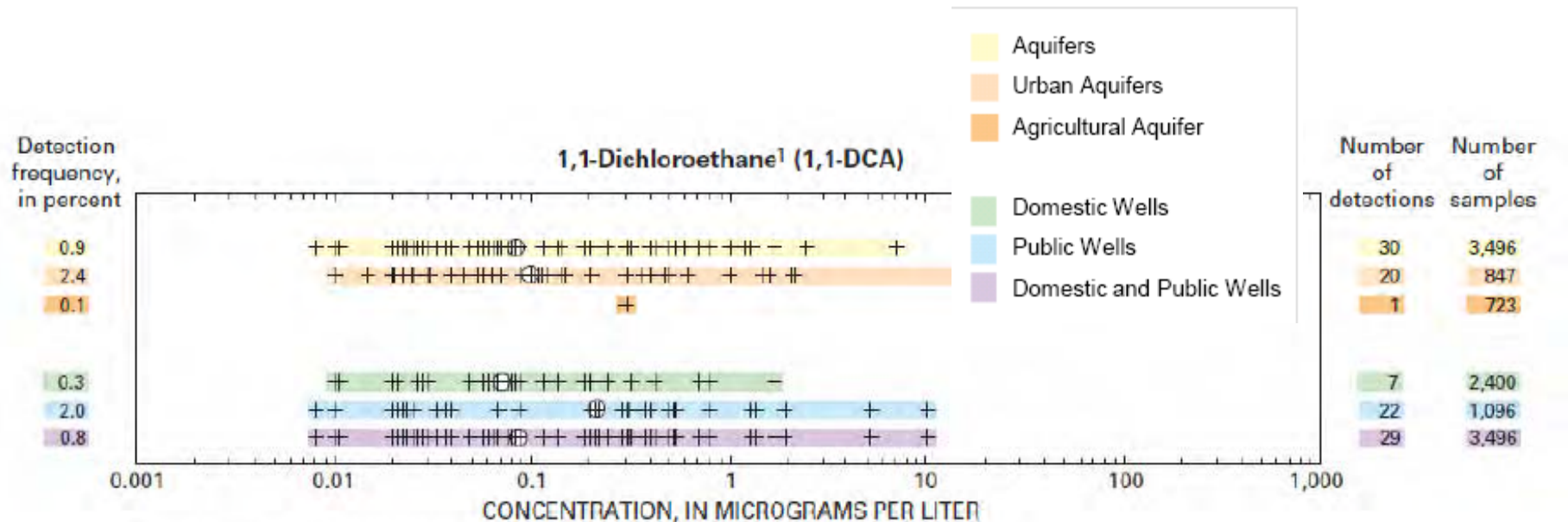
There is extensive data on SOME of these VOAs at HIGHER MRLs... and they do show up.

1,2,3-TCP is a known problem in CA and parts of HI.

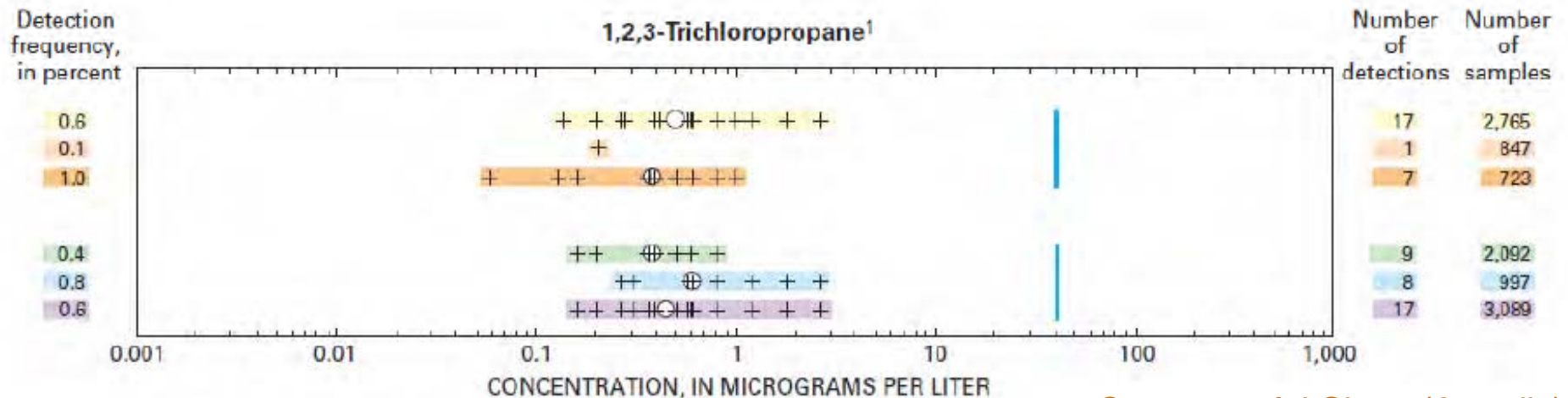
1,1-DCA already in 524.2; found in contaminated sites

HCFC-22, Halon-1011, bromomethane, and chloromethane show up sporadically at higher levels

USGS Data On A Few of the Volatiles (But with Higher MRLs Than UCMR3)



¹Neither an MCL nor HBSL has not been established for this compound.



