United States
Environmental Protection
Agency

Discuss Potential Approaches to the Sixth Unregulated Contaminant Monitoring Rule (UCMR 6)

Held April 17 and 18, 2024 USEPA, Office of Ground Water and Drinking Water

Office of Water (MLK 140) EPA 815-A-24-001 April 2024

Discuss Potential Approaches to the Sixth Unregulated Contaminant Monitoring Rule (UCMR 6)

Pre-Proposal Public Webinar
April 17 and 18, 2024

U.S. EPA

Office of Ground Water and Drinking Water,
Standards and Risk Management Division,
Unregulated Contaminant Monitoring Branch

Welcome

Eric Burneson, Director
U.S. EPA
Office of Ground Water and Drinking Water
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Logistics and General Meeting Information

Melissa Simic
U.S. EPA
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Standards and Risk Management Division
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Webinar Tips

- Webinar Slides
  - Located under “Handouts” in the right navigation bar on your screen
    - Slides were also emailed to all registered participants
  - Contain all content that will be discussed
- Webinar Audio
  - Webinar lines are muted to minimize background noise (listen-only mode)
- Webinar Support
  - Send email to UCMRWebinar@cadmusgroup.com
    - *e.g.*, “I can hear you speaking, but I cannot see the slides.”

Questions Specific to this Presentation

- Click on “?” in the upper part of the control panel (Figure 1) to submit questions or comments
  - Type a question in the box, click send (Figure 2)
- Submit your questions throughout the webinar
  - Questions will be answered on an individual basis throughout the presentation
  - Common and clarifying questions will be shared with the group or discussed after the breaks

Figure 1

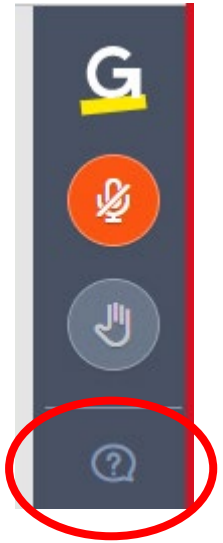
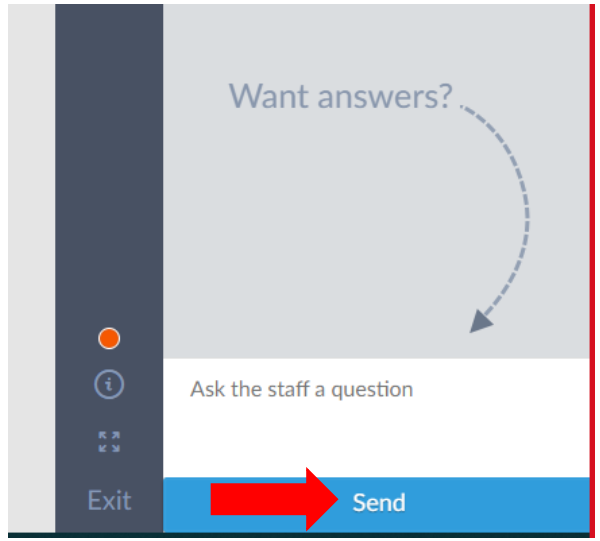


Figure 2



General Meeting Information

- Purpose
  - Provide an opportunity for the public to learn and discuss potential approaches to developing the proposal for the sixth Unregulated Contaminant Monitoring Rule (UCMR 6):
    - Analytical methods and contaminants being considered
    - Sampling design
    - Laboratory approval
    - Other possible requirements

Agenda

APRIL 17 & 18, 2024	TOPICS
11:00 a.m.	Sign-in
	Welcome
	Logistics and General Meeting Information
	Overview of the SDWA Regulatory Process and UCMR
	UCMR 6 Potential Approaches
	UCMR 6 Anticipated Public Engagement
~12:15 p.m.	Break
	General Guidelines Used in the U.S. EPA Drinking Water Method Development and Application
	Anticipated Process for Approval of Laboratories Supporting UCMR 6
	UCMR 6 Candidate Prioritization and Rationale
~1:45 p.m.	Break
~2:00 p.m.	Open Forum and Discussion
	Closing Remarks/Adjourn

Open Discussion

- Participants that registered to make a public statement will present first
- Participants that would like to make a public statement the day of the presentation
  - Click on “?” in the upper part of the control panel (Figure 1) and request to speak at the end of the discussion
    - Include your full name and email address
  - Submit your request by the first break
  - You will receive a presenter/panelist email link by the second break
  - At the second break, please close the webinar and rejoin the webinar with the new link

Figure 1

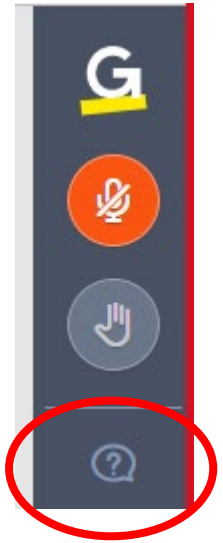
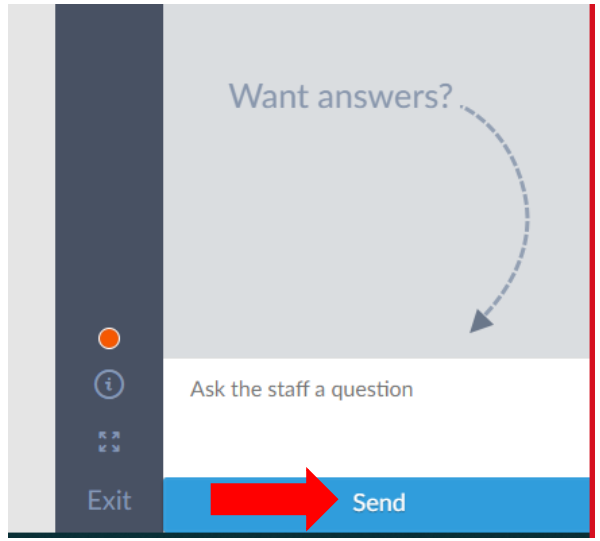


Figure 2



Overview of the Safe Drinking Water Act (SDWA) Regulatory Process and UCMR

Brenda Bowden
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Standards and Risk Management Division
Unregulated Contaminant Monitoring Branch

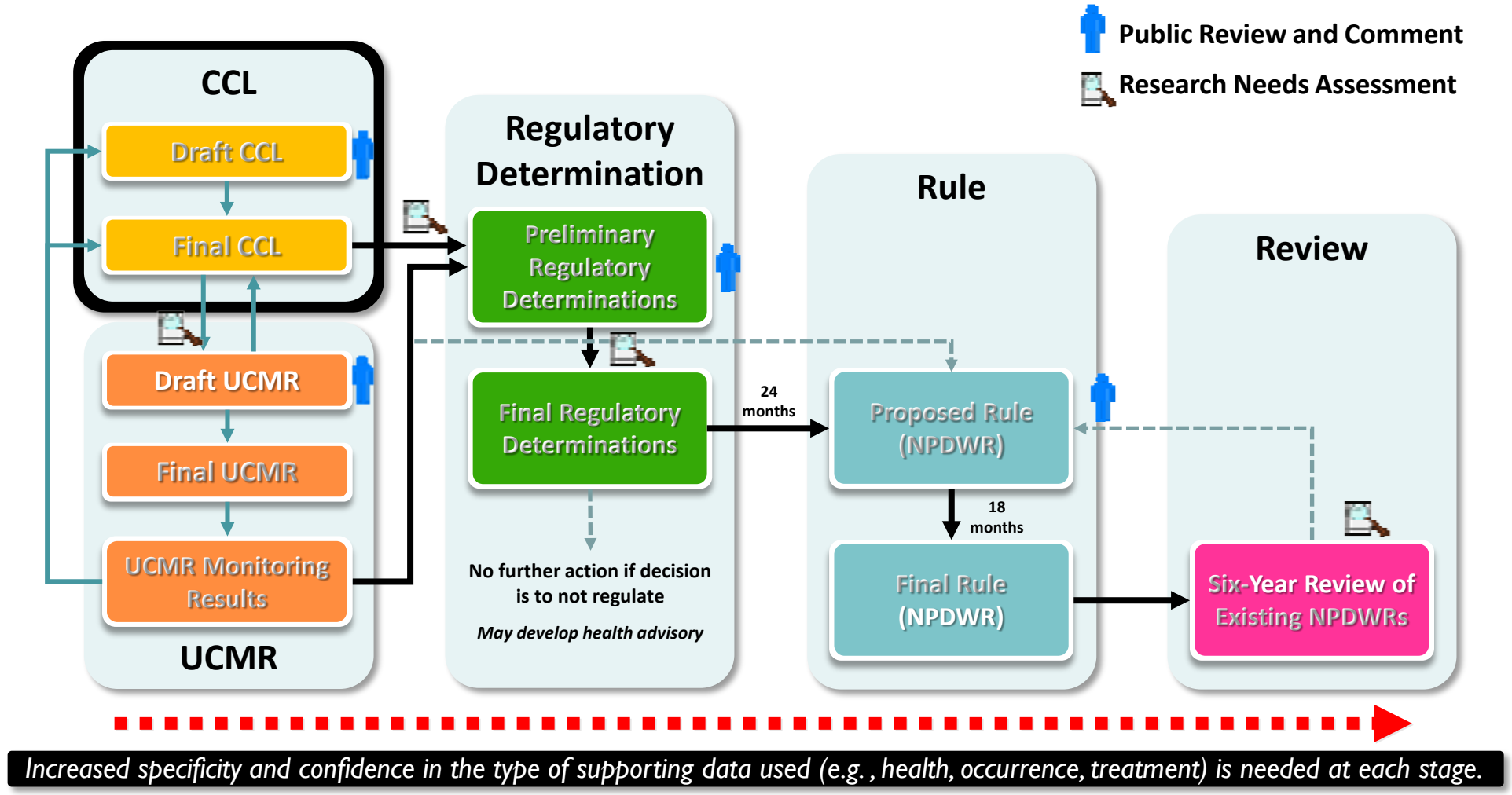
Overview

- Regulatory background for UCMR and relationship to other Safe Drinking Water Act (SDWA) programs
    - Contaminant Candidate List (CCL)
    - Unregulated Contaminant Monitoring Rule (UCMR)
        - UCMR objective
        - History and general process of UCMR
    - Regulatory Determination
    - National Primary Drinking Water Regulations (NPDWRs)
    - Six-Year Review

Safe Drinking Water Act (SDWA)

- Enacted in 1974, SDWA authorized the U.S. Environmental Protection Agency (EPA) to set enforceable health standards for contaminants in drinking water
  - National Primary Drinking Water Regulations (NPDWRs)
- 1986 SDWA amendments were the basis for the original “UCM” program
  - State drinking water programs managed the original UCM program
- 1996 SDWA amendments changed the process of developing and reviewing NPDWRs
  - CCL
  - UCMR (EPA-managed implementation)
  - Regulatory Determination
  - Six-Year Review

General Flow of SDWA Regulatory Processes

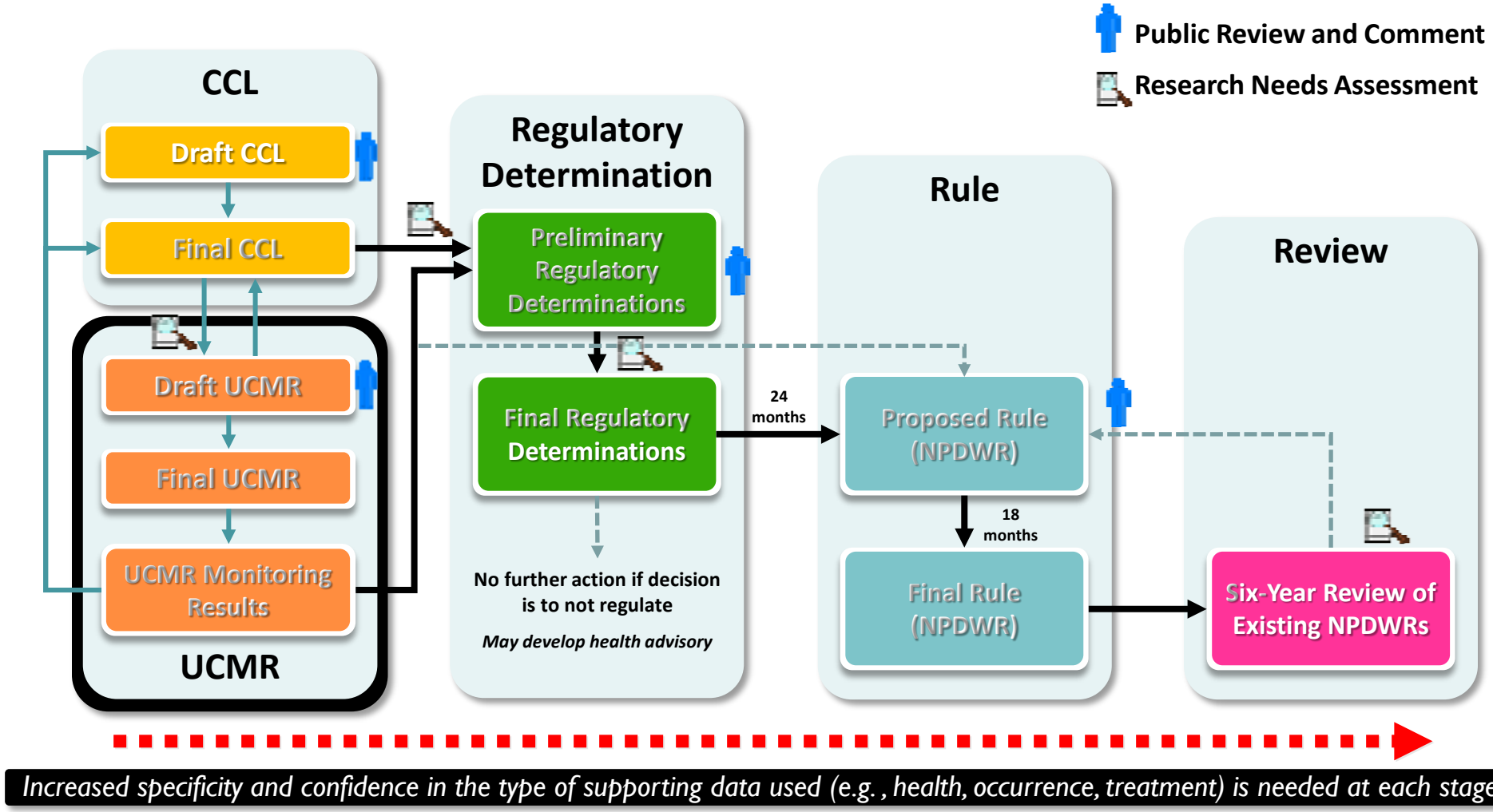


Contaminant Candidate List (CCL)

- SDWA 1412(b)(1)(B) requires the EPA to establish a list of contaminants that are:
  - Not subject to any proposed or promulgated NPDWR
  - Known or anticipated to occur in PWSs
  - May require regulation under SDWA
- List must be published every five years

The Final CCL 5 was published November 14, 2022 and includes 66 chemicals, three chemical groups, and 12 microbial contaminants

General Flow of SDWA Regulatory Processes



Unregulated Contaminant Monitoring Rule (UCMR)

