

Water Quality

Per- and Polyfluoroalkyl Substances

“PFAS”

*“The only true wisdom is in knowing
that you know nothing.”*

- Socrates

There are known knowns...

“There are known knowns; there are things we know we know. We also know there are known unknowns; that is to say we know there are some things we do not know. But there are also unknown unknowns – the ones we don’t know we don’t know.”

- Donald Rumsfeld

Safe Drinking Water Act

- Federal – Title 40, Code of Federal Regulations
- State – Title 22, California Code of Regulations
- USEPA establishes Maximum Contaminant Levels (MCL) and Treatment Technique Requirements
- SWRCB – DDW can adopt or make MCLs more stringent

Acronym Soup

- MCL – Maximum Contaminant Level
- SMCL – Secondary Maximum Contaminant Level
- TTR – Treatment Technique Requirements
- MCLG – Maximum Contaminant Level Goal
- PHG – Public Health Goal
- NOAEL – No Observable Adverse Effect Level
- DLR – Detection Limit for Reporting
- MRL – Method Reporting Limit
- NL – Notification Level
- AL – Action Level

Many, many, more...

MCL & TTR Process

- EPA evaluates National Primary Drinking Water Standards based on three criteria
 - Studies on health effects (toxicology and epidemiology)
 - Studies on the occurrence of the contaminant in water
 - Studies of the effectiveness and cost of treatment available to remove the contaminant
- An MCLG is then set at the NOAEL
- An MCL (or TTR) is set as close to the MCLG as technologically and economically feasible

Why NLs?

- Notification Levels are set for contaminants lacking an MCL.
- Unregulated Contaminant Monitoring Rule (UCMR)
 - Contaminant Candidate List (CCL)
 - Samples collected every ~5 years
- CA NL Exceedances
 - Notification to governing bodies
 - Recommendation to take source out of service if 10x, 30x, 50x, and 100x the NL for specific contaminants

*“Better Things for Better
Living...Through Chemistry.”*

- DuPont (slogan from 1935 to 1982)

What are PFASs and how do they effect us...

- Per- and polyfluoroalkyl substances
 - Perfluorooctane sulfonate (PFOS)
 - Perfluorooctanoic acid (PFOA)
- Manmade in US since the 1950s until 2015 (PFOA)
- Repel oil and water
- Industrial and consumer products
 - Carpet and clothing treatments
 - Non-stick and other coatings
 - Firefighting foams
- Toxicological studies in animals indicate potential developmental, reproductive, and systemic effects
 - Biological mechanisms by which disorders are produced are not yet understood

Where we are to date...

- UCMR
 - UCMR1 – 15 chemicals (2001 – 2005)
 - UCMR2 – 25 chemicals (2007 – 2011)
 - UCMR3 – 30 chemicals – included PFAS (2012 – 2016)
 - UCMR4 – 30 chemicals (2017 – 2021)
- SCV Water collected 150+ samples for PFAS (2014)
 - 8 positive samples for PFOA in 6 total wells
- USEPA added PFAS to CCL and established an Advisory Level of 70 ng/L (2016)
- CalEPA OEHHA added PFOS/PFOA to Prop 65 List (2017)
- DDW/OEHHA established NLs (2018)
 - PFOS – 13 ng/L
 - MRL = 4 ng/L
 - PFOA – 14 ng/L
 - MRL – 2 ng/L

SWRCB Phased Investigation

- Phase 1
 - Investigation Orders
 - 31 airports
 - Up to 578 drinking water wells within a 2 mile radius
 - Investigation Orders
 - 252 MSW landfills
 - Up to 353 drinking water wells within a 1 mile radius
 - UCMR based sampling up to 389 drinking water sources within a 1 mile radius of impacted wells (SCV Water to sample 15 wells)
- Phase 2
 - Source investigation – manufacturing facilities, refineries, bulk terminals, & non-airport fire training areas
 - 2017 – 2018 urban wildfire areas
- Phase 3
 - Source Investigation – secondary manufacturing sites, wastewater treatment & pre-treatment plants, domestic wells

What other states are doing...

- Seven states are pursuing policies stricter than EPA's current 70 ng/L Lifetime Health Advisory level (LHA)
 - AK, CA, MN, NH, NJ, NY, VT
- NJ has been the most aggressive state
 - PFNA – MCL of 13 ng/L (2017)
 - PFOS/PFOA – ISGWQS of 10 ng/L (2019)
 - PFOS/PFOA – Proposed MCL of 13 ng/L & 14 ng/L (4/2019)
- Vermont
 - All water systems required to monitor for PFAS
 - Monitoring frequency dependent on levels
 - If results are above 20 ppt implement treatment and issue "Do Not Drink" notice

Measuring Contaminant Levels to nanograms per liter (parts per trillion)

- 70 nanograms per liter analogy
- 1 drop in 660,000 gallons of an Olympic size pool is 1 ng/L or ppt
- If a person lived to 78 years and drank eight, 8-ounce glasses of water per day, they would have consumed 14,235 gallons, which would equate to about 1.5 drops of 70 ng/L of a contaminant

Next Steps

- DDW issued order to sample 15 SCV Water Wells
 - Various states including CA have established drinking water guidelines and are requiring sampling
- Sampling to start second quarter 2019 (Apr-Jun) and continue for 4 consecutive quarters
 - Currently only 13 ELAP certified labs in the US
- Sample analysis costs ~\$1,000 per sample or ~\$60,000 in total
- Statewide
 - 192 Public Water Systems
 - 613 Wells

What does the future hold?

- USEPA
 - Included PFAS in the CCL
 - Determine range which an Integrated Risk Information System (IRIS) is needed.
 - Should have regulatory findings by Dec 2019
 - MCL would take up to an additional 42 months

California 2019 and Beyond

- Notification level adjustments for new contaminants
- Regulation of PFAS by class and not specific components
- Public Health Goals (OEHHA)
 - Occurrence and health data collection
 - Two year process
- MCL
 - Need to wait for PHG
 - Two year process
- Response actions based on detections

Possible Treatment Technologies

- Conventional Adsorption (“de-facto” interim measures)
 - GAC (granular activated carbon)
 - AIX (anion exchange)
- Reverse Osmosis or Nano-Filtration
 - Geochemical and co-contaminant competition often requires a treatment train
- Soil Treatment – excavation and offsite incineration
- In Situ and Ex Situ Technologies being researched

“Now this is not the end. It is not even the beginning of the end. But it is, perhaps, the end of the beginning.”

- Winston Churchill

- Perchlorate revised DLR
- UCMR 4 (2019/2020)
 - Cyanotoxins
 - Heavy metals
 - Pesticides
 - Disinfection by-products (brominated HAAs)
- UCMR5, 6, 7...
- Other PFAS (PFHxS, et.al)
- GenX and other substitutes for PFAS
- Pharmaceuticals and Personal Care Products