CONTRA COSTA COUNTY
HAZARDOUS MATERIALS COMMISSION

Thursday, March 28, 2019
4:00 p.m. – 6:00 p.m.

The County Connection
2477 Arnold Industrial Way, Board Room
Concord CA 94520

COMMISSION ACTION MAY BE TAKEN ON ANY ISSUE IDENTIFIED IN THIS AGENDA

The Contra Costa County Hazardous Materials Commission will provide reasonable accommodations for persons with disabilities planning to attend the Hazardous Materials Commission meetings who contact Michael Kent, Hazardous Materials Commission Executive Assistant, at least 24 hours before the meetings, at (925) 313-6587

AGENDA

1. CALL TO ORDER, ANNOUNCEMENTS AND INTRODUCTIONS
2. APPROVAL OF MINUTES: February 28, 2019
3. PUBLIC COMMENT
4. HAZARDOUS MATERIALS PROGRAMS REPORT ................................................................. Randy Sawyer
5. OPERATIONS COMMITTEE REPORT ........................................................................... Committee Chair
6. PLANNING AND POLICY DEVELOPMENT COMMITTEE REPORT ................................... Committee Chair
7. OLD BUSINESS:
   a) None
8. NEW BUSINESS: CO-SPONSORED BY THE CONTRA COSTA SUSTAINABILITY COMMISSION
   a) Presentation on SB 1000 requirements in General Plan Updates; Dr. Elizabeth Baca, California Office of Planning and Research and Tiffany Eng, California Environmental Justice Alliance.
9. REPORTS FROM COMMISSIONERS ON MATTERS OF COMMISSION INTEREST .............................................. Members
10. PLAN NEXT AGENDA
11. ADJOURNMENT

Attachments

Questions: Call Michael Kent (925) 313-6587

Any disclosable public records related to an open session item on a regular meeting agenda and distributed by Contra Costa Health Services to a majority of members of the Hazardous Materials Commission less than 72 hours prior to that meeting are available for public inspection at 597 Center Avenue in Martinez.
CONTRA COSTA COUNTY
HAZARDOUS MATERIALS COMMISSION

2019 MEETING CALENDAR

HAZARDOUS MATERIALS COMMISSION

The County Connection - 2477 Arnold Industrial Way, Board Room
Concord CA 94520

4th Thursday of Each Month, 4:00 p.m. – 6:00 p.m. - (except Nov/Dec)

January 24
February 28
March 28
April 25
May 23
June 27
July 25
August 22
September 26
October 24
December 5

OPERATIONS COMMITTEE

North Richmond Center for Health - 1501 Fred Jackson Way
Richmond CA 94801

2nd Friday of Each Month, 10:00 a.m. – 12:00 noon

January 11
February 8
March 8 - cancelled
April 12
May 10
June 14
July 12
August 9
September 13
October 11
November 8
December 13

PLANNING & POLICY DEVELOPMENT COMMITTEE

United Steelworkers Local 5 (PACE) - 1333 Pine Street, Suite C-1
Martinez CA 94553

3rd Wednesday of Each Month, 4:00 p.m. – 5:30 p.m.

January 16
February 20 - cancelled
March 20
April 17
May 15
June 19
July 17
August 21
September 18
October 16
November 20
December 18