- SDWA Section 1445(a)(2), establishes the requirements of the UCMR Program:
  - Issue a list of no more than 30 priority unregulated contaminants in drinking water, once every five years
  - Require large PWSs serving a population more than 10,000 people to monitor
  - Require small PWSs serving between 3,300 and 10,000 to monitor; ensure that only a nationally representative sample of small PWSs serving fewer than 3,300 people monitor
    - Limitations: subject to the availability of appropriations and sufficient laboratory capacity to accommodate the analysis
  - Make analytical results publicly available in the National Contaminant Occurrence Database for drinking water (NCOD)
  - The EPA funds shipping and analytical costs for small PWSs serving 10,000 or fewer
- The EPA manages the program in partnership with states, Tribes, and Territories (hereafter referred to as “states”) that volunteer to assist

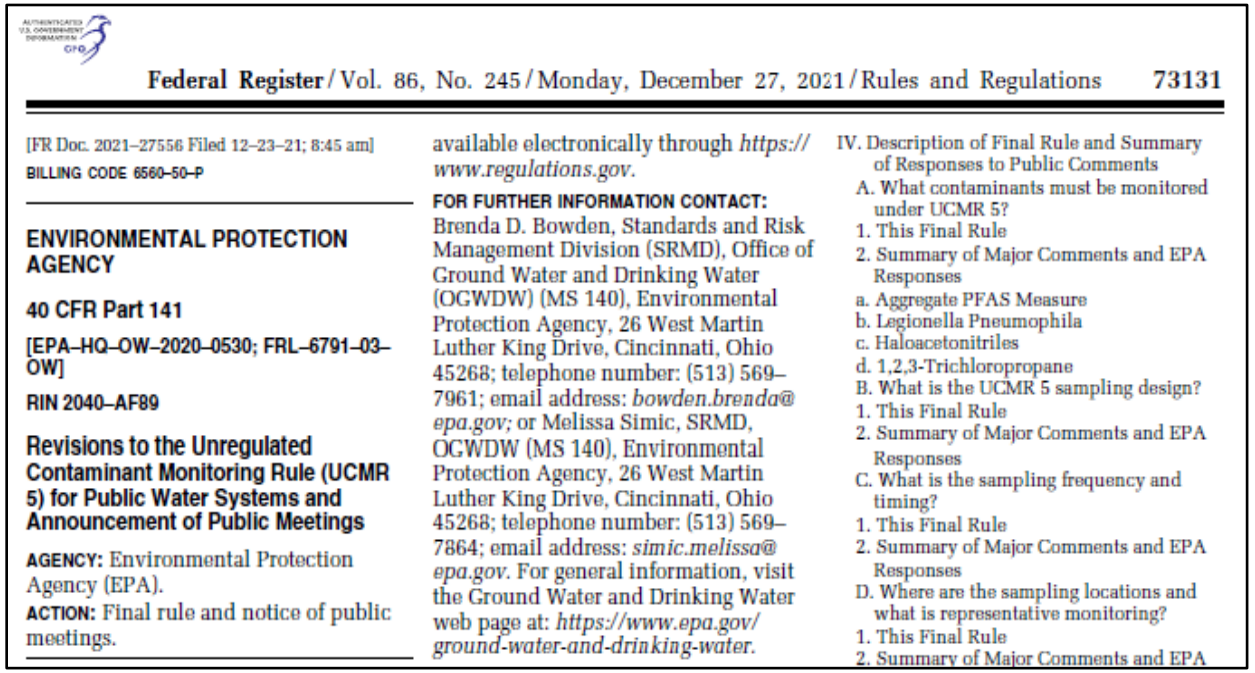
Objective of the UCMR Program

- Collect nationally representative drinking water occurrence data for unregulated contaminants that may warrant regulation under SDWA
  - Consider data collected as part of future EPA decisions on actions to protect public health
  - Provide data to states, local governments, and to the public for their use in decisions regarding public health protection

National occurrence data publicly available:
https://www.epa.gov/dwucmr/occurrence-data-unregulated-contaminant-monitoring-rule

History of UCMR

- UCMR 1 (2001-2005)
- UCMR 2 (2007-2011)
- UCMR 3 (2012-2016)
- UCMR 4 (2017-2021)
- UCMR 5 (2022-2026)
  - PWSs collect samples 2023-2025
- UCMR 6 (2027-2031)
  - Anticipating proposal mid-late 2025 and final rule late 2026
  - Anticipating sample collection 2028-2030



Federal Register / Vol. 86, No. 245 / Monday, December 27, 2021 / Rules and Regulations 73131

[FR Doc. 2021–27556 Filed 12–23–21; 8:45 am]

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ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 141

[EPA–HQ–OW–2020–0530; FRL–6791–03–OW]

RIN 2040–AF89

Revisions to the Unregulated Contaminant Monitoring Rule (UCMR 5) for Public Water Systems and Announcement of Public Meetings

AGENCY: Environmental Protection Agency (EPA).

ACTION: Final rule and notice of public meetings.

available electronically through *https://www.regulations.gov*.

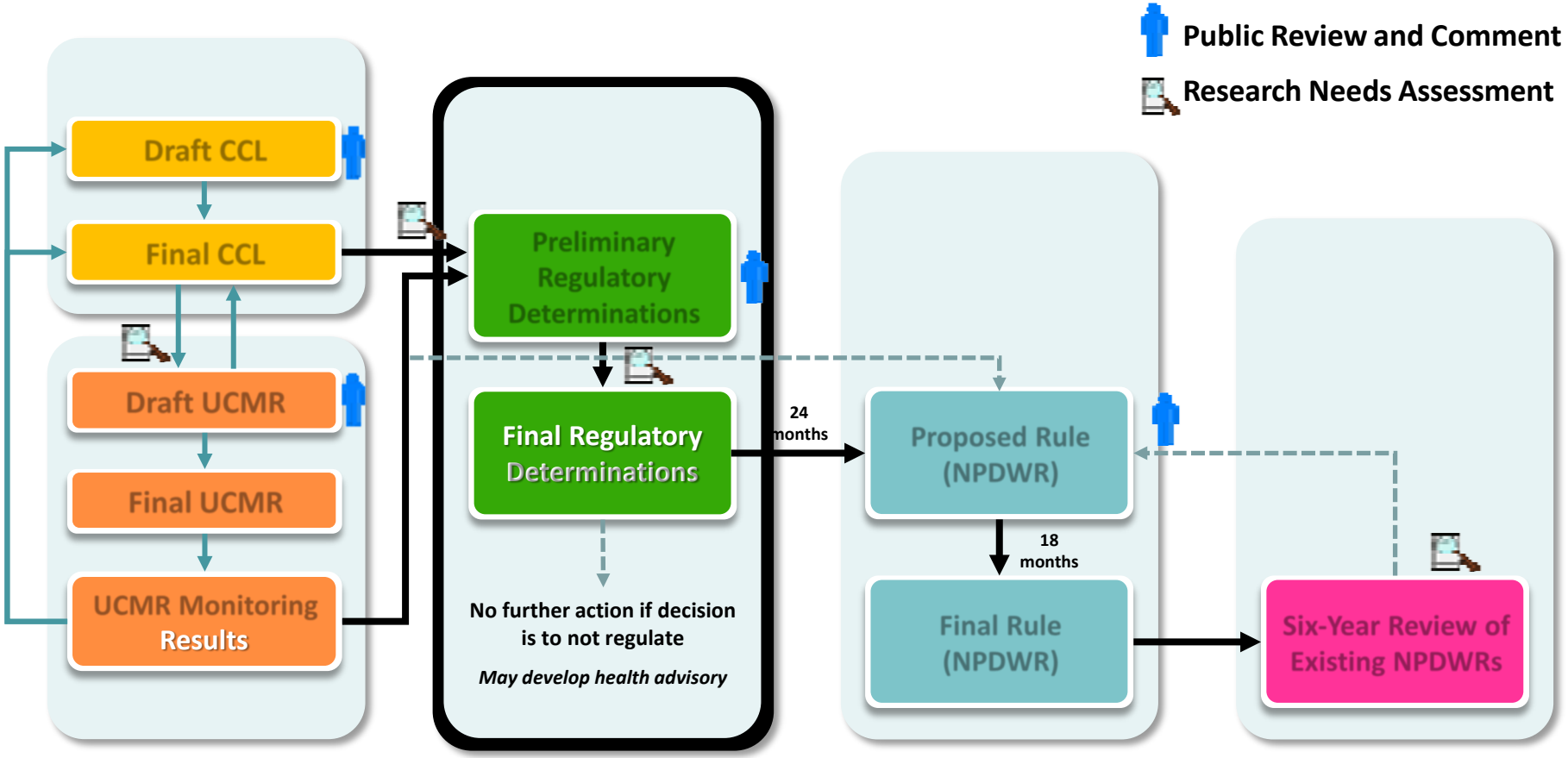
FOR FURTHER INFORMATION CONTACT: Brenda D. Bowden, Standards and Risk Management Division (SRMD), Office of Ground Water and Drinking Water (OGWDW) (MS 140), Environmental Protection Agency, 26 West Martin Luther King Drive, Cincinnati, Ohio 45268; telephone number: (513) 569–7961; email address: *bowden.brenda@epa.gov;* or Melissa Simic, SRMD, OGWDW (MS 140), Environmental Protection Agency, 26 West Martin Luther King Drive, Cincinnati, Ohio 45268; telephone number: (513) 569–7864; email address: *simic.melissa@epa.gov*. For general information, visit the Ground Water and Drinking Water web page at: *https://www.epa.gov/ground-water-and-drinking-water*.

Each new UCMR cycle is established via a revision to the rule for the ongoing/preceding cycle

General Process for Developing UCMR

- Early public meetings
  - Provide background on statutory requirements
  - Discuss current/prospective method availability for emerging contaminants
  - Discuss anticipated elements of the proposal
- Develop proposed rule and publish in the *Federal Register* (FR)
  - The agency typically provides a 60-day public comment period
  - Public meeting during public comment period
- Develop final rule and publish in the FR
- Public meetings after final rule publication to prepare for implementation

General Flow of SDWA Regulatory Processes



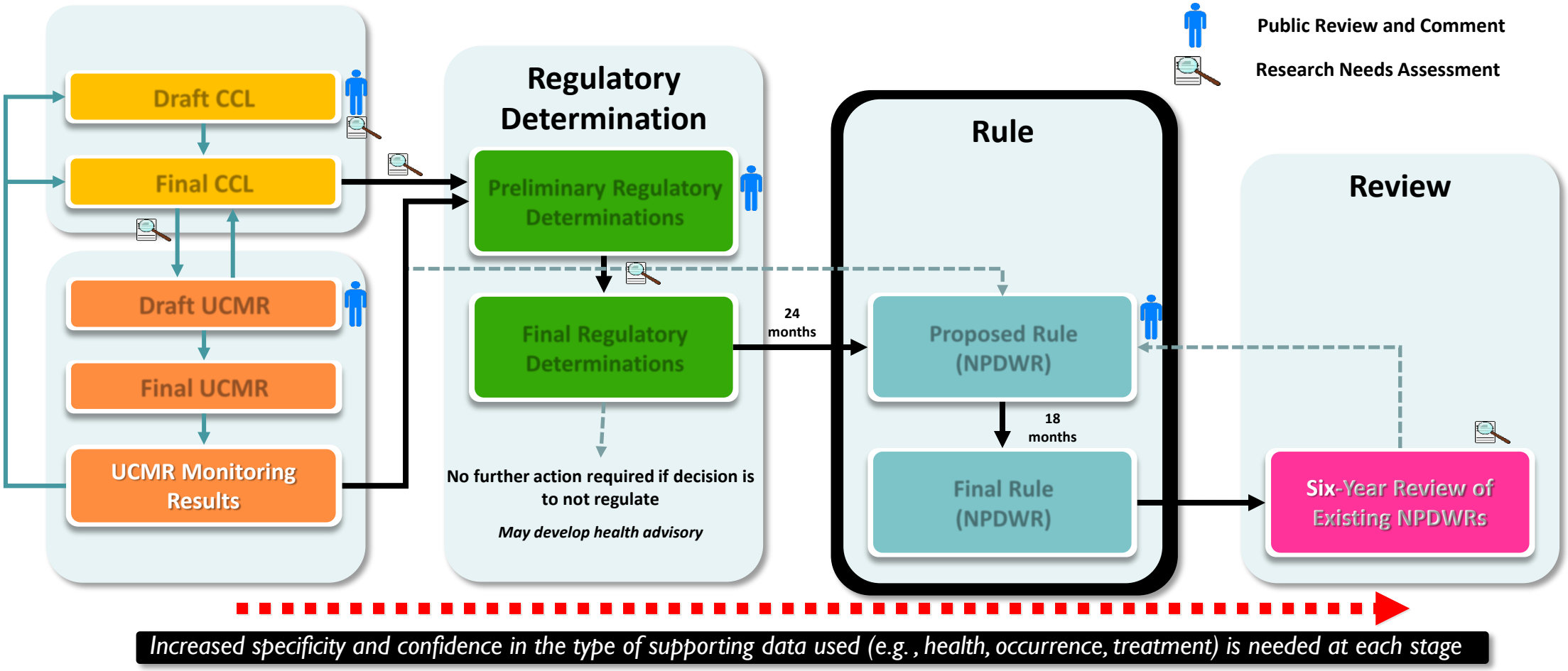
Increased specificity and confidence in the type of supporting data used (e.g., health, occurrence, treatment) is needed at each stage.

Regulatory Determinations

- Every five years, the Administrator shall, after notice of the preliminary determination and opportunity for public comment, for not fewer than five contaminants included on the CCL, make determinations on whether to regulate such contaminants.
- SDWA* requires the EPA to publish a maximum contaminant level goal (MCLG) and promulgate a NPDWR for a contaminant if the Administrator determines that:
  1. The contaminant may have an **adverse effect** on the health of persons;
  2. The contaminant is **known to occur or there is substantial likelihood** that the contaminant will occur in public water systems with a frequency and at levels of public health concern; **and**
  3. In the sole judgment of the Administrator, regulation of such contaminant presents a meaningful opportunity for health risk reduction for persons served by public water systems.