Courtesy of J Shaw (Arcadis)

Specific UCMR3 Volatiles – Best Guesses Suggest ~1% Detections for Most



Compound	UCMR3 MRL (ug/L)	90 th percentile (ug/L)	95 th percentile (ug/L)	99 th percentile (ug/L)
Bromochloromethane (Halon 1011)	0.06	ND	ND	Trace
Chlorodifluoromethane (Freon 22)	0.06	ND	ND	Trace
Chloromethane	0.2	Trace	Trace	0.3-0.5
Bromomethane	0.2	ND	Trace	0.3
1,1-dichloroethane	0.03	ND	ND	0.1
1,3- Butadiene (limited data)	0.1	ND	ND	ND
1,2,3-trichloropropane	0.03	ND	Tr-0.1	0.1-0.5

Compilation of USGS data and EEA database

Can We Predict The Volatiles With Certainty?



Not very effectively, because there is not enough data as yet with MRLs at UCMR3 levels

And some of these samples (especially USGS) are source waters

But we do know that 1-5% of samples tested nationally with UCMR3 MRLs are positive for 1 or more volatiles, in particular those shown on the prior slide.

1,4-Dioxane: Could be Widespread



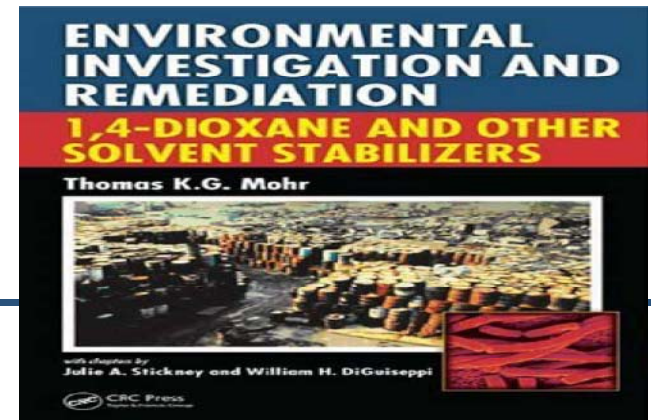
UCMR3 MRL (0.07 ppb) is \ll HRL (1 ppb)