597 Center Avenue, Suite 200, Martinez CA 94553 (925) 313-6712 Fax (925) 313-6721
<table>
<thead>
<tr>
<th>REPRESENTATIVES</th>
<th>MEMBERS (ALTERNATES)</th>
<th>EXPIRATION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Business Seat #1</strong></td>
<td>Fred Glueck</td>
<td>December 31, 2022</td>
</tr>
<tr>
<td>* West County Council of Industries</td>
<td>Aaron Winer (A)</td>
<td>December 31, 2022</td>
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<tr>
<td>* Veolia North America</td>
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<tr>
<td><strong>Business Seat #2</strong></td>
<td>Mark Hughes</td>
<td>December 31, 2021</td>
</tr>
<tr>
<td>* Industrial Association</td>
<td>Peter Dahling (A)</td>
<td>December 31, 2021</td>
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<tr>
<td>* Marathon Oil Refinery</td>
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<tr>
<td><strong>Business Seat #3</strong></td>
<td>Don Bristol</td>
<td>December 31, 2020</td>
</tr>
<tr>
<td>* Contra Costa Taxpayers Association</td>
<td>Marj Leeds (A)</td>
<td>December 31, 2020</td>
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<tr>
<td>* Contra Costa Taxpayers Association</td>
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<tr>
<td><strong>City Seat #1</strong></td>
<td>Gabe Quinto</td>
<td>December 31, 2022</td>
</tr>
<tr>
<td>* City of El Cerrito</td>
<td>Dave Hudson (A)</td>
<td>December 31, 2022</td>
</tr>
<tr>
<td>* City of San Ramon</td>
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<tr>
<td><strong>City Seat #2</strong></td>
<td>Mark Ross</td>
<td>December 31, 2019</td>
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<tr>
<td>* City of Martinez</td>
<td>Rich Kinney (A)</td>
<td>December 31, 2019</td>
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<tr>
<td>* City of San Pablo</td>
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<tr>
<td><strong>Environmental Engineering Seat</strong></td>
<td>George Smith – Chair</td>
<td>December 31, 2021</td>
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<tr>
<td>* GBR Smith Group</td>
<td>Ron Chinn (A)</td>
<td>December 31, 2021</td>
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<tr>
<td>* Innovex Environmental Management</td>
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<tr>
<td><strong>Environmental Organization Seat #1</strong></td>
<td>Ralph Sattler</td>
<td>December 31, 2021</td>
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<tr>
<td>* Communities for a Safe Environment</td>
<td>Lisa Park (A)</td>
<td>December 31, 2021</td>
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<tr>
<td>* Sierra Club</td>
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<tr>
<td><strong>Environmental Organization Seat #2</strong></td>
<td>Steven Linsley</td>
<td>December 31, 2020</td>
</tr>
<tr>
<td>* Richmond South Shoreline Area Community Advisory Group</td>
<td>Linus Eukel (A)</td>
<td>December 31, 2020</td>
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<tr>
<td>* John Muir Land Trust</td>
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<tr>
<td><strong>Environmental Organization Seat #3</strong></td>
<td>Vacant</td>
<td>December 31, 2019</td>
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<td>*</td>
<td>Peter Dragovich (A)</td>
<td>December 31, 2019</td>
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<td>* Sustainable Contra Costa</td>
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<td><strong>General Public Seat</strong></td>
<td>Frank Gordon</td>
<td>December 31, 2019</td>
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<td>Tim Bancroft (A)</td>
<td>December 31, 2019</td>
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<td><strong>Labor Seat #1</strong></td>
<td>Rick Alcaraz</td>
<td>December 31, 2020</td>
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<tr>
<td>* Central Labor Council</td>
<td>Vacant (A)</td>
<td>December 31, 2020</td>
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<tr>
<td><strong>Labor Seat #2</strong></td>
<td>Jim Payne</td>
<td>December 31, 2019</td>
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<tr>
<td>* United Steelworkers - Local 5</td>
<td>Tracy Scott (A)</td>
<td>December 31, 2019</td>
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<td>* United Steelworkers - Local 5</td>
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<td><strong>League of Women Voters Seat</strong></td>
<td>Leslie Stewart</td>
<td>December 31, 2020</td>
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<td>Rita Xavier (A)</td>
<td>December 31, 2020</td>
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* For identification purposes only
Contra Costa County
HAZARDOUS MATERIALS COMMISSION

Draft Minutes
February 28, 2019

Members and Alternates Present: Don Bristol, Fred Glueck, Steve Linsley, Gabe Quinto, George Smith, Leslie Stewart, Ralph Sattler, Tim Bancroft (alternate), Lisa Park (alternate)
Absent: Rick Alcaraz, Jim Payne, Mark Ross, Frank Gordon (represented by alternate), Industrial Association Seat – vacant, Environmental Seat #2 – vacant
Staff: Michael Kent
Members of the Public: Peter Dahling, Marathon

1. Call to Order: Commissioner Smith called the meeting to order at 4:07

Announcements and Introductions:

Michael Kent announced:
- DTSC notices announcing cleanup activities at Brookside site in Richmond and John Mansville in Pittsburg
- The East Bay Leadership Council Environmental committee will be having Ralph Stevens from the Regional Water Quality Control Board attend their monthly meeting tomorrow at 9:00 am at Brown and Caldwell in Walnut Creek

Lisa Park announced that one week from tonight there will be a town hall meeting on the Phillips 66 refinery permit application.