**SDWA Section 1412(b)(1)*

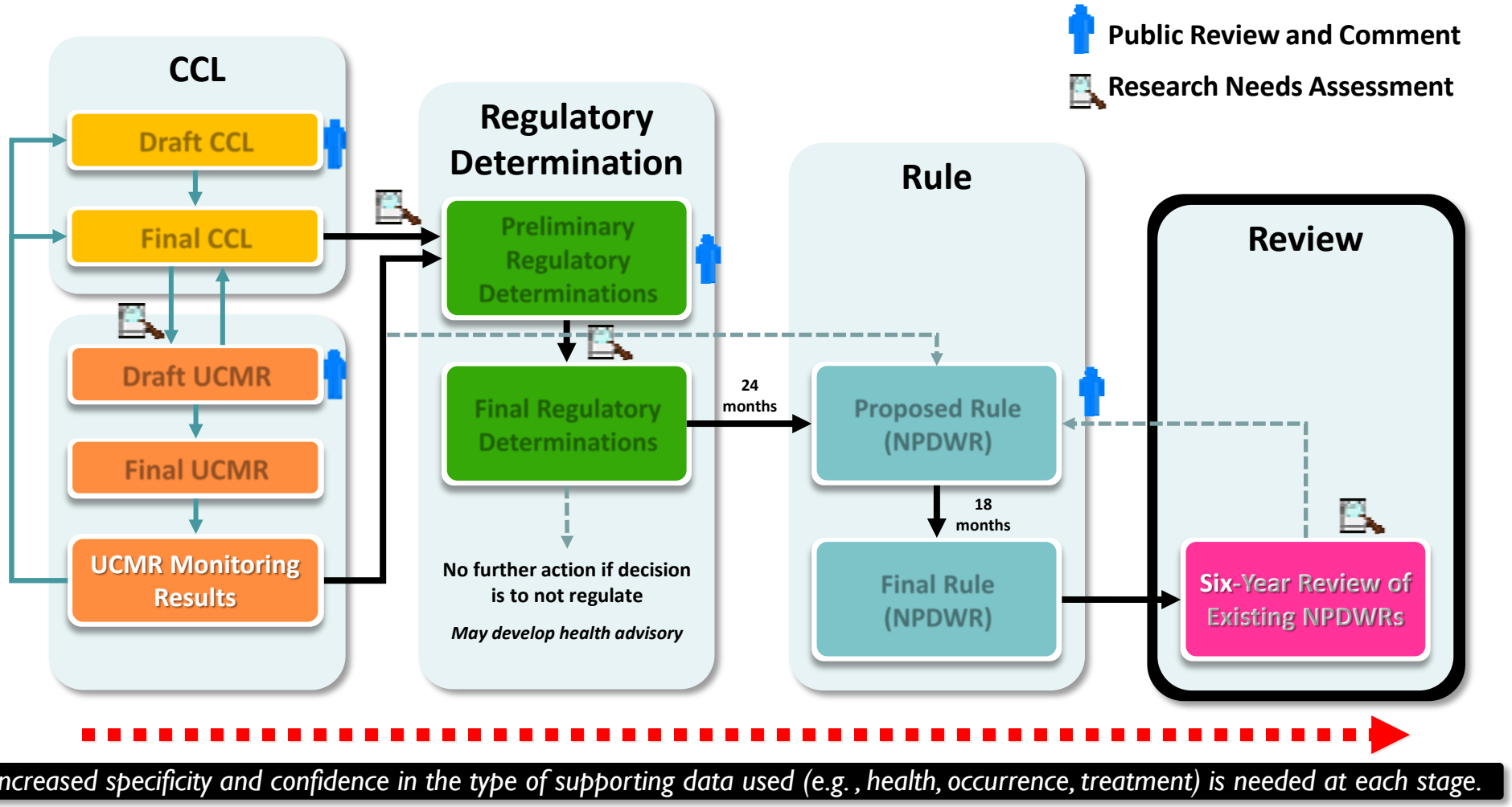
General Flow of SDWA Regulatory Processes



National Primary Drinking Water Regulations (NPDWRs)

- For each contaminant that the Administrator decides to regulate, the Administrator shall publish MCLGs and promulgate, by rule, NPDWRs. The Administrator shall:
  - Propose the MCLG and NPDWRs for a contaminant no later than 24 months after the determination to regulate
  - Publish an MCLG and promulgate a NPDWR within 18 months after the proposal thereof
- A NPDWR shall take effect three years after the date on which the regulation is promulgated. The Administrator, or a state, may allow this period to be extended up to two additional years if it determines that additional time is necessary for capital improvements

General Flow of SDWA Regulatory Processes



Six-Year Review

- SDWA Section 1412(b)(9) requires review and revision, as appropriate, of each NPDWR no less often than every six years. The review includes:
  - Re-evaluation of health effects, occurrence, exposure, drinking water analytical methods, treatment feasibility, risk-balancing, and implementation issues
- Any revision of a NPDWR shall maintain, or provide for greater, protection of the health of people

UCMR 6 Potential Approaches

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Unregulated Contaminant Monitoring Branch

Overview

- Timeline
- PWS types
- Sampling design considerations
- Approach to tiered monitoring
  - Assessment Monitoring (AM)
  - Screening Survey (SS)
  - Pre-Screen Testing (PST)
- Applicability
- Sampling frequency and locations
- Implementation roles
  - EPA
  - States
  - Small PWSs
  - Large PWSs
- Potential changes between UCMR 5 and UCMR 6

Draft Timeline of UCMR 6 Development

2024	2025	2026
UCMR 6 Development		**Publish Final Rule**
Method Development *Federal Register* Notice (**February 8, 2024**) Pre-Proposal Meeting **(April 17 & 18, 2024)**	Publish Proposal, 60-day Public Comment Period, Public Meeting **(Mid-Late 2025)**	Publish UCMR 6 Final Rule **(Late 2026)**
	Post Proposal: Initiate Implementation • Lab Approval • PWS Safe Drinking Water Accession and Review System (SDWARS) registration/notification/Inventory • Partnership Agreements (PAs), State Monitoring Plans (SMPs), Small System Inventory (SSI), Large System Inventory (LSI) • Ground Water Representative Monitoring Plan (GWRMP) submittal • Outreach/trainings	

Draft Timeline of UCMR 6 Activities

2027	2028	2029	2030	2031
Pre-monitoring Implementation	← **Monitoring** →			**Post-monitoring Phase**
Continuation of: • Lab Approval • PWS SDWARS registration/notification/Inventory • PAs, SMPs, SSIs, LSIs • GWRMP submittal[1] • Outreach/trainings • Implementation public meetings	**Implementation Activities** • Assist PWSs with compliance • Implement small PWS monitoring • Post data quarterly to NCOD **Reporting and Analysis of Data** • All PWSs serving 3,300 or more people[2] • Representative sample of small PWSs serving fewer than 3,300 people			• Complete resampling, as needed • Conclude data reporting • Finalize NCOD • Compliance assistance/ enforcement, as needed

[1] GWRMP submissions are due six months prior to PWS scheduled monitoring date and could therefore occur during the UCMR 6 monitoring years.
[2] Monitoring by all PWSs serving between 3,300 and 10,000 people is subject to availability of appropriations and laboratory capacity.

UCMR Applicability by PWS Type

- **Public Water System (PWS)**: provides water for human consumption through pipes or other constructed conveyances to at least 15 service connections or serves an average of at least 25 people for at least 60 days a year
  - **Community Water System (CWS):** PWS that supplies water to the same population year-round
  - **Non-Transient Non-Community Water System (NTNCWS):** PWS that supplies water to at least 25 of the same people at least six months per year but not year-round (*e.g.*, schools)
  - **Transient Non-Community Water System (TNCWS)** (not generally included in UCMR sampling): PWS that provides water where people do not remain for long periods of time (*e.g.*, gas stations, campgrounds)

Selection of Nationally Representative PWSs

- Statistically-based sampling design has been vetted with stakeholders and peer-reviewed
- Data Quality Objectives for the representative sample of PWSs
  - Provides occurrence data for unbiased national exposure estimates
  - The statistical design:
    - Stratifies by PWS size and source water type
    - Allocates PWSs across the strata proportional to population served with at least two PWSs allocated to each state

For additional information see the "Selection of Nationally Representative Public Water Systems for the Unregulated Contaminant Monitoring Rule: 2021 Update:"
https://www.regulations.gov/document/EPA-HQ-OW-2020-0530-0127

UCMR Approach

- UCMR approach relies on using one or more of 3 monitoring tiers
  - Assessment Monitoring (primary approach to-date, used in UCMR 1 through UCMR 5)
  - Screening Survey (used in UCMR 1, UCMR 2, UCMR 3 for a subset of contaminants)
  - Pre-Screen Testing (used in UCMR 3 for the viruses)
- Based on:
  - Availability and complexity of drinking water analytical methods
  - Laboratory capacity
  - Sampling frequency
  - Relevant PWSs based on contaminant (*e.g.*, PWS type, source water type)
  - Other considerations (*e.g.*, cost/burden)

Assessment Monitoring: Statistical Approach

- Primary approach – presuming availability of appropriations and lab capacity, America's Water Infrastructure Act of 2018 (AWIA) expands participating PWSs to include:
  - Nationally representative sample of 800 small PWSs serving fewer than 3,300 people
  - Census of small PWSs serving between 3,300 and 10,000 people
  - Census of large PWSs serving more than 10,000 people
- Nationally-representative sample of small PWSs plus census of PWSs serving 3,300 or more people provides a powerful tool for assessing national contaminant occurrence in drinking water
- **Total number of PWSs included in UCMR 5: ~10,300**

Screening Survey: Statistical Approach

- Designed to ensure the data can be used to support regulatory decisions
- Account for possible laboratory capacity limitations
- Approach used in UCMR 2 and 3 involved:
  - Nationally representative sample of 800, allocated across PWSs serving 100,000 or fewer people
  - Census of all PWSs serving more than 100,000 (~450 PWSs)
- **Total number of PWSs: ~1,250**

Pre-Screen Testing

- Envisioned for use with methods that are in the early stages of development, and/or very specialized (*e.g.*, viruses)
- May be conducted by limited number of PWSs identified as vulnerable (by the EPA and/or state agencies), as was done with UCMR 3 virus monitoring
- Approach can be customized to meet specific monitoring objectives of a particular UCMR cycle
- Sampling design is not necessarily population weighted

Typical UCMR Applicability

	PWS Type	PWSs Serving > 10,000 people	PWSs Serving 3,300 – 10,000 people	PWSs Serving <3,300 people
Assessment Monitoring	CWS[1] & NTNCWS[2]	All PWSs (~4,400)	All PWSs (~5,200) (~400 non-AWIA)[3]	800 randomly selected PWSs (~400 non-AWIA)[3]
Screening Survey	CWS & NTNCWS	All PWSs (~450) serving more than 100,000, and 320 randomly selected PWSs serving 10,001 to 100,000	480 randomly selected PWSs	
Pre-Screen Testing	May be conducted by a limited number of PWSs			

[1] Community Water System.

[2] Non-Transient Non-Community Water System.

[3] Assessment Monitoring will convert to the non-AWIA design (*i.e.*, nationally representative sample of 800 small PWSs serving 10,000 or fewer people) if the appropriations (additional $15,000,000 in each fiscal year for which monitoring is required to be carried out) are not received, or sufficient laboratory capacity is not available.

Small PWS Notifications about Participation

- The EPA expects to have funding available to support monitoring at the representative national sample of 800 PWSs serving 10,000 or fewer people and will notify selected PWSs
- The EPA's ability to support monitoring at the census of small PWSs serving between 3,300 and 10,000 people depends on additional appropriations. The EPA anticipates that these PWSs will participate in UCMR 6, but will confirm approximately 6 months prior to their scheduled sampling

UCMR Sampling Frequency

- UCMR 1 through UCMR 5 used similar sampling frequency
  - **Surface Water (SW)** – PWSs with surface water sources (including those using groundwater under the direct influence of surface water) sampled four times during their year of monitoring
  - **Ground Water (GW)** – PWSs with ground water sources sampled two times during their year of monitoring
  - Specialized sampling frequency was used for focused sample designs (*e.g.*, eight sample events for cyanotoxins in UCMR 4)

UCMR Sampling Locations

- Typical Sampling locations:
  - Contaminants are generally sampled at the entry points to the PWS's distribution systems (EPTDSs)
  - Disinfection byproducts and microbial contaminants are generally sampled at Disinfectants and Disinfection Byproducts Rules (D/DBPR) distribution system (DS) locations or at the at the distribution system maximum residence time (DSMRT) location
  - Sampling exceptions may be made based on particular contaminants

EPA Implementation Roles

(slide 1 of 2)

- Small PWS support:
  - Maintain laboratory and implementation contracts to support UCMR
  - Compile contact and inventory information
  - Manage sample kit distribution and tracking
- Large and Small PWS support:
  - Download data (via SDWARS) and review prior to reporting to NCOD
  - Support the SDWARS reporting system and users
  - Update PWS inventory and schedules as needed
  - Provide technical assistance
  - Use SDWARS for real-time communication and outreach

EPA Implementation Roles

(slide 2 of 2)

- State, PWS, and Laboratory support:
  - Review and track rule applicability and PWS sampling progress
  - Manage Laboratory Approval Program
  - Provide technical support
  - Coordinate outreach
  - Lead compliance assistance and enforcement

Extended UCMR Implementation Team

- EPA Office of Ground Water and Drinking Water (OGWDW)
  - Lead organization for direct-implementation of rule
- EPA Regional Offices
  - Coordinate state Partnership Agreements
  - Assist states and PWSs with UCMR requirements, compliance assistance, and enforcement
- Partnering states
  - Support various aspects of implementation based on state-specific interest

States' Role in the UCMR Program

- Participation by states is voluntary and documented via Partnership Agreements
- States help the EPA implement the UCMR program and ensure high data quality
- Partnership Agreement activities can include any or all of the following:
  - Review and revise State Monitoring Plans
  - Provide inventory and contact information for small and large PWSs
  - Review proposed Ground Water Representative Monitoring Plans (GWRMPs)
  - Provide compliance assistance (*e.g.*, notify and instruct systems)
  - Collect samples
  - Other

EPA Responsibilities on behalf of Small PWSs

- The EPA pays for sample analyses and shipping for PWSs serving 10,000 or fewer people
  - The EPA coordinates with the UCMR implementation contractor to send sampling kits to PWSs
  - The EPA coordinates sample analyses with contracted laboratories
- Both the EPA and the UCMR implementation contractor engage states and PWSs to ensure samples are collected per the designated schedule
- The EPA examines the results along with quality control (QC) data and makes results available to the respective state and PWS via SDWARS

Small PWS Responsibilities

- Register for a SDWARS account and complete pre-sampling requirements (*e.g.*, sign notification letter, inventory, physical shipping address, additional data elements)
- Collect and ship samples according to the monitoring schedule in SDWARS using the sampling kits, pre-paid shipping label, and materials provided by EPA
- Small PWSs and states have access to results in SDWARS following EPA review of the data posted by the laboratory

Large PWS Responsibilities

- PWSs serving more than 10,000 people arrange and pay for sample analyses and shipping
  - PWS coordinates with an EPA-approved UCMR 6 laboratory
- Register for a SDWARS account and complete pre-sampling requirements (*e.g.*, sign notification letter, inventory, additional data elements)
- Laboratories post the data to SDWARS
- PWS reviews and can act upon (*e.g.*, approve) data in SDWARS
- States have access to results following large PWS review period

Potential Change Between UCMR 5 and UCMR 6 Proposal

- The agency anticipates maintaining the approach to rule applicability, reporting timeframes for laboratories and PWSs, and Ground Water Representative Monitoring Plan (GRWMP) flexibility
- Potential/anticipated revisions (typical of each cycle)
  - Revised list of contaminants and associated methods
  - Sampling design considerations
  - Sampling frequency and locations based on contaminants selected

UCMR 6 Anticipated Public Engagement

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Unregulated Contaminant Monitoring Branch

UCMR 6 Anticipated Public Engagement Overview

- Pre-proposal engagement
  - Method development update and request for comment
  - Public webinar
  - Tribal Consultation
  - State Consultation
  - Environmental Justice (EJ) considerations
- Post-proposal public engagement
  - Public comment period
  - Public webinar
- Post-final public engagement
  - Outreach, public webinars and trainings

Pre-proposal: Method Development Update and Request for Comment

- Published *Federal Register* Notice (FRN)
  - February 8, 2024 (89 FR 8584)
  - Outlined drinking water analytical methods for contaminants on the CCL 5 and other emerging contaminants with an expectation that some of these methods may support UCMR 6 and/or other future cycles of the UCMR program
  - Requested comments on the drinking water analytical methods summarized in the FRN
  - Announced the UCMR 6 pre-proposal webinar

Pre-Proposal: Public Webinar

- April 17 and 18, 2024 (identical meetings)
  - Provides background on statutory requirements
  - Summarizes method development for emerging contaminants
  - Discusses approaches to UCMR 6 development
- Includes time for brief remarks by participants
- Slides will be uploaded onto the UCMR webpage
  - https://www.epa.gov/dwucmr/unregulated-contaminant-monitoring-rule-ucmr-meetings-and-materials