Common solvent stabilizer; associated with 1,1,1-TCA

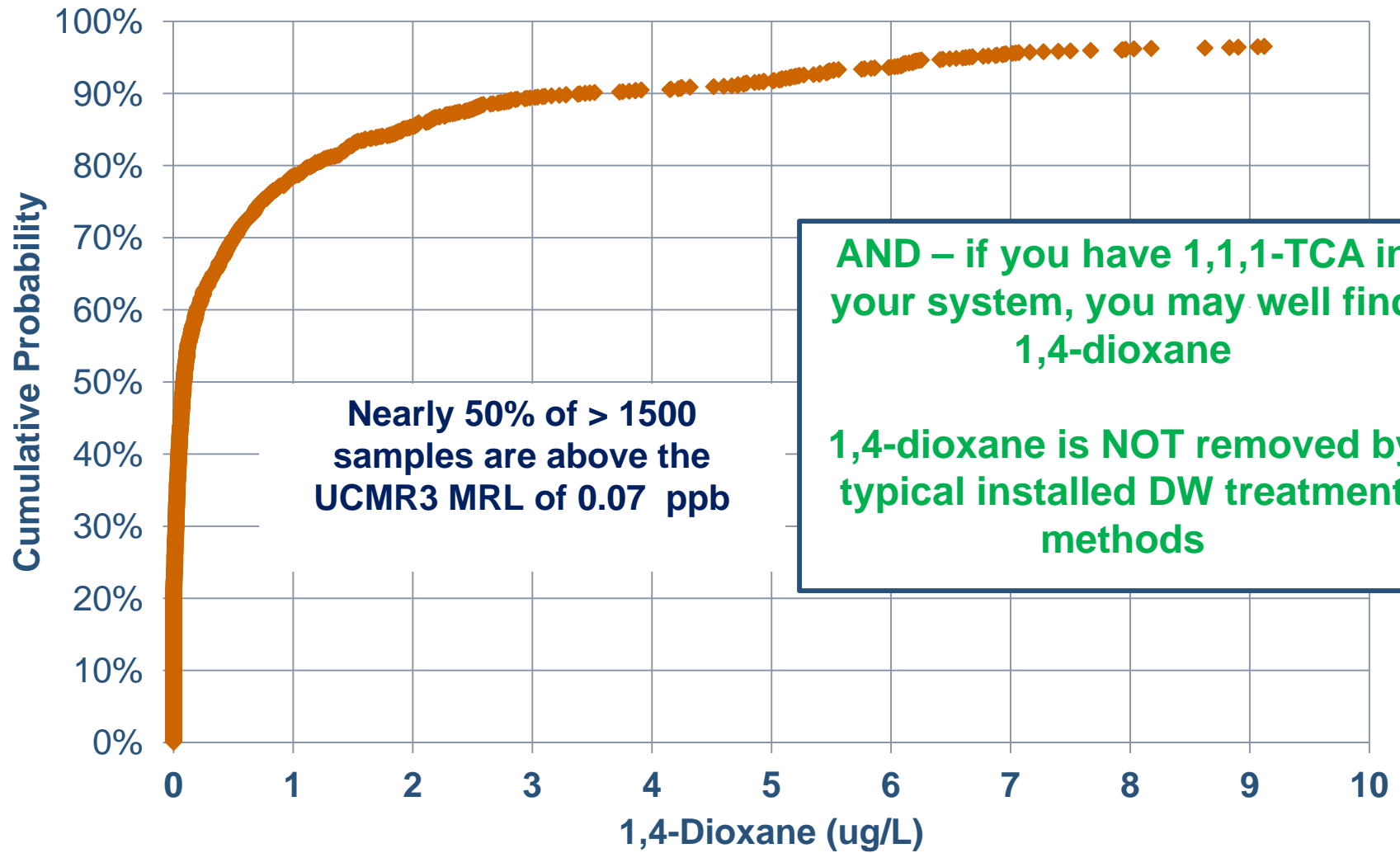
EPA had a hard time finding samples that were ND when doing method development

Mohr, who literally wrote the book on dioxane, predicted in 2012 that 1,4-dioxane could show up in 2-3% of UCMR3 samples.