2. Approval of the Minutes:

The minutes for the September January 24, 2019 meeting were moved by Commissioner Glueck, seconded by Commissioner Smith and approved 6-0-2 with Commissioners Bancorft and Bristol abstaining.

3. Public Comments: None

4. Hazardous Materials Programs Report:

- Randy Sawyer, Hazardous Materials Programs manager was unable to attend.

5. Operations Committee Report:

The committee elected their Chair and Co-chair for the year, received an update on the status of the Pharmaceutical Ordinance, and interviewed Johnathan Bash for the open Environmental seat. The committee unanimously recommended Mr. Bash to the full Commission for appointment to the open Environmental Seat.
6. Planning and Policy Development Committee Report:

The committee did not meet in February.

7. Old Business:

a) Update on the AB 617 Process in Richmond

The Bay Area Air Quality Management District help a community summit in Richmond on February 16th to engage the community in the AB 617 process, Approximately 100 people attended. The topics for the meeting were to describe the relationship between air quality and health, which was done by the Public Health Director, Dan Peddycoard; to review the history of Environmental Justice in Richmond, which was presented by Dr. Henry Clark of the West County Toxics Coalition; review the AB 617 process, which was done by Air District and Air Resources Board staff; and to encourage participation in the steering committee that will develop the air monitoring plan for process. A detailed description of the desired makeup of the steering committee was given by Air District staff.

8. New Business:

a) Consider Candidate for open Environmental Seat

The Commission considered the unanimous recommendation of the Operations Committee to recommend Jonathan Bash for the open Environmental Seat.

Commissioner Glueck said that he had a positive interview and thought that he would represent his constituency well.

Commissioner Stewart said that she likes that he works for a NGO that has an Environmental Justice perspective, and that he interviewed well. She also said that her alternate, Commissioner Xavier, knows and likes him.

Commissioner Quinto said that he knows Mr. Bash, and that he consulted for political campaigns and also worked for Supervisor Burgis.

Commissioner Park said that she liked him and that he was lively and energetic in his interview.

Commissioner Smith said it was good to see volunteer work on his resume.

The Commission voted 8 – 0 to recommend his nomination to the Hazardous Materials Commission to the Board of Supervisors.

b) Presentation by Amy Wilson, TRC, on PFAS in the Environment.

Ms. Wilson gave a presentation which gave a brief history of PFAS, the chemistry of PFAS, their fate and transport in the environment, exposure routes and toxicity, its regulatory status,
sampling and laboratory analysis, source identification and forensic analysis, and a remediation overview. The slides for her presentation are attached to the minutes.

9. Reports From Commissioners On Matters of Commission Interest:

None

10. Plan Next Agenda:

The Commission will receive a presentation on the requirements of SB 1000 – addressing Environmental Justice concerns in General Plan updates

11. Adjournment: The meeting adjourned at 6:00 pm.
Attachment

Item 1
Per- and Poly-Fluoroalkyl Substances (PFAS): Understanding emerging issues with these widespread compounds

Contra Costa County Hazardous Materials Commission
February 28, 2019

What are PFAS?

A brief history of PFAS
The chemistry of PFAS
Fate and transport
Exposure and toxicity
Regulatory status
Sampling and laboratory analysis
Source identification and forensic analysis
Remediation overview

Don’t worry, this is all you need to know.

What are PFAS?

A family of chemicals
Anthropogenic only
Used from 1940s to early 2000s to make products that resist heat, oils, grease, stains, and water
Industries: aerospace, automotive, construction, chemical, semiconductor, textile
Found globally, even in remote places
Most well-known and researched are PFOA (perfluorooctanoic acid) and PFOS (perfluorooctane sulfonic acid)

Oak Ridge, TN uranium enrichment plant, where Teflon, manufactured with PFOS, was used to coat valves and seals as part of the Manhattan Project.

What are PFAS?