Pre-Proposal: Tribal Consultation

- Executive Order (EO) 13175
- Consultation period: March 10 to June 20, 2024
  - The EPA holds an informational webinar to discuss UCMR 6 development and requests comments by Tribal government representatives
    - May 20, 2024, 2:30 p.m. – 4:00 p.m., Eastern Time
    - Information on the webinar and submitting comments can be found in the UCMR 6 Tribal Official Notification Letter in TCOTS
  - Tribes may submit written comments via email at any point in the consultation period
- Summary of consultation efforts will be provided in the UCMR 6 docket (Docket ID No. EPA-HQ-OW-2023-0469)

Tribal Consultation Opportunities Tracking System (TCOTS):
https://tcots.epa.gov/ords/tcotspub/f?p=106:1

Pre-Proposal: State Consultation

- The EPA will hold a meeting to discuss UCMR 6 development with state drinking water program representatives
- The EPA welcomes input on:
  - What contaminants of emerging concern are a priority in your state?
  - Are there any changes your state recommends to the UCMR monitoring approach?
- Summary of state/EPA consultation will be provided in the UCMR 6 docket (Docket ID No. EPA-HQ-OW-2023-0469)

Pre-Proposal: Environmental Justice (EJ) Considerations

- Consistent with EO 12898, the EPA is committed to considering and addressing potential EJ concerns when developing UCMR 6
- By seeking to identify unregulated contaminants that may pose health risks via drinking water from PWSs across the country, UCMR furthers the protection of public health for *all* people, regardless of race, color, national origin, or income
  - UCMR includes monitoring of a statistically derived set of small PWSs that is population-weighted within each PWS size category in each state (under this approach, Tribes (combined) and Territories (combined) are treated as equivalent to a state). This, along with the census monitoring approach for larger PWSs, ensures representation for the United States population
- For UCMR 6, the EPA anticipates collecting Zip Code(s) for customers served by each PWS, as has been done since UCMR 3, and is considering other data collection options to support future assessments of whether or not certain communities are disproportionately impacted by particular drinking water contaminants

Post-Proposal: Public Comment Period

The EPA anticipates publishing the UCMR 6 Proposal in mid/late 2025.

- The EPA typically provides a 60-day comment period

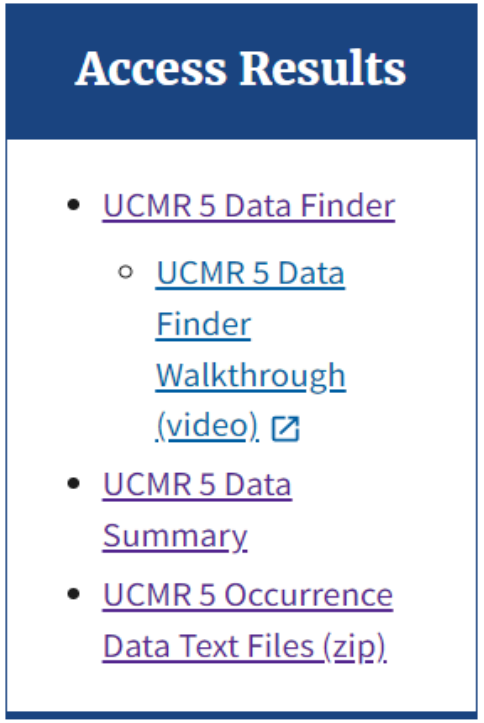
Post-Proposal: Public Webinar

- The EPA anticipates hosting a public webinar during the public comment period
  - Expected to describe the UCMR 6 proposal and how to provide public comments via the UCMR 6 docket
- Examples of past meetings materials are on the UCMR "Meetings and Materials" webpage

UCMR Meeting and Materials:
https://www.epa.gov/dwucmr/unregulated-contaminant-monitoring-rule-ucmr-meetings-and-materials

Post-Final Rule: Outreach, Webinars, and Trainings

- The EPA anticipates that it will publish the UCMR 6 Final Rule in late 2026
- The agency expects to engage in outreach to help stakeholders prepare for UCMR 6 implementation
  - Webinars between 2027-2028
    - Reviews the final rule and preparation for implementation
    - Describes the Safe Drinking Water Accession and Review System (SDWARS) and actions PWSs must take to prepare for UCMR 6 monitoring
    - Discusses accessing data and communicating results
  - Supporting documents and videos



Check out the UCMR 5 webpage for examples of current materials
https://www.epa.gov/dwucmr/fifth-unregulated-contaminant-monitoring-rule

Break

General Guidelines Used in the U.S. EPA Drinking Water Method Development and Application

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Office of Ground Water and Drinking Water
Technical Support Branch

Overview

- General drinking water method development process
- Methods development update

Drinking Water Method Attributes

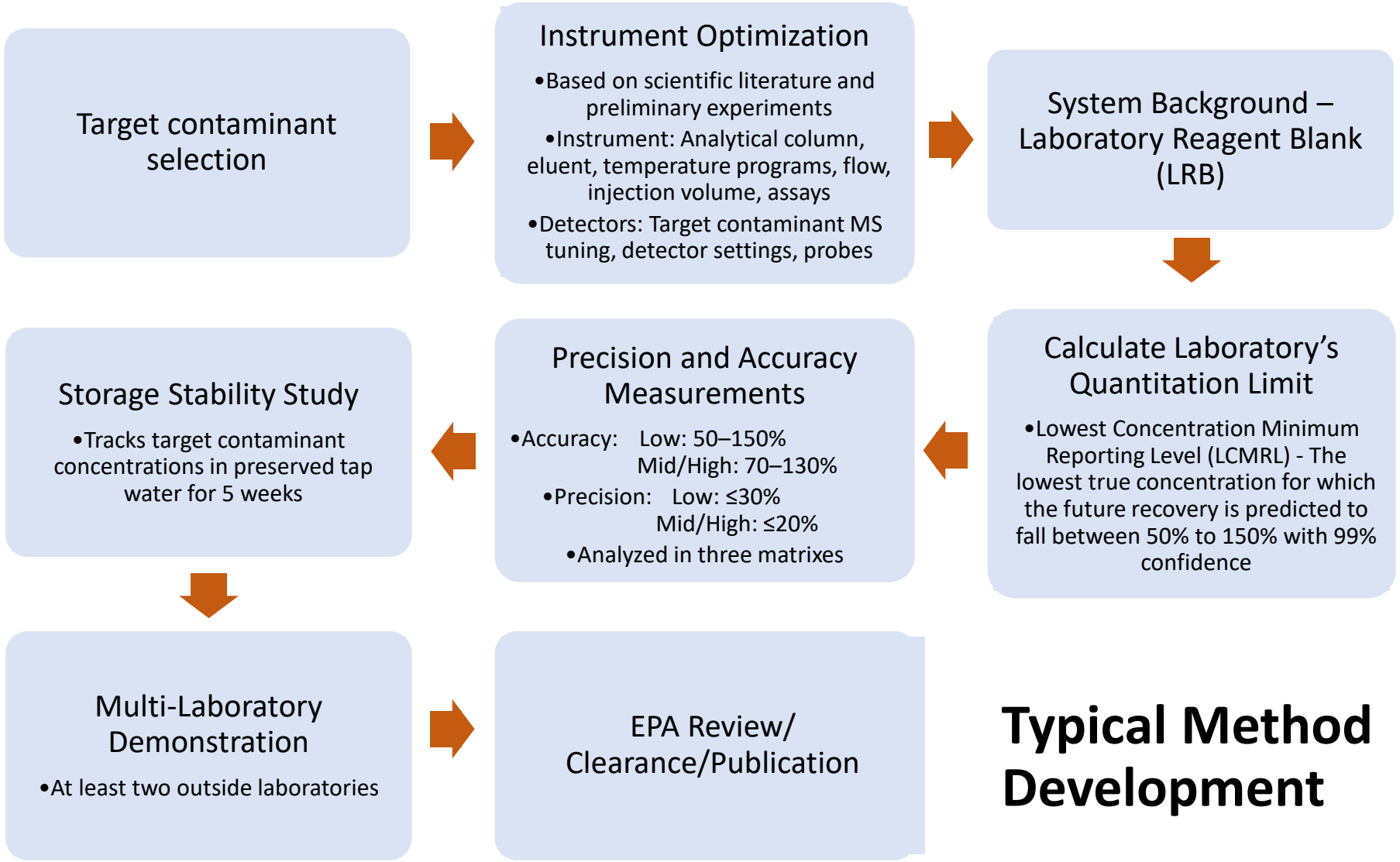
- Preservation
  - Dechlorination
  - Storage Stability/Hold Time Studies
- Quality Control
- Quantitation Levels

Method Development Considerations

- Simplicity
  - Limit complicated steps
  - Relatively non-hazardous components
  - Ease of sample collection
  - Generally-available instrumentation
- Data Quality
  - Focus on QC to ensure valid data

Laboratory Quality Control

- Initial Demonstration of Capability (IDC)
  - Demonstration of Low System Background
  - Precision and Accuracy
  - Confirmation of ability to quantify at particular concentrations
  - Quality Control Sample (QCS) from Second Source
- Ongoing QC
  - Initial Calibration
  - Continuing Calibration Check (CCC)
  - Laboratory/Field Reagent Blank (LRB/FRB)
  - Laboratory Fortified Blank (LFB)
  - Internal Standards (IS)
  - Surrogates Standards (SUR)
  - Laboratory Fortified Sample Matrix and Duplicates (LFSM, LFSMD)
  - QCS at intervals



Typical Method Development

Method Performance Data

- Evaluation of Method Performance
  - Assesses method capability
  - Demonstrates ruggedness (national implementation)
- Demonstration of Low System Background using a Laboratory Reagent Blank (LRB)
- Laboratory Quantitation Limit
  - LCMRL – the lowest true concentration, for which the future recovery is predicted to fall between 50% to 150% with 99% confidence
- Precision and Accuracy Study in At Least Three Matrixes
  - Meet percent recovery (%Rec) and percent relative standard deviation (%RSD) thresholds
- Storage Stability Study
  - 35-day study observing target contaminant loss over time
- Multi-Laboratory Validation
  - At least two additional laboratories or sites evaluate method performance

General Method Flexibility

YES

- Analytical columns
- Instrument conditions
- Detector conditions
- Other consumables where allowed

NO

- Sample preservation
- QC requirements
- Extraction procedure

- General flexibilities can be superseded by specific information described in the method text
- Following any modification, the laboratory must verify method performance by repeating IDC, verifying all QC in the method are met, and verifying method performance in a representative sample matrix

Method Development Update

- Published on February 8, 2024 (89 FR 8584)
  - Outlined drinking water analytical methods for contaminants on the CCL 5 and other emerging contaminants with an expectation that some of these methods may support UCMR 6 and/or other future cycles of the UCMR program
  - Requested comments on the drinking water analytical methods summarized in the FRN

Federal Register Notice
https://www.govinfo.gov/content/pkg/FR-2024-02-08/pdf/2024-02247.pdf

Request for Input on Methods for Emerging Contaminants

- The EPA requested information on the following on February 8, 2024 (89 FR 8584):
  - Method name and instrumentation
  - Status of the method (*e.g.*, fully-developed, nearing completion, early development)
  - Emerging contaminant(s), particularly the CCL 5 contaminants, that can be analyzed with the drinking water analytical method
  - Method performance information, such as sensitivity, selectivity, accuracy, and precision attainable for the contaminant(s)
    - Describe the degree to which the method performance has been validated
  - Cost, availability, and projected laboratory capacity
  - Citations for referenced analytical methods, including author(s), title, journal (or other publication), and date
  - Contact information for the principal investigator, when available

EPA Method Validation and Peer Review Policies and Guidelines
https://www.epa.gov/measurements-modeling/method-validation-and-peer-review-policies-and-guidelines

EPA Drinking Water Methods in Development – Outlined in FRN

(slide 1 of 2)

- Drinking water analytical methods in development to address CCL 5 contaminants
  - Draft EPA Method 562 – Determination of selected pesticides in drinking water by solid phase extraction and liquid chromatography/tandem mass spectrometry (LC/MS/MS)
  - Draft EPA Method for Purgeable Organics – Measurement of purgeable organic compounds in water by capillary column gas chromatography/mass spectrometry (GC/MS)
  - Draft EPA Method for *Legionella* – *Legionella spp.* and *Legionella pneumophila* quantitative polymerase chain reaction (qPCR) detection
  - Draft EPA Method for *Mycobacterium* – *Mycobacterium abscessus* culture recovery with matrix-assisted laser desorption/ionization mass spectrometry (MALDI-MS)
  - Draft EPA Method for *Mycobacterium* by qPCR– *Mycobacterium avium* and *Mycobacterium intracellulare* quantitative polymerase chain reaction (qPCR) detection

EPA Drinking Water Methods in Development – Outlined in FRN

(slide 2 of 2)

- Drinking water analytical methods in development to address per- and polyfluoroalkyl substances (PFAS) contaminants
  - Draft EPA Method(s) for Targeted PFAS – The agency continues to conduct research and monitor advances and techniques that may improve the ability to measure specific PFAS
  - Draft EPA EOF Method – An aggregate/“total PFAS” technique with screening potential for the determination of extractable organic fluorine (EOF) in drinking water by anion exchange solid phase extraction and combustion ion chromatography (CIC)
- Drinking water analytical methods in development to address other emerging contaminants
  - Draft EPA Method for Microplastics – Analysis of microplastics in drinking water using spectroscopic instrumentation

Methods Request *Federal Register* Notice (FRN) – Comment Summary

- The EPA's FRN published on February 8, 2024 (89 FR 8584) requested comments on methods by April 8, 2024 (though the agency continues to welcome input, including today, and will consider it as schedules permit)
- The EPA received 12 comments
- The following contaminants were addressed by commenters: (six EPA methods, eight EPA methods in development, three external stakeholder methods)
  - Chemicals – PFAS, microplastics, DBPs, 1,2,3-trichloropropane
  - Microbes – *Legionella* species, *Pseudomonas aeruginosa*, *Mycobacterium* species
  - Other public interest contaminants – (*i.e.*, hexavalent chromium, 6PPD-quinone)
- The EPA is currently reviewing comments
- A summary of the comments will be provided in the UCMR 6 docket