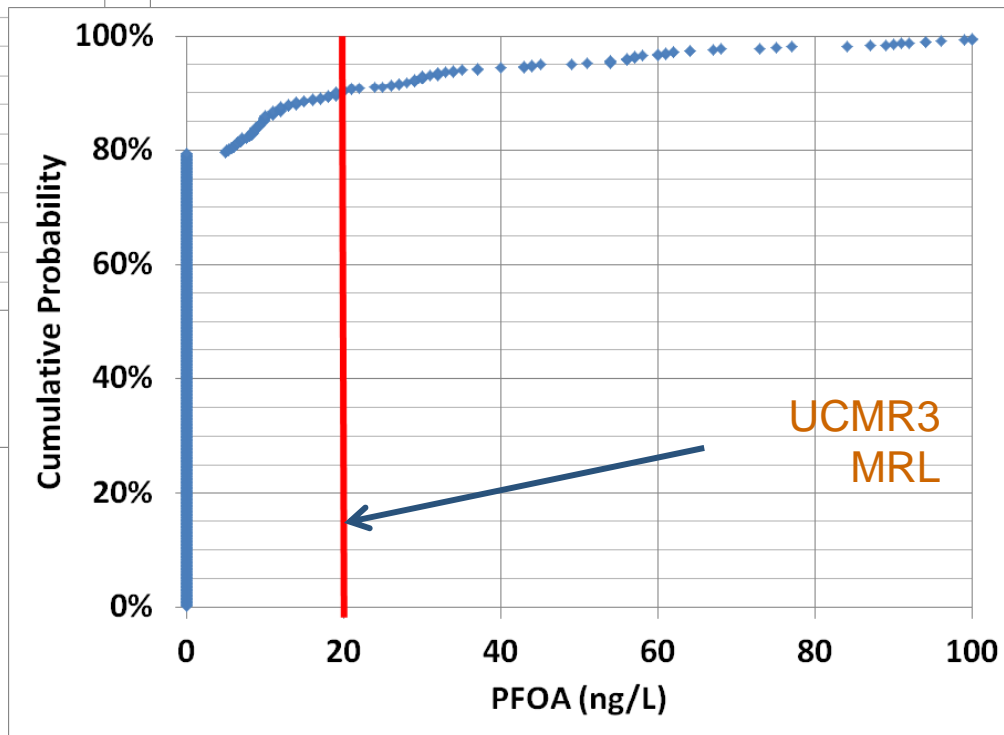
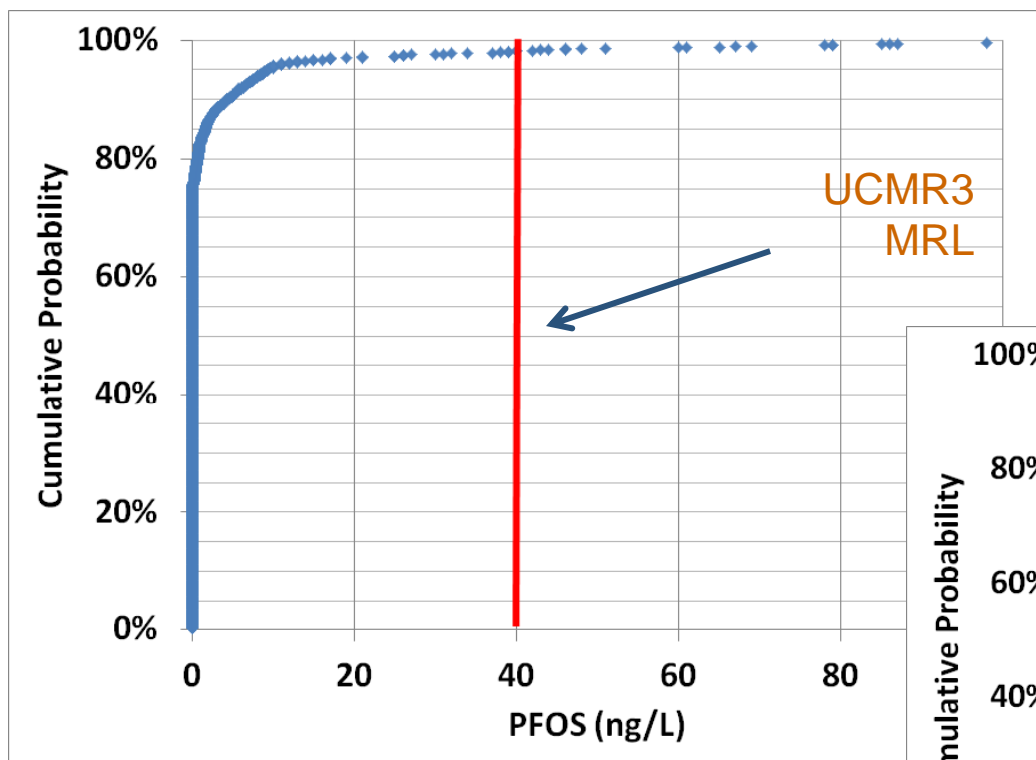
Needs AOP to remove.



1,4-Dioxane - Existing EEA Data



PFOS/PFOA- While It Looks Superficially Like a High Percentage (>5%) of Hits....



Every detect over the UCMR3 MRL is from two east coast states with known PFC issues

Factors for Hormone Occurrence Predictions – the Wastewater Impact



Analysis of ~20 Wastewater plant effluents from different parts of the country show:

- Estrone as high as 500 ppt (most <5)
- Estradiol all < 5 ppt
- Ethinylestradiol all < 5 ppt

Analysis of >400 finished drinking waters show:

- Estrone **0** detects (at 5 ppt)
- Estradiol **0** detects (at 5 ppt)
- Ethinylestradiol **0** detects (at 5 ppt)

But the Low MRLs Add Another Wildcard



Most of the hormones are very sensitive to chlorine, which should minimize hits....

But 5 of the 7 UCMR3 hormones have SUB ppt MRLs, which increases the potential for hits AND there is little data at those reporting levels.

99% of >400 drinking water samples tested for testosterone at 1 ppt were ND (but nearly 30% had possible detects above the UCMR3 MRL)

So Here is Our Crystal Ball for Organics Detections



Compound Group	Which Ones Will show up >1%	National Projection
VOCs	1,2,3-TCP 1,1-DCA Freon Chloromethane	1 to 5% 1% 1% 1-5%
1,4-Dioxane		2-5%
Hormones		< 1%
PFCs		< 1%

Conclusions



Be careful with your sample collection – repeat samples due to field blank contamination are costly!

There will be a lot of detections above the UCMR3 MRLs

Utilities should already be thinking of communication strategies, based on what we have seen with Cr (VI) and the ability of NGOs and the press to focus on detection and not health effects levels

Questions?



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