A Brief History of PFAS

PFAS = perfluoralkyl and polyfluoroalkyl substances

Perfluorinated alkyl substances – fully fluorinated alkyl tail

PFOA (C7)

PFOS (C8)

The Chemistry of PFAS (Quick)

PFAS = perfluoralkyl and polyfluoroalkyl substances

Perfluorinated alkyl substances – fully fluorinated alkyl tail

PFOA (C7)

PFOS (C8)
The Chemistry of PFAS (Quick)

PFAS = per- and polyfluorinated alkyl substances
polyfluorinated alkyl substances — non-fluorine atom (typically H or O) attached to at least one carbon atom

Fluorotelomer Alcohol (8:2 FTOH)

GenX (replacement chemical for PFDA)

The Chemistry of PFAS: What is a Precursor?

- They are polyfluoroalkyl substances that can transform to perfluoroalkyl acids
  - They break down microbially or via ultraviolet degradation
  - There exist 1000s of these
- Though PFOS and PFDA have been taken out of use, their precursors are still in use
  - Example 1: GenX (poly) is being proposed as a replacement chemical for PFDA (per). But, GenX can break down into a "per".
  - Example 2: 6:2 FTS is the replacement chemical for PFOS
  - Example 3:

7:2
tetramer

Fate and Transport of PFAS

Four primary source scenarios
- Fire Training / Fire Response
  - Aqueous film forming foam (AFFF) used by military and others for decades
- Industrial Site
  - Production and manufacturing using PFAS
  - Stack emissions
- Landfill
  - Ultimate repository
  - Unlined landfills — transport through groundwater
  - Lined landfills — leachate sent to waste water treatment plant (WWTP)
- WWTP / Biosolids
  - Landfill / Foodchain

Fate and Transport of PFAS

Industrial Site

Landfill / WWTP / Biosolids

PFAS in Groundwater (Mobility or Commingling?)
Exposure Routes

Occupational Exposure
- Manufacturing of PFAS
  - Inhalation, dermal contact
- Firefighting
  - Ingestion, inhalation, dermal contact with AFFF
- Improper PPE

Non-Occupational Exposure
- Contamination of food and air
  - Ingestion of contaminated drinking water
  - Ingestion of fish from contaminated water bodies
  - Ingestion of crops grown in contaminated soils
- Inhalation and ingestion of dust containing PFAS

Contact with consumer products treated with PFAS
- Carpets, furniture, clothing treated for stain resistance

Toxicity of PFAS
- Non-Cancer Reference Dose
  - 0.00002 mg/kg/day for both PFDoA and PFOS
  - Based on developmental toxicity studies of mice and rats
  - 10 times more toxic than arsenic
- Cancer Slope Factor
  - PFOS classified as a group B2 carcinogen
  - Oral Slope factor of 0.07 mg/kg-day
  - Based on testicular cancer in rodents
  - Kidney, liver, and pancreatic tumors also reported
- PFOA
  - Not calculated
- Safe level is unknown for most PFAS

EPA and the National Toxicology Program (NTP) are collaborating on toxicity studies for PFAS as of January 2019

Bioaccumulation
- In surface water bodies, PFAS accumulate in the tissues of fish
- Fish may act as a secondary, ongoing source of PFAS, much as sediment bioaccumulation of contaminants does
- This can confound monitoring and evaluation of cleanup
- Biomagnification of PFOS is also known to occur

Exposure
- Majority of US population exposed to PFAS
- Half-life = 2-10 years in humans
- Prevalent in blood and urine samples
- CB (PFOA) Health Project - 70,000 residents with drinking water exposure linked to serum-PFOA concentrations and variety of health outcomes
- Agency for Toxic Substances and Disease Registry (ATSDR) (2018) comprehensive report

Regulatory Status – EPA (2016)
- 70 ppm (parts per trillion) in perspective:
  - 1 person in 2 world populations (7.6 billion in October 2017)
  - 3.5 drops in an Olympic-sized swimming pool (860,490 gallons)

- Under pressure from the states and from drinking water purveyors around the country, EPA convened a meeting of the states on May 22, 2018 to discuss action on PFAS.
- Held public forums in NH, PA, NC, CO, KS, and MI in communities affected by PFAS contamination to aid in drafting a National PFAS Management Plan
- Senate hearing, September 26 – “Federal Role in the Toxic PFAS Chemical Crisis”
- US Congress, October 2 – FAA Reauthorization Act allows discontinuation of PFAS in airport fire fighting foams (House 398-23, Senate 93-6)
Regulatory Status – EPA and Federal (2019)

- H.R. 565 - PFAS Action Act introduced on January 14, 2019
  - Bipartisan Representatives from Michigan
  - Would require EPA to designate all PFAS as hazardous substances under CERCLA