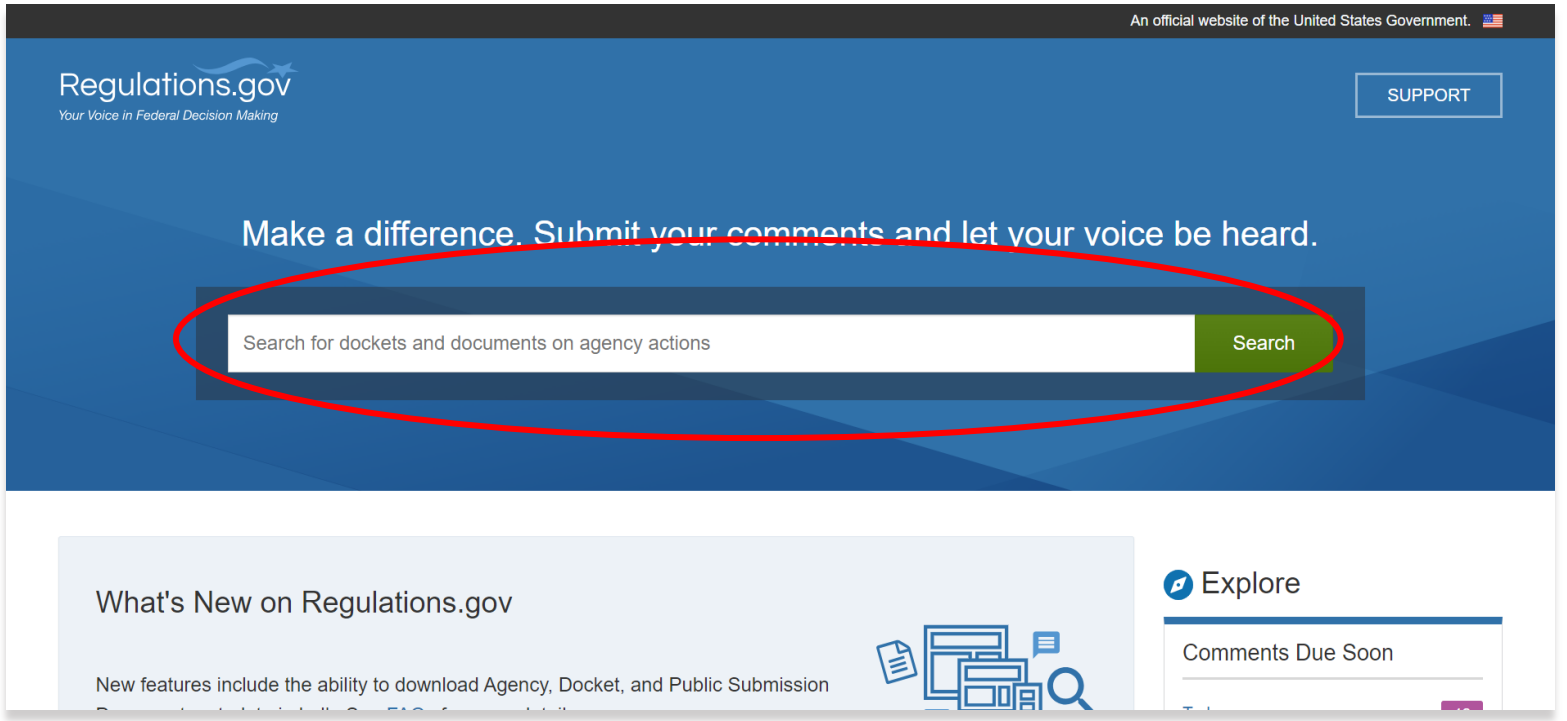
Instructions for viewing the FRN and related comments can be found on slides 71-74.

Reviewing Public Comments in the UCMR 6 Docket

(slide 1 of 4)

To view comments:

1. Go to https://www.regulations.gov/
2. Type the Docket ID No. EPA-HQ-OW-2023-0469 into the search box

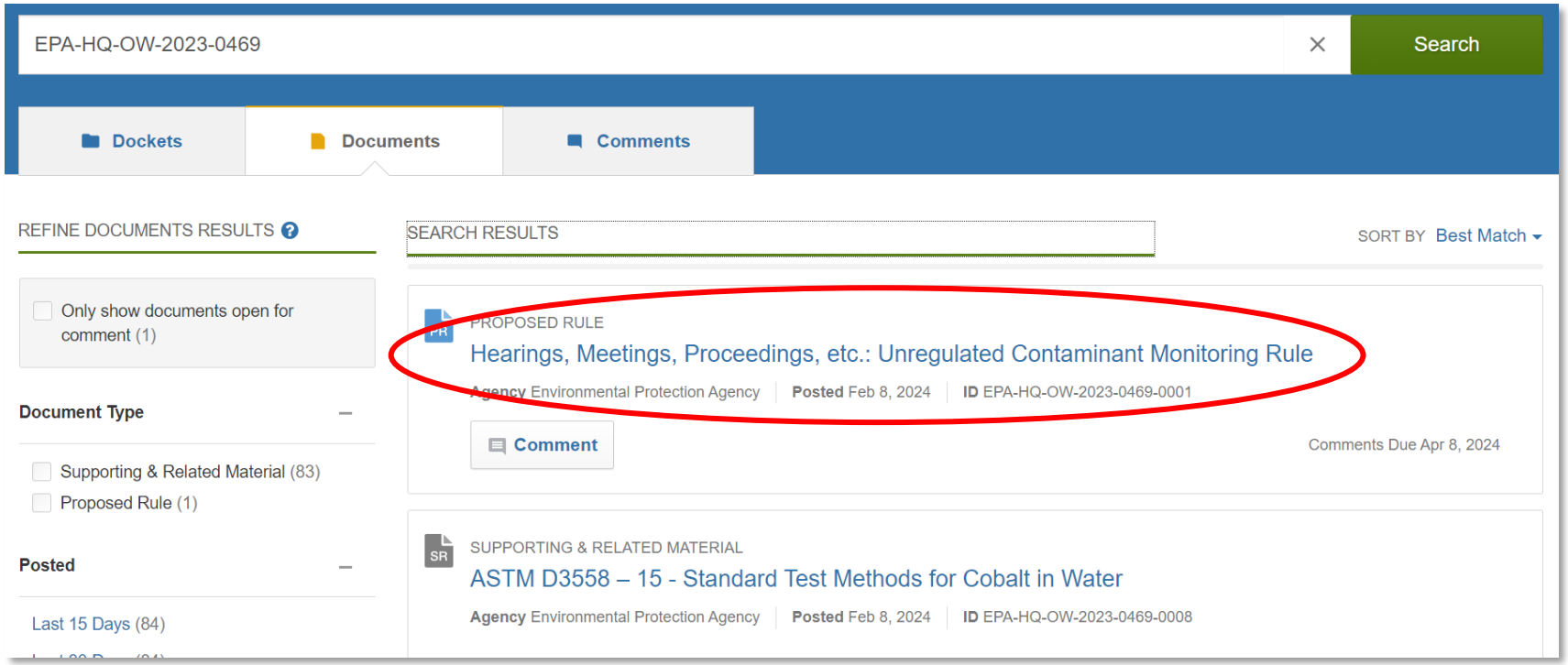


Reviewing Public Comments in the UCMR 6 Docket

(slide 2 of 4)

To view comments:

3. Select the "Hearings, Meetings, Proceedings, etc.: Unregulated Contaminant Monitoring Rule" document

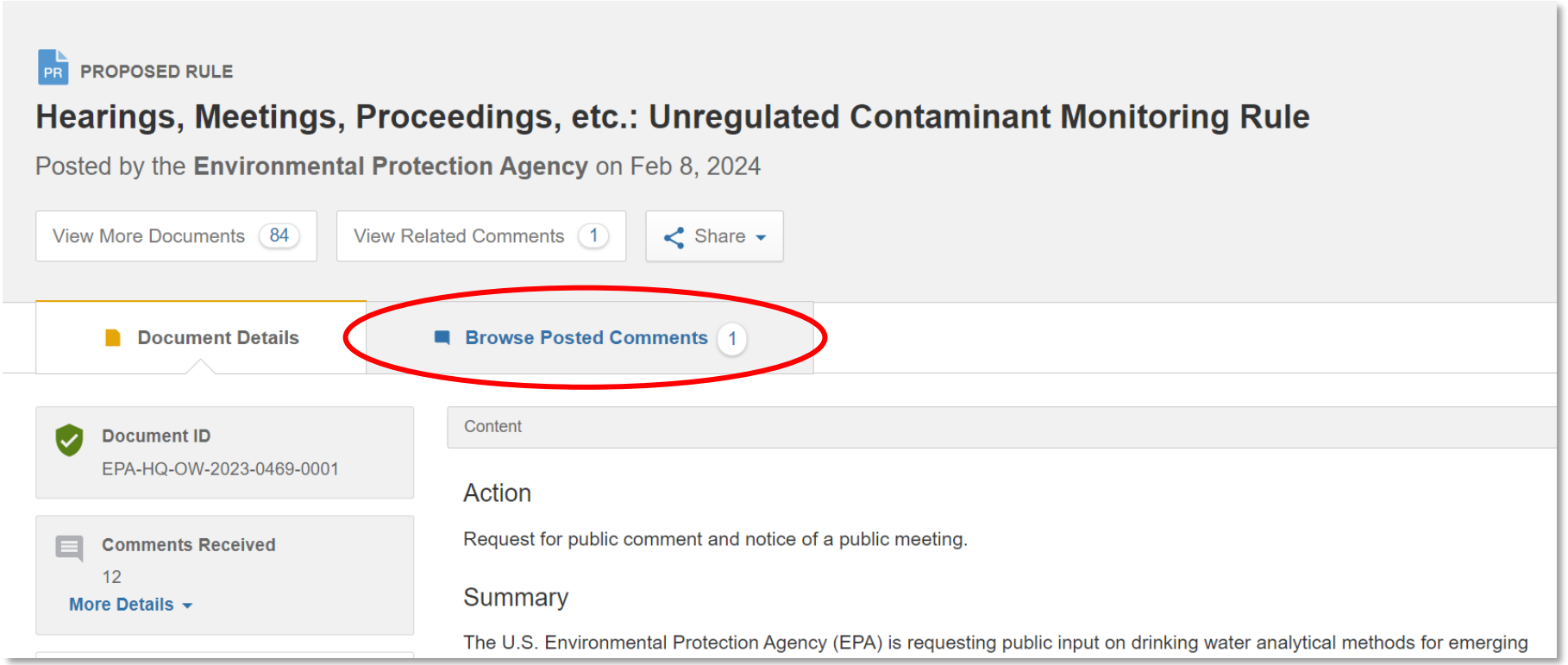


Reviewing Public Comments in the UCMR 6 Docket

(slide 3 of 4)

To view comments:

4. Select the "Browse Posted Comments" tab, which shows every available comment
5. Select a comment to download

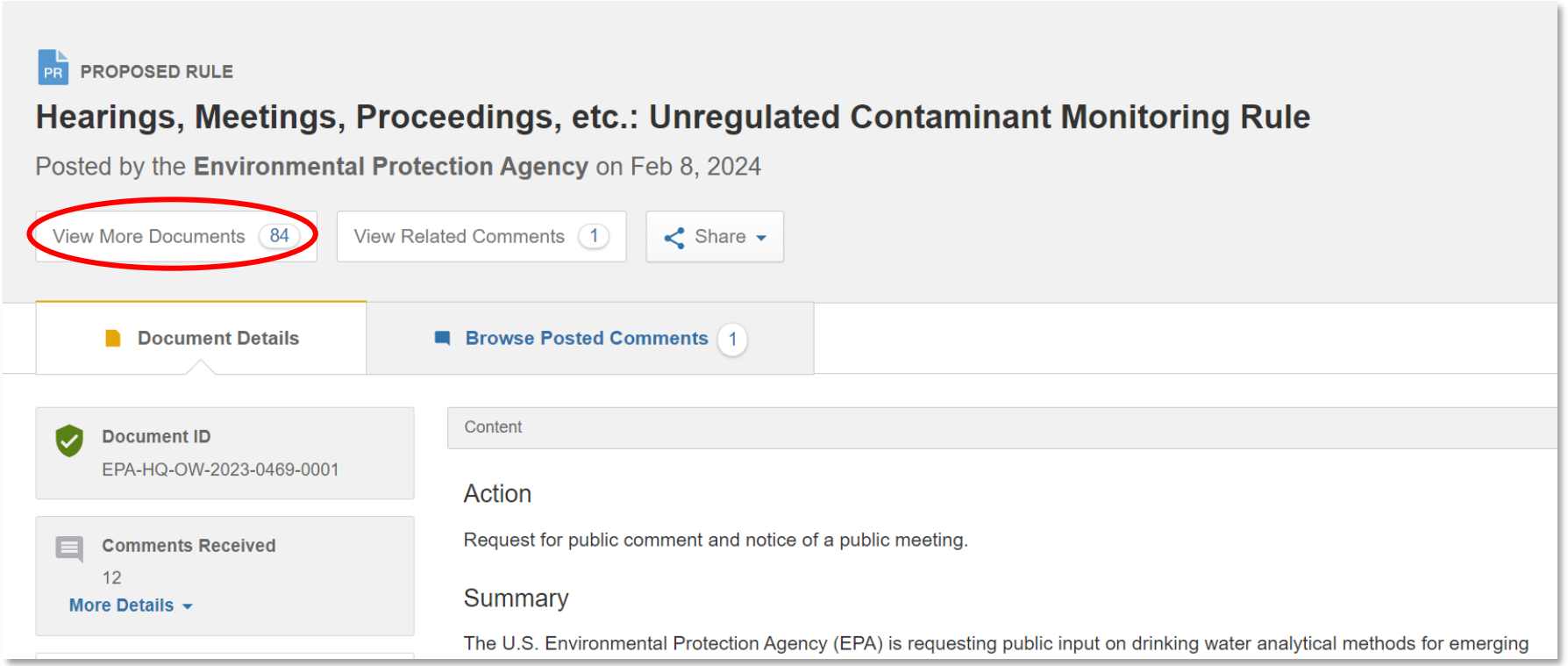


Reviewing Public Comments in the UCMR 6 Docket

(slide 4 of 4)

To view related UCMR 6 documents:

1. Select the "View More Documents" button



Anticipated Process for Approval of Laboratories Supporting UCMR 6

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Overview

- Applying for EPA approval to support UCMR
- Maintaining approval
- Multi-Laboratory UCMR Minimum Reporting Level (MRL)

General Expectations

- Laboratory Approval Program expected to be similar to the process used for previous UCMR cycles
- Only EPA approved laboratories can analyze UCMR samples collected at PWSs
  - Approval is by method and by individual laboratory locations
  - A laboratory may apply for approval for any method(s)
  - The EPA anticipates that each laboratory analyzing samples from small PWSs (under contract to EPA) will be required to be approved for all UCMR 6 methods.
- Laboratories need to meet:
  - UCMR 6 approval program criteria
  - Required equipment criteria
  - Laboratory performance criteria
  - Data reporting requirements (including text file format requirements for SDWARS)
- The agency expects that laboratories supporting UCMR 6 will need to be approved under the EPA's program for the UCMR 6 methods, irrespective of whether they are certified/accredited by a state

Laboratory Approval General Procedure

- Upon publication of the UCMR 6 proposal, anticipated in mid/late 2025, the EPA expects to initiate its UCMR 6 Laboratory Approval Program, which includes the following:
  - Step 1: Laboratory submits request for registration materials
  - Step 2: Laboratory completes registration
  - Step 3: Laboratory completes application package(s)
  - Step 4: EPA reviews application package(s)
  - Step 5: Laboratory participates in Proficiency Testing (PT) study(ies)
  - Step 6: EPA sends written approval to successful laboratory

Reference – Laboratory Approval Program for UCMR 5:
https://www.epa.gov/dwucmr/laboratory-approval-program-unregulated-contaminant-monitoring-rule-ucmr-5

Step 1 – Request to Participate

- Interested laboratories submit a written request to the UCMR Laboratory Approval Coordinator at UCMR_Lab_Approval@epa.gov
- The EPA provides registration material

Step 2 – Registration

- Laboratory completes registration materials, which typically includes:
  - List of the UCMR methods, for which the laboratory sought approval
  - Laboratory information
  - Mailing and shipping address
  - Contact information
- The EPA provides a custom application package based on registration information, along with a copy of the Laboratory Approval Manual