EPA PFAS Action Plan introduced on February 14, 2019
- Will move forward with the MCL process for PFOS and PFOA (note: a new MCL has not been promulgated since 1996)
- Will move forward with listing PFOS and PFOA as hazardous substances under CERCLA (pathway to cost recovery from PRPs)
- Groundwater cleanup recommendations will be coming soon.
- Expanding research - new analytical methods, toxicity standards
- Developing risk communication tool box

Other News Briefs

- PFAS Action Plan – Mixed Reviews
  - Bipartisan group of senators thinks it doesn’t go far enough
  - The National Rural Water Association opposes MCLs, preferring “alternative federal initiatives” such as funding for treatment and monitoring assistance.

- Chemours is sending Glen-X waste from the Netherlands to its plant in Fayetteville, North Carolina
  - May be destined for deep well injection in Texas
  - US trailing Europe in PFAS regulation – disposal here is currently easier

Regulatory Status – California

- November 2017 - OEHHA listed PFOA and PFOS as known to the state to cause reproductive toxicity (developmental endpoint) under Proposition 65
- June 2018 - OEHHA recommended interim notification levels (INLs) for PFOS (based on liver toxicity and cancer risks) and for PFOA (based on immunotoxicity)
  - 12 ppt for PFOS
  - 14 ppt for PFOA
- December 2018 - PFOS and PFOA were added to CEQA's list of SWRCB's Recycled Water Policy
- PFAS are a key element in DAS' Safer Consumer Products Program

How Will PFAS Emerge in California?

- One-off regulatory requests for sampling at regulated industrial sites
- Via public comment at individual sites
- Agency requests for historic use information at industrial sites – developing
  - Discovery in drinking water?
  - Litigation?
  - Enforceable regulatory limits?
  - Public awareness?
  - ????

UCMR3 Results

EPA Unregulated Contaminant Monitoring Rule (UCMR3)
PFAS included in UCMR3 (2016-2015)

- Nationwide (4,912 public water systems tested, 36,972 samples)
  - PFOS: 0.96 systems > 70 ng/L (46 systems)
  - PFOA: 0.3% systems > 70 ng/L (13 systems)
- California (437 out of ~7,500 public water systems tested, ~6,468 samples)
  - PFOS: 1.33% systems > 70 ng/L (6 systems)
  - PFOA: 0 systems > 70 ng/L

Regulatory Status – The States

- International:
  - Australia
  - Canada
  - Denmark
  - Germany
  - Italy
  - Netherlands
  - Switzerland
  - UK
- Residential soil standards exist also.
Requirements and Activities in (Select) Other States

- New Hampshire:
  Requires PFAS screening at active waste sites, sites undergoing site assessments, and all landfills subject to groundwater monitoring requirements.

- New York:
  For investigations of soil, surface water, groundwater, and sediments, the lab must report "all PFAS for which the lab has standards.

Requirements and Activities in (Select) Other States

- Massachusetts:
  Encourages sampling for PFAS at sites where potential sources exist.

- Connecticut:
  Must include PFAS as site characterization COC if historical/operational use indicated.

PFAS Sampling - High Risk of Cross-Contamination

- Due to sensitive detection limits and environmental presence of PFAS, special care is required to prevent cross-contamination.
- Accomplished by exclusion of specific sampling equipment.

Examples of PFAS Sampling Dos and Don'ts

<table>
<thead>
<tr>
<th>What Should I Avoid?</th>
<th>Use Instead</th>
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<tbody>
<tr>
<td>Frost bites during sample handling</td>
<td>Regular ice in Ziploc™ bags</td>
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<tr>
<td>Blue ice® (chemical ice packs)</td>
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<tr>
<td>Waterproof field books, plastic clipboards,</td>
<td>Loose paper, aluminum or Masonite clipboards,</td>
</tr>
<tr>
<td>and spiral bound notebooks</td>
<td>or record electronically</td>
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<tr>
<td>Unnecessary handling with nitrile gloves</td>
<td>High-density polyethylene (HDPE) or silicone</td>
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<tr>
<td>Equipment with Teflon™ (e.g., ball, tubing, parts in pump)</td>
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<tr>
<td>Low-density polyethylene (LDPE) or glass sample containers</td>
<td>HDPE or polypropylene containers and caps</td>
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<tr>
<td>or containers with Teflon™-lined lids</td>
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<tr>
<td>Waterproof labels for sample bottles</td>
<td>Paper labels with clear tape</td>
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<tr>
<td>Sunscreen, insect repellent</td>
<td>Products that are 100% natural, DEET</td>
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<td>Shurpy®</td>
<td>Rapidpoint pens</td>
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PFAS Laboratory Analysis, Precursor Analysis