Step 3 – Application Package

- Laboratory completes application package(s)
  - Separate application for each method
  - Application package typically includes:
    - Proof of current drinking water laboratory certification (for select compliance monitoring methods)
    - Personnel information
    - Quality Assurance (QA) information
    - Information regarding analytical equipment and sample handling procedures
    - Data submission for each method (*e.g.*, Initial Demonstration of Capability (IDC) study, Quality Control (QC) sample results, quantification reports)

Step 4 – Review of Application Package

- The EPA reviews application package(s)
  - If deficiencies are identified the agency gives the laboratory an opportunity to take corrective actions and submit new application information
  - If all requested information is present and acceptable, the EPA notifies the laboratory that they are eligible to participate in corresponding proficiency testing (PT) studies

Step 5 – Proficiency Testing

- The EPA provides method-specific PT samples
- Laboratory participates in Proficiency Testing (PT) study(ies):
  - Analyze PT sample(s) for each contaminant and method
  - Successfully report PT data to SDWARS using text file format
  - No PT studies are anticipated after monitoring begins but audits are expected during monitoring

Step 6 – Written EPA Approval

- After successful participation in a PT study for a specific method, the EPA notifies the laboratory in writing
- The EPA posts a list of approved laboratories and associated methods at: https://www.epa.gov/dwucmr

Laboratory Approval Manual

- Procedures for obtaining UCMR approval and for revocation of approval
- QA requirements
- QC requirements
  - Verification of ability to meet the EPA's quantitation requirements (Method MRL Confirmation for multi-laboratory UCMR MRLs)
  - Initial demonstration of capability
  - Initial calibration
  - Continuing calibration checks
  - Surrogate and internal standard criteria
  - Reagent blanks and fortified blanks
  - QC samples
  - Spiked field samples
  - Field blank criteria (if required by the method)
- Sample handling requirements

Typical Criteria for Maintaining Approval

- Adhere to QA/QC measures in the methods, rule language, and the Laboratory Approval Manual
- Post occurrence data and required QC data via SDWARS within prescribed timeframe
- Respond to inquires or requests from the Laboratory Approval Coordinator
- Participate and pass on-site and/or paper audits

Multi-Laboratory UCMR MRLs

- The multi-laboratory UCMR MRLs are established:
  - Using pooled data from multiple laboratories that performed the “Lowest Concentration Minimum Reporting Level” (LCMRL) studies to identify their quantitation capability
    - The EPA set quantifiable reporting limits based on pooled LCMRL results from a multi-laboratory study
  - To achieve quality and consistency across all UCMR laboratories, while allowing for appropriate national laboratory capacity
  - As low as is feasible (generally); with the EPA’s goal to set them lower than current health reference levels (HRLs) and health advisory concentrations
- The EPA will consider raising UCMR MRLs if there is evidence that an MRL is unattainable/impractical

Multi-Laboratory UCMR MRLs

- The Multi-Laboratory UCMR MRL is the lowest quantitation level that, with 95% confidence, can be achieved by capable analysts at 75% or more of the laboratories nationwide using a specified drinking water analytical method
- Each single-laboratory lowest concentration MRL (LCMRL) is the lowest true concentration for which the future recovery is predicted to fall, with high confidence (99%), between 50 and 150% recovery
  - Simultaneous application of precision and accuracy

UCMR 6 Candidate Prioritization and Rationale

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Standards and Risk Management Division
Unregulated Contaminant Monitoring Branch

Overview

- Contaminant Candidate List 5 (CCL 5) contaminants
- UCMR candidate selection process and rationale
- Method considerations
- Health and occurrence data and sources
- Contaminant specific information by method

Fifth Contaminant Candidate List (CCL 5)

- CCL 5 was published on November 14, 2022 (87 FR 68060)
  - Docket ID No. EPA-HQ-OW-2018-0594 at https://www.regulations.gov/
- CCL 5 Approach
  - Build Universe
  - Screen – Preliminary CCL (PCCL) (starting point for UCMR 6 “universe”)
    - CCL 5 Contaminant Information Sheets (CISs)
    - Contains health effects and occurrence data collected through December 2019 for contaminants
  - CCL Classification

The Fifth Contaminant Candidate List (CCL 5) Approach
https://www.epa.gov/ccl/overview-ccl-5-approach

PCCL 5 Individual Chemical Contaminants (slide 1 of 2)

BOLD: Contaminants on CCL 5	Contaminants Previously Monitored in UCMRs	Contaminants Not Yet Monitored with Method(s)/EPA Method(s) In Development

1,1,2,2-Tetrachloroethane	**Acephate**	**Bisphenol A**	**Cobalt** (UCMR 3)	EPTC (UCMR 1)
1,2,3-Trichloropropane (UCMR 3)	Acetamiprid	**Boron**	Cotinine	Esfenvalerate
1,2,4-Trimethylbenzene	Acetochlor ESA (UCMR 2)	Boscalid	Cycloate	**Ethalfluralin**
1,3-Butadiene (UCMR 3)	Acetochlor OA (UCMR 2)	Bromacil	Cyfluthrin	Ethion
1,3-Dichloropropene (cis- & trans-)	Acetophenone	Bromochloromethane (Halon 1011) (UCMR 3)	Cyhalothrin	**Ethoprop** (UCMR 4)
1,4-Dioxane (UCMR 3)	**Acrolein**	**Bromoxynil**	Cypermethrin	Famoxadone
17-alpha-ethynyl estradiol (UCMR 3)	Acyclovir	Bupropion	Cyprodinil	Fenbuconazole
17-beta estradiol (UCMR 3)	Alachlor ESA (UCMR 2)	Butyl benzyl phthalate	**Deethylatrazine**	Fenitrothion
1-Butanol (UCMR 4)	Alachlor OA (UCMR 2)	Caffeine	**Desisopropyl atrazine**	Fenpropathrin
1-O-Benzoylhexopyranuronic acid	Aldrin	Calcium	**Desvenlafaxine**	Fenthion
1-Phenylacetone	**alpha-Hexachlorocyclohexane** (UCMR 4)	Camphor	Diazepam	Fexofenadine
2,4-Dichlorophenoxybutyric acid (2,4-DB)	Ametryn	Carbamazepine	**Diazinon**[1] (UCMR 1)	**Fipronil**
2,4-Dichlorophenol[1] (UCMR 1)	Ammonia	**Carbaryl**	Dicamba	**Fluconazole**
2,4-Dinitrophenol[1] (UCMR 1)	Androstenedione (UCMR 3)	**Carbendazim**	Dichlorvos	**Flufenacet**
2,4-Dinitrotoluene (UCMR 1)	**Anthraquinone**	Carbon disulfide	**Dicrotophos**	**Fluometuron**
2,6-Dinitrotoluene (UCMR 1)	Atenolol	**Chlordecone (kepone)**	**Dieldrin**	Fluoranthene
2-Aminotoluene (UCMR 4)	Azoxystrobin	Chlorodifluoromethane (HCFC-22) (UCMR 3)	Diethyl phthalate	Fluoxetine
2-Hydroxyatrazine	Benfluralin	Chloromethane (Methyl chloride) (UCMR 3)	Difenoconazole	Galaxolide
2-Methylnaphthalene	**Bensulide**	Chlorothalonil	Dimethenamid	Gemfibrozil
3-Monoacetylmorphine	Bentazon	**Chlorpyrifos** (UCMR 4)	Dimethenamid OA	Heroin
4-tert-Octylphenol	Benzoic acid	Clomazone	**Dimethoate** (UCMR 2)	Hexazinone
6-Chloro-1,3,5-triazine-2,4-diamine	Benzophenone	Clopyralid	Di-n-butyl phthalate	Hippuric acid
6-Monoacetylmorphine	Bifenthrin	Clothianidin	**Diuron**[1] (UCMR 1)	Hydromorphone

[1] These contaminants were included in UCMR 1 as a Screening Survey (SS), which was not intended to be nationally representative of drinking water. Screening Surveys in following UCMR cycles are designed to be nationally representative.

PCCL 5 Individual Chemical Contaminants (slide 2 of 2)

BOLD: Contaminants on CCL 5	Contaminants Previously Monitored in UCMRs	Contaminants Not Yet Monitored with Method(s)/EPA Method(s) In Development

Hydromorphone-3-glucuronide	MCPP	**Nonylphenol**	**Propargite**	Terbacil (UCMR 1)
Hydroxyamphetamide	Meprobamate	**Norflurazon**	**Propazine**	**Terbufos**[1] (UCMR 1)
Imazalil	Metalaxyl	Oxadiazon	Propiconazole	Testosterone (UCMR 3)
Imazapyr	Metformin	**Oxyfluorfen** (UCMR 4)	**Propoxur**	Tetraconazole
Imazaquin	Methamphetamine	p,p'-DDE (UCMR 1)	Prosulfuron	Thiabendazole
Imazethapyr	Methocarbamol	p-Cresol	Pymetrozine	**Thiamethoxam**
Imidacloprid	**Methomyl**	Pendimethalin	Pyraclostrobin	Thiobencarb
Indoxacarb	Methylbenzotriazole	**Permethrin** (cis- & trans-) (UCMR 4)	Pyrene	Thiram
Iprodione	**Methylmercury**	Phenanthrene	Pyridaben	Tin
Isodrin	Metolachlor ESA (UCMR 2)	Phenol	**Quinoline** (UCMR 4)	**Tri-allate**
Isophorone	Metolachlor OA (UCMR 2)	Phenylpropanolamine	Silicon	**Tribufos** (UCMR 4)
Isopropylbenzene (Cumene)	Metoprolol	**Phorate**	Sitagliptin	**Tributyl phosphate**
Isoxaflutole	Metribuzin	**Phosmet**	Sodium	Triclopyr
Lactofen	**Molybdenum** (UCMR 3)	Phosphorus	Sulfamethoxazole	Triclosan
lambda-Cyhalothrin	Morphine	**Phostebupirim**	Sulfentrazone	Triethyl citrate
Lidocaine	Morphine-3-glucuronide	Piperonyl butoxide	Sulfometuron-methyl	Trifloxystrobin
Linuron[1] (UCMR 1)	Morphine-6-glucuronide	Potassium	Tamoxifen	Trifluralin
Lithium (UCMR 5)	**MTBE** (UCMR 1)	**Profenofos** (UCMR 4)	Tris(2-butoxylethyl) phosphate (TBEP)	**Tungsten**
Loratadine	Myclobutanil	Prometon[1] (UCMR 1)	**Tris(2-chloroethyl) phosphate (TCEP)**	**Vanadium** (UCMR 3)
Magnesium	Naled	Prometryn	Tris(1,3-dichloro-2-propyl) phosphate (TDCP)	Verapamil
Malathion	Naphthalene	Pronamide	**Tebuconazole** (UCMR 4)	
Manganese (UCMR 4)	Nicotine	**Propachlor**	Tebuthiuron	
MCPA	N,N-Diethyl-m-toluamide (DEET)	**Propanil**	Tefluthrin	

[1] These contaminants were included in UCMR 1 as a Screening Survey (SS), which was not intended to be nationally representative of drinking water. Screening Surveys in following UCMR cycles are designed to be nationally representative.

PCCL 5 Chemical Contaminant Groups (slide 1 of 2)

BOLD: Contaminants on CCL 5	Contaminants Previously Monitored in UCMRs	Contaminants Not Yet Monitored with Method(s)/EPA Method(s) In Development

Disinfectant Byproduct (DBP) Group

HALOACETIC ACIDS	IODINATED TRIHALOMETHANES	NITROSAMINES
Bromochloroacetic acid (BCAA) (UCMR 4)	**Bromochloroiodomethane (BCIM)**	**Nitrosodibutylamine (NDBA)** (UCMR 2)
Bromodichloroacetic acid (BDCAA) (UCMR 4)	**Bromodiiodomethane (BDIM)**	**N-Nitrosodiethylamine (NDEA)** (UCMR 2)
Dibromochloroacetic acid (DBCAA) (UCMR 4)	**Chlorodiiodomethane (CDIM)**	**N-Nitrosodimethylamine (NDMA)** (UCMR 2)
Tribromoacetic acid (TBAA) (UCMR 4)	**Dibromoiodomethane (DBIM)**	**N-Nitrosodi-n-propylamine (NDPA)** (UCMR 2)
HALOACETONITRILES	**Dichloroiodomethane (DCIM)**	**N-Nitrosodiphenylamine (NDPhA)**
Dichloroacetonitrile (DCAN)	**Iodoform (triiodomethane, TIM)**	**Nitrosopyrrolidine (NPYR)** (UCMR 2)
Dibromoacetonitrile (DBAN)		OTHERS
HALONITROMETHANES		**Chlorate** (UCMR 3)
Bromodichloronitromethane (BDCNM)		**Formaldehyde**
Chloropicrin (trichloronitromethane, TCNM)		
Dibromochloronitromethane (DBCNM)		

Cyanotoxin Group[1,2]

Anatoxin-a (UCMR 4)
Cylindrospermopsin (UCMR 4)
Saxitoxin
MICROCYSTINS
Microcystin LA (UCMR 4)
Microcystin LR (UCMR 4)
Microcystin RR (UCMR 4)
Microcystin YR (UCMR 4)

[1] As defined by the final Contaminant Candidate List 5 (CCL 5): "Toxins naturally produced and released by some species of cyanobacteria (previously known as "blue-green algae"). The group of cyanotoxins includes, but is not limited to: anatoxin-a, cylindrospermopsin, microcystins, and saxitoxin."

[2] The CCL 5 does not list specific microcystins. The microcystins listed above are microcystins with available drinking water analytical methods. Appendix D of the "Technical Support Document for the Final Fifth Contaminant Candidate List (CCL 5) – Chemical Contaminants" also lists microcystin LW.

PCCL 5 Chemical Contaminant Groups (slide 2 of 2)

BOLD: Contaminants on CCL 5	Contaminants Previously Monitored in UCMRs	Contaminants Not Yet Monitored with Method(s)/EPA Method(s) In Development

Per- and Polyfluoralkyl Substances (PFAS) Group[1,2]

11-Chloroperfluoro-3-oxaundecanesulfonic acid (11Cl-PF3OUdS) (UCMR 5)	**Perfluorodecanoic acid (PFDA)** (UCMR 5)
2-(N-Ethylperfluorooctanesulfonamido)acetic acid (NEtFOSAA) (UCMR 5)	**Perfluorododecanoic acid (PFDoA)** (UCMR 5)
2-(N-Methylperfluorooctanesulfonamido)acetic acid (NMeFOSAA) (UCMR 5)	**Perfluoroheptanesulfonic acid (PFHpS)** (UCMR 5)
4,8-Dioxa-3H-perfluorononanoic acid (ADONA) (UCMR 5)	**Perfluoroheptanoic acid (PFHpA)** (UCMR 5)
4:2 Fluorotelomer sulfonic acid (4:2 FTS) (UCMR 5)	**Perfluorohexanesulfonic acid (PFHxS)** (UCMR 5)
6:2 Fluorotelomer sulfonic acid (6:2 FTS) (UCMR 5)	**Perfluorohexanoic acid (PFHxA)** (UCMR 5)
8:2 Fluorotelomer sulfonic acid (8:2 FTS) (UCMR 5)	**Perfluorononanoic acid (PFNA)** (UCMR 5)
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3ONS) (UCMR 5)	**Perfluorooctanesulfonic acid (PFOS)** (UCMR 5)
Hexafluoropropylene oxide dimer acid (HFPO DA) (UCMR 5)	**Perfluorooctanoic acid (PFOA)** (UCMR 5)
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA) (UCMR 5)	**Perfluoropentanesulfonic acid (PFPeS)** (UCMR 5)
Perfluoro(4-methoxybutanoic acid) (PFMBA) (UCMR 5)	**Perfluoropentanoic acid (PFPeA)** (UCMR 5)
Perfluoro-2-ethoxyethanesulfonic acid (PFEESA) (UCMR 5)	**Perfluorotetradecanoic acid (PFTA)** (UCMR 5)
Perfluoro-3-methoxypropanoic acid (PFMPA) (UCMR 5)	**Perfluorotridecanoic acid (PFTrDA)** (UCMR 5)
Perfluorobutanesulfonic acid (PFBS) (UCMR 5)	**Perfluoroundecanoic acid (PFUnA)** (UCMR 5)
Perfluorobutanoic acid (PFBA) (UCMR 5)	

[1] As defined in the final Contaminant Candidate List 5 (CCL 5): "For the purpose of CCL 5, the structural definition of per- and polyfluoroalkyl substances (PFAS) includes chemicals that contain at least one of these three structures (except for PFOA and PFOS which are already in the regulatory process):

1. R-(CF2)-CF(R')R", where both the CF2 and CF moieties are saturated carbons, and none of the R groups can be hydrogen
2. R-CF20CF2-R', where both the CF2 moieties are saturated carbons, and none of the R groups can be hydrogen
3. CF3C(CF3)RR', where all the carbons are saturated, and none of the R groups can be hydrogen"

[2] The CCL 5 does not list specific PFAS. The EPA recognizes that this slide only captures a subset of thousands of PFAS compounds encompassed in the CCL 5 structural definition. The PFAS listed above are PFAS with available drinking water analytical methods. Appendix D of the "Technical Support Document for the Final Fifth Contaminant Candidate List (CCL 5) – Chemical Contaminants" also lists ammonium perfluoro-2-methyl-3-oxahexanoate and perfluorooctanesulfonamide (PFOSA), which do not have available analytical methods.

PCCL 5 Microbial Contaminants

BOLD: Contaminants on CCL 5	Contaminants Previously Monitored in UCMRs	Contaminants Not Yet Monitored with Method(s)/EPA Method(s) In Development

Acinetobacter baumannii	**Enterovirus**[2] (UCMR 3)	***Naegleria fowleri***
Adenovirus	***Escherichia coli (O157)***	Nontuberculous *Mycobacteria* (NTM)
Aeromonas hydrophila[1]	*Exophiala jeanselmei*	*Pantoea agglomerans*
Arcobacter butzleri	*Fusarium solani*	*Plesiomonas shigelloides*
Aspergillus fumigatus group	***Helicobacter pylori***	***Pseudomonas aeruginosa***
Astrovirus	Hepatitis A virus	Rotavirus
Blastocystis hominis	Hepatitis E virus	*Salmonella enterica*
Caliciviruses	*Isospora belli*	***Shigella sonnei***
Campylobacter jejuni	***Legionella pneumophila***	*Taxoplasma gondii*
Comanonas testosteroni	Microsporidia	*Vibrio cholerae*
Cyclospora cayetanensis	***Mycobacterium abscessus***	*Yersinia enterocolitica*
Entamoeba histolytica	***Mycobacterium avium***	

[1] *Aeromonas* genus was monitored in UCMR 1.
[2] Enterovirus was monitored in UCMR 3. UCMR 3 also monitored for rotavirus, which is not listed on PCCL 5.

PCCL 5 Chemical Contaminants with Method(s)/EPA Method(s) in Development

(slide 1 of 2)

BOLD: Contaminants on CCL 5	Contaminants Previously Monitored in UCMRs	Contaminants Not Yet Monitored with Method(s)/EPA Method(s) In Development

1,1,2,2-Tetrachloroethane	**6-Chloro-1,3,5-triazine-2,4-diamine**	**Bisphenol A**	**DBAN**	**Ethoprop** (UCMR 4)
1,2,3-Trichloropropane (UCMR 3)	**8:2FTS** (UCMR 5)	**Boron**	**DBCAA** (UCMR 4)	**Fipronil**
1,2,4-Trimethylbenzene	**9Cl-PF3ONS** (UCMR 5)	Bromacil	**DCAN**	**Flufenacet**
1,3-Butadiene (UCMR 3)	**Acephate**	**Bromoxynil**	**Deethylatrazine**	**Fluometuron**
1,3-Dichloropropene	Acetochlor ESA (UCMR 2)	Butyl benzyl phthalate	**Desisopropyl atrazine**	Fluoranthene
1,4-Dioxane (UCMR 3)	Acetochlor OA (UCMR 2)	Caffeine	Diazepam	Fluoxetine
11Cl-PF3OUdS (UCMR 5)	**ADONA** (UCMR 5)	Calcium	**Diazinon** (UCMR 1)	**Formaldehyde**
17-alpha-ethynyl estradiol (UCMR 3)	Alachlor ESA (UCMR 2)	Carbamazepine	Dicamba	Gemfibrozil
17-beta estradiol (UCMR 3)	Alachlor OA (UCMR 2)	**Carbaryl**	Dichlorvos	Halon 1011 (UCMR 3)
1-Butanol (UCMR 4)	Aldrin	**Carbendazim**	**Dicrotophos**	HCFC-22 (UCMR 3)
2,4-Dichlorophenoxybutyric acid (2,4-DB)	**alpha-Hexachlorocyclohexane** (UCMR 4)	Carbon disulfide	**Dieldrin**	Hexazinone
2,4-Dichlorophenol (UCMR 1)	Ametryn	**Chlorate** (UCMR 3)	Diethyl phthalate	**HFPO DA** (UCMR 5)
2,4-Dinitrophenol (UCMR 1)	**Anatoxin-a** (UCMR 4)	**Chlordecone**	Dimethenamid OA	**Iprodione**
2,4-Dinitrotoluene (UCMR 1)	Androstenedione (UCMR 3)	Chlorothalonil	**Dimethoate** (UCMR 2)	Isophorone
2,6-Dinitrotoluene (UCMR 1)	**BCAA** (UCMR 4)	**Chlorpyrifos** (UCMR 4)	Di-n-butyl phthalate	Isopropylbenzene (Cumene)
2-Aminotoluene (UCMR 4)	**BDCAA** (UCMR 4)	Clothianidin	**Diuron** (UCMR 1)	Lactofen
4:2FTS (UCMR 5)	**Bensulide**	**Cobalt** (UCMR 3)	EPTC (UCMR 1)	Linuron (UCMR 1)
4-tert-Octylphenol	Bentazon	Cycloate	Esfenvalerate	**Lithium** (UCMR 5)
6:2FTS (UCMR 5)	Bifenthrin	**Cylindrospermopsin** (UCMR 4)	Ethion	Magnesium

PCCL 5 Chemical Contaminants with Method(s)/EPA Method(s) in Development

(slide 2 of 2)

BOLD: Contaminants on CCL 5	Contaminants Previously Monitored in UCMRs	Contaminants Not Yet Monitored with Method(s)/EPA Method(s) In Development

Malathion	**NDPA** (UCMR 2)	**PFHxA** (UCMR 5)	Prometryn	Thiobencarb
Manganese (UCMR 4)	**NEtFOSAA** (UCMR 5)	**PFHxS** (UCMR 5)	Pronamide	Tin
MCPA	**NFDHA** (UCMR 5)	**PFMBA** (UCMR 5)	**Propachlor**	**Tribufos** (UCMR 4)
MCPP	**NMeFOSAA** (UCMR 5)	**PFMPA** (UCMR 5)	**Propanil**	Triclosan
Methomyl	N,N-Diethyl-m-toluamide (DEET)	**PFNA** (UCMR 5)	**Propazine**	Trifluralin
Methyl chloride (UCMR 3)	**Nonylphenol**	**PFOA** (UCMR 5)	**Propoxur**	**Vanadium** (UCMR 3)
Metolachlor ESA (UCMR 2)	**Norflurazon**	**PFOS** (UCMR 5)	Pyrene	
Metolachlor OA (UCMR 2)	**NPYR** (UCMR 2)	**PFPeA** (UCMR 5)	**Quinoline** (UCMR 4)	
Metribuzin	**Oxyfluorfen** (UCMR 4)	**PFPeS** (UCMR 5)	Silicon	
Microcystin LA (UCMR 4)	PFAS Group	**PFTA** (UCMR 5)	Sodium	
Microcystin LR (UCMR 4)	p,p'-DDE (UCMR 1)	**PFTrDA** (UCMR 5)	Sulfamethoxazole	
Microcystin RR (UCMR 4)	**Permethrin (cis- & trans-)** (UCMR 4)	**PFUnA** (UCMR 5)	**TBAA** (UCMR 4)	
Microcystin YR (UCMR 4)	**PFBA** (UCMR 5)	Phenanthrene	**TCNM**	
Molybdenum (UCMR 3)	**PFBS** (UCMR 5)	Phenol	**Tebuconazole** (UCMR 4)	
MTBE (UCMR 1)	**PFDA** (UCMR 5)	**Phorate**	Tebuthiuron	
Naphthalene	**PFDoA** (UCMR 5)	Phosphorus	Terbacil (UCMR 1)	
NDBA (UCMR 2)	**PFEESA** (UCMR 5)	Potassium	**Terbufos** (UCMR 1)	
NDEA (UCMR 2)	**PFHpA** (UCMR 5)	**Profenofos** (UCMR 4)	Testosterone (UCMR 3)	
NDMA (UCMR 2)	**PFHpS** (UCMR 5)	Prometon (UCMR 1)	**Thiamethoxam**	

PCCL 5 Microbial Contaminants with Method(s)/EPA Method(s) in Development[1]

BOLD: Contaminants on CCL 5	Contaminants Previously Monitored in UCMRs	Contaminants Not Yet Monitored with Method(s)/EPA Method(s) In Development

Enterovirus (UCMR 3)	***Naegleria fowleri***
Legionella pneumophila	***Pseudomonas aeruginosa***
Mycobacterium abscessus	*Salmonella enterica*
Mycobacterium avium	

PCCL 5 Contaminants Monitored in Previous UCMRs

UCMR 1	UCMR 2	UCMR 3	UCMR 4		UCMR 5	
2,4-Dichlorophenol[1]	Acetochlor ethanesulfonic acid (ESA)	1,2,3-Trichloropropane	1-Butanol	Microcystin LA	11Cl-PF3OUdS	PFEESA
2,4-Dinitrophenol[1]	Acetochlor oxanilic acid (OA)	1,3-Butadiene	2-Aminotoluene (o-Toluidine)	Microcystin LR	4:2FTS	PFHpA
2,4-Dinitrotoluene	Alachlor ethanesulfonic acid (ESA)	1,4-Dioxane	alpha-Hexachlorocyclohexane	Microcystin RR	6:2FTS	PFHpS
2,6-Dinitrotoluene	Alachlor oxanilic acid (OA)	17-alpha-ethynyl estradiol	Anatoxin-a	Microcystin YR	8:2FTS	PFHxA
Diazinon[1]	Dimethoate	17-beta estradiol	Bromochloroacetic acid (BCAA)	Oxyfluorfen	9Cl-PF3ONS	PFHxS
Diuron[1]	Metolachlor ethanesulfonic acid (ESA)	4-Androstene-3,17-dione	Bromodichloroacetic acid (BDCAA)	Permethrin (cis- & trans-)	ADONA	PFMBA
Ethyl dipropylthiocarbamate (EPTC)	Metolachlor oxanilic acid (OA)	Bromochloromethane (Halon 1011)	Chlorpyrifos	Profenofos	HFPO DA	PFMPA
Linuron[1]	Nitrosodibutylamine (NDBA)	Chlorate	Cylindrospermopsin	Quinoline	Lithium	PFNA
Methyl tert-butyl ether (MTBE)	Nitrosopyrrolidine (NPYR)	Chlorodifluoromethane (HCFC-22)	Dibromochloroacetic acid (DBCAA)	Tebuconazole	NEtFOSAA	PFOA
p,p'-DDE (4,4'-DDE)	N-Nitrosodiethylamine (NDEA)	Chloromethane (Methyl chloride)	Ethoprop	Tribromoacetic acid (TBAA)	NFDHA	PFOS
Prometon[1]	N-Nitrosodimethylamine (NDMA)	Cobalt	Manganese	Tribufos	NMeFOSAA	PFPeA
Terbacil	N-Nitrosodi-n-propylamine (NDPA)	Enterovirus			PFBA	PFPeS
Terbufos[1]		Molybdenum			PFBS	PFTA
		Testosterone			PFDA	PFTrDA
		Vanadium				

[1] These contaminants were included in UCMR 1 as a Screening Survey (SS), which was not intended to be nationally representative of drinking water. Screening Surveys in following UCMR cycles are designed to be nationally representative.

PCCL 5 Chemical Contaminants Not Yet Monitored With Method(s) /EPA Method(s) in Development [1]

BOLD: Contaminants on CCL 5

1,1,2,2-Tetrachloroethane (EPA 502.2, 524.2, 524.3, 524.4)	**Carbendazim** (EPA In Development 562)	**Fluometuron** (EPA 532)	Phenol (EPA 528)
1,2,3-Trichloropropane (EPA 502.2, 504.1, 524.2, 524.3, 524.4, 551.1)	Carbon disulfide (EPA 524.2, 524.3, 524.4)	Fluoranthene (EPA 550, 550.1)	**Phorate** (EPA 525.3)
1,2,4-Trimethylbenzene (EPA 502.2, 524.2, 524.3, 524.4)	**Chlordecone** (EPA 527*, In Development 562)	Fluoxetine (EPA 542)	Phosphorus (EPA 200.7)
1,3-Dichloropropene (cis- & trans-) (502.2, 524.2, 524.3, 524.4)	Chlorothalonil (EPA 508, 508.1, 525.2, 525.3)	**Formaldehyde**[2] (EPA 554, 556.1)	Potassium (EPA 200.7)
2,4-DB (EPA 515.3, 515.4, 555)	Clothianidin (EPA In Development 562)	Gemfibrozil (EPA 542)	Prometryn (EPA 507, 523, 525.2, 525.3, 527)
4-tert-Octylphenol (559)	Cycloate (EPA 507, 525.2, 525.3)	Hexazinone (EPA 507, 525.2, 525.3, 527)	Pronamide (EPA 525.2, 525.3)
6-Chloro-1,3,5-triazine-2,4-diamine (523, 536)	**DBAN**[2] (EPA 551.1)	**Iprodione** (EPA In Development 562)	**Propachlor** (EPA 508, 508.1, 525.2, 525.3)
Acephate (EPA 538)	**DCAN**[2] (EPA 551.1)	Isophorone (EPA 525.2, 525.3)	**Propanil** (EPA 532)
Aldrin (EPA 505, 508, 508.1, 525.2, 525.3)	**Deethylatrazine** (EPA 523, 536)	Isopropylbenzene (Cumene) (EPA 502.2, 524.2, 524.3, 524.4)	**Propazine** (EPA 507, 523, 525.2, 525.3, 527, 536)
Ametryn (EPA 507, 523, 525.2, 525.3)	**Desisopropyl atrazine** (EPA 523, 536)	Lactofen (EPA 515.3**, 515.4**)	**Propoxur** (EPA 531.1, 531.2)
Bensulide (EPA 540, 543)	Diazepam (EPA 542)	Magnesium (EPA 200.5, 200.7)	Pyrene (EPA 525.2, 525.3, 550, 550.1)
Bentazon (EPA 515.3, 515.4, 555)	Dicamba (EPA 515.3, 515.4, 555)	**Malathion** (EPA 527)	Silicon (SM 3111 D)
Bifenthrin (EPA 527)	Dichlorvos (EPA 507, 525.2, 525.3)	MCPA (EPA 555)	Sodium (EPA 200.5, 200.7)
Bisphenol A (SM 6810 B)	**Dicrotophos** (EPA 538)	MCPP (EPA 555)	Sulfamethoxazole (EPA 542)
Boron (EPA 200.7)	**Dieldrin** (EPA 505, 508, 508.1, 525.2, 525.3)	**Methomyl** (EPA 531.1, 531.2, 540)	**TCNM**[2] (EPA 551.1)
Bromacil (EPA 507, 525.2, 525.3, 527, 551.1)	Diethyl phthalate (EPA 506, 525.2, 525.3)	Metribuzin (EPA 507, 508.1, 525.2, 525.3, 551.1)	Tebuthiuron (EPA 507, 525.2, 525.3, 532)
Bromoxynil (EPA In Development 562)	Dimethenamid OA (EPA 535)	Naphthalene (EPA 502.2, 524.2, 524.3, 524.4, 550, 550.1)	**Thiamethoxam** (EPA In Development 562)
Butyl benzyl phthalate (EPA 506, 525.2, 525.3)	Di-n-butyl phthalate (EPA 506, 525.2, 525.3)	N,N-Diethyl-m-toluamide (DEET) (525.3)	Thiobencarb (EPA 527)
Caffeine (SM 6810 B)	Esfenvalerate (EPA 527*)	**Nonylphenol** (EPA 559)	Tin (EPA 200.5, 200.7, 200.9)
Calcium (EPA 200.5, 200.7)	Ethion (EPA 525.3)	**Norflurazon** (EPA 507, 525.2, 525.3, 527*)	Triclosan (EPA 542)
Carbamazepine (EPA 542)	**Fipronil** (EPA In Development 562)	PFAS Group (EOF)	Trifluralin (EPA 508, 508.1, 525.2, 525.3, 551.1)
Carbaryl (EPA 531.1, 531.2)	**Flufenacet** (EPA In Development 562)	Phenanthrene (EPA 525.2, 525.3, 550, 550.1)	

[1] Voluntary consensus standards body (VCSB) methods are also listed, including ASTM International (ASTM) and Standard Methods (SM). The EPA methods in development may or may not be validated before UCMR 6; these methods may be candidates for future UCMR cycles.

[2] Analytical methods have been published for these four disinfectant byproducts (DBPs) but they have not been monitored in earlier UCMR cycles.

* EPA method 527: There are potential method analysis issues with these compounds

** EPA method 515.3 and 515.4: The herbicide Lactofen will be quantitated as Acifluorfen as their structures represent different esters of the same carboxylate moiety

PCCL 5 Microbial Contaminants Not Yet Monitored with Method(s)/EPA Method(s) in Development[1]

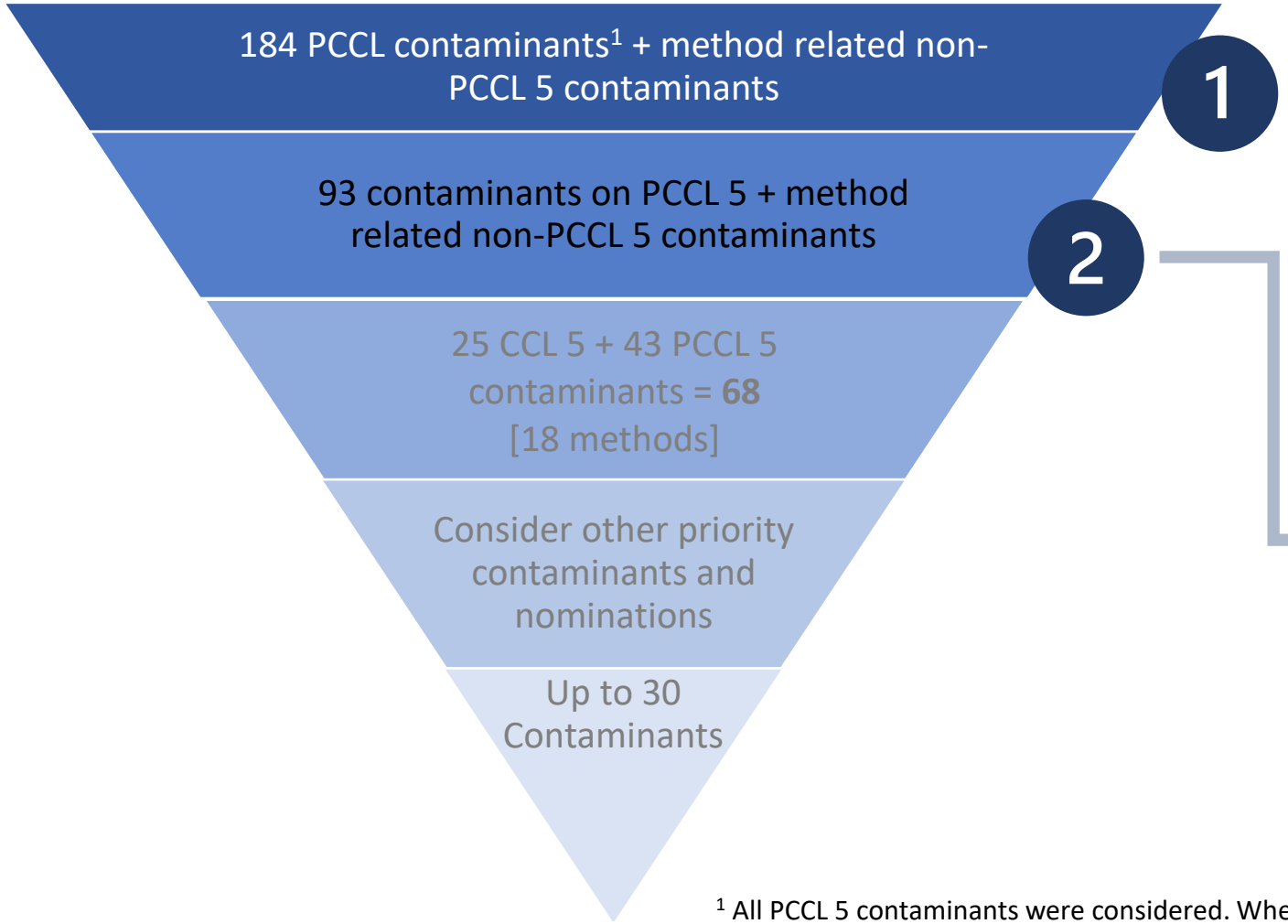
BOLD: Contaminants on CCL 5

Legionella pneumophila (EPA In Development, ASTM D8429-21 (Legiolert), ISO 11731:2017, ISO/TS 12869:2019)	***Naegleria fowleri*** (SM 9750 – Proposed)
Mycobacterium abscessus (EPA In Development)	***Pseudomonas aeruginosa*** (ASTM D5246-19, SM 9213 E, SM 9213 F, SM 9213 G)
Mycobacterium avium (EPA In Development)	*Salmonella enterica* (EPA SAP 600/R-10/133)

[1] Voluntary consensus standards body (VCSB) methods are also listed, including ASTM International (ASTM), Standard Methods (SM), and International Organization for Standardization (ISO) methods. UCMB has not yet evaluated these methods for UCMR 6 purposes. The EPA methods in development may or may not be validated before UCMR 6; these methods may be candidates for future UCMR cycles.

UCMR 6 Contaminant Prioritization Process

(slide 1 of 2)



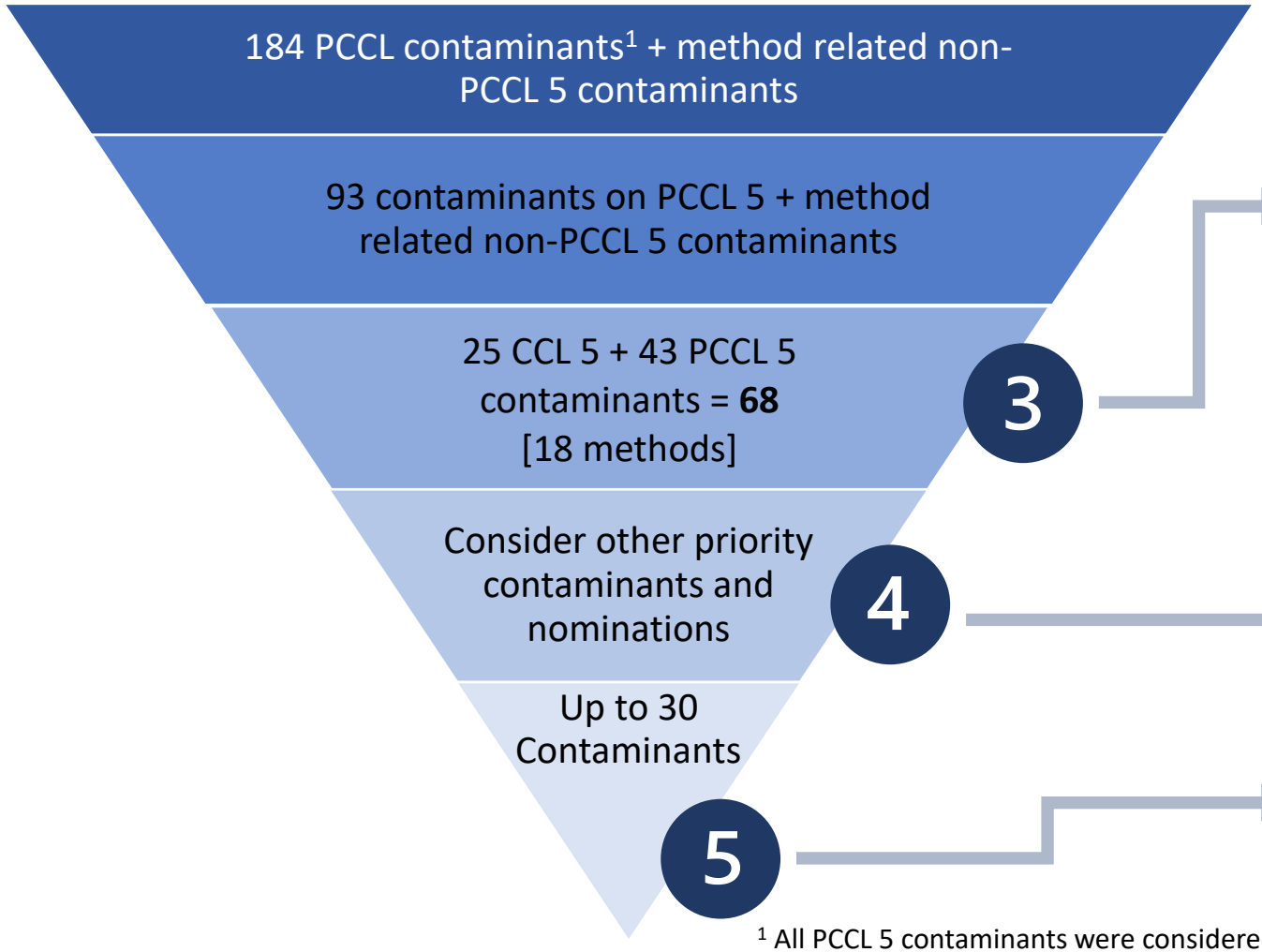
- Contaminant selection first considers contaminants on the PCCL 5[1] (individual contaminants and groups) with a drinking water analytical method completed or near completion
- Other contaminants within the scope of analytical methods for PCCL 5 contaminants are also considered

- In Step 2, the EPA generally focuses on the subset of Step 1 that were not monitored for in a previous UCMR cycle

[1] All PCCL 5 contaminants were considered. When only considering contaminants with analytical methods, 184 contaminants remain.

UCMR 6 Contaminant Prioritization Process

(slide 2 of 2)



In Step 3 the EPA considers the subset of Step 2 contaminants that:

- Have an available health assessment to facilitate regulatory determinations
- Have critical health endpoints, are probable carcinogens, are active pesticides
- Have potential for widespread occurrence in drinking water based on use, production, or release data

In Step 4, based on workgroup discussion, the contaminant list will be narrowed down, and potential additional contaminants will be considered based on workgroup discussion, consultations, agency priorities.

In the final step, the EPA identifies up to 30 contaminants to be included in the UCMR 6 proposal and invites public comment.

[1] All PCCL 5 contaminants were considered. When only considering contaminants with analytical methods, 184 contaminants remain.

Other Considerations: Revisions to the Microbial and Disinfectant Byproduct Rules

- The EPA is currently examining opportunities to enhance protection against microbes and disinfectant byproducts (DBPs) through revisions to the suite of Microbial and Disinfection Byproduct (MDBP) Rules
  - The agency anticipates finalizing the revisions to the MDBP rules in accordance with the dates in the Settlement Agreement between EPA and Waterkeeper Alliance
    - Waterkeeper Alliance, Inc. v. U.S. EPA, No. 1:19–cv– 00899–LJL (S.D.N.Y. Jun. 1, 2020)
      - Docket ID No. EPA-HQ-OGC-2020-0140-0001 at https://www.regulations.gov/
    - Docket ID No. EPA-HQ-OW-2020-0486 at https://www.regulations.gov/
- The UCMR 6 timeframe is such that the agency does not expect that the resulting occurrence data could meaningfully inform MDBP revisions. Further, the EPA recognizes that any data collected under UCMR 6 would not reflect conditions at PWSs after any regulatory revisions become effective (because water quality would be expected to change as a result of PWSs complying with such regulatory revisions).

DBPs and Microbes Potentially Addressed by Revisions to the MDBP Rules

- DBPs:
  - CCL 5
    - Chloropicrin (trichloronitromethane, TCNM) (EPA 551.1)
    - Dibromoacetonitrile (DBAN) (EPA 551.1)
    - Dichloroacetonitrile (DCAN) (EPA 551.1)
    - Formaldehyde (EPA 554, EPA 556.1)
- Microbes:
  - CCL 5:
    - *Legionella pneumophila* (EPA In Development, ASTM D8429-21 (Legiolert), ISO 11731:2017, ISO/TS 12869:2019)
    - *Mycobacterium* species (EPA In Development)
    - *Pseudomonas aeruginosa* (SM 9213 E, F, G)
    - *Naegleria fowleri* (SM 9750)
  - PCCL 5
    - *Salmonella enterica* (EPA SAP 600/R-10/133)

UCMR 6: Contaminants and Methods Being Considered (slide 1 of 3)

Table Key
CCL 5 Not Yet Monitored
PCCL 5 Not Yet Monitored

EPA Method 200.7
Boron

EPA Method 523
6-Chloro-1,3,5-triazine-2,4-diamine (Atrazine-desethyl-desisopropyl)
Desethylatrazine (Atrazine-desethyl)
Desisopropylatrazine (Atrazine-desisopropyl)
Propazine
Ametryn
Prometryn

EPA Method 524.2, 524.3, 524.4
1,2,4-Trimethylbenzene
1,1,2,2-Tetrachloroethane
1,3-Dichloropropene (cis- & trans-)
Carbon disulfide
Isopropylbenzene (Cumene)
Naphthalene

EPA Method 515.3, 515.4
2,4-Dichlorophenoxybutyric acid (2,4-DB)
Bentazon
Dicamba
Lactofen

EPA Method 527
Malathion
Norflurazon
Propazine
Bifenthrin
Bromacil
Esfenvalerate
Hexazinone