- EPA Method 537: solid phase extraction (SPE) and liquid chromatography/tandem mass spectrometry (LC/MS/MS)
  - Reporting limits: 2-15 ng/L (comparable to typical VOCs at 0.5 ng/L - 500 ng/L)
  - Cost: $250 to $400 per sample
  - Select PFAS compounds

- Screening tool: TOP Assay
  - Test univiable precursor assay
  - Analyze sample normally first
  - Treat sample to eliminate precursors
  - Analyze treated sample
  - Total precursors = PFAS treated - PFAS untreated

- Michigan:
  - WWTP must achieve <12 ppt PFOS if discharged to a non-drinking water source, and <11 ppt PFOS if discharged to a drinking water source.
  - By June 30, 2018, POTW must have completed a survey of their Significant Industrial Users (SIU) with potential to discharge PFAS, develop a sampling plan, and sample any potential PFAS contributors.
  - Testing drinking water supplies
  - Testing surface waters and identifying sources
  - Identifying/resting metal plating and finishing sites with WWTP lagoons
Fingerprinting for Source Identification: Landfill Studies

PFAS Treatment Technologies - Soil
- Excavation & Disposal
  - Expensive
  - PFAS are re-located, but not destroyed
  - Add to the landfill accumulation of PFAS and associated fate/transports
  - Not sustainable

In-situ
- Expensive
- Limited by regulations in some states
- Need better understanding of destruction mechanisms and end products

Additives/Binding
- In-situ mixing
- High dosage due to co-contaminant remediation
- pH-sensitive

Fingerprinting for Source Identification: Landfill Studies

PFAS Treatment Technologies - Water
- Ex-Situ
  - Activated Carbon
    - Regeneration feasible
    - Less effective for shorter chain PFAS
    - Competitive adsorption from contaminants and organic carbon
  - Reverse Osmosis
    - Pretreatment
    - Reject water disposal/processing
  - Ion Exchange Resins
    - In development (Purilite)
    - Regeneration brine disposal issues
  - Surface Active Foam Fractionation
    - Australian technology
    - Takes advantage of PFAS tendency to fractionate in bubbles

In-Situ
- Liquid Activated Carbon
  - In development (Plumastop®, PFCCare)
  - Competitive adsorption
  - More sites/case studies needed

PFAS Treatment Technologies – Water

Surface Active Foam Fractionation (SAFF)
- PFAS are surfactants
- Under static conditions PFAS may loosely associate on the water surface and partition between the air/water interface
- This can also happen within introduced bubbles (foaming at high concentrations)
- PFAS properties confound traditional remediation methods, but also offer opportunities

Recent limited release using second-generation AFF (PFOA and PFHxS-based)
1990 fire extinguished with AFF (older, PFOS-based)

AffFC Fingerprinting of Surface Water/Groundwater Airport Site in the US Northeast Assessing Source of Reservoir Impacts

Release in five carpet reactors was primarily due to 53: FTCA and PFHxS
Release in clothing reactors was largely due to PFOA

Aside: Results demonstrate that carpet and clothing are likely sources of PFAS in landfill leachate.

Aside: PFAS released over 600 kg (over 1,300 pounds) estimated for 2013
Surface Active Foam Fractionation (SAFF)
- Australian technology
- Takes advantage of PFAS tendency to fractionate in bubbles
- Air is introduced into the column of PFAS contaminated water through a diffuser
- Bubble column rises to produce a contaminant rich foam on the surface
- Foam fraction is readily separated/extracted

Ineffective, Inefficient, or Under-Study In-Situ Technologies
- Soil vapor extraction (PFAS highly soluble)
- Air sparging (PFAS highly soluble)
- Bioremediation / MNA (largely untested to date; concerns about precursors)
- Oxidation (study at UC Berkeley now going into field; low pH, high temperatures; concerns about precursors)
- Others (pending ITRC guidance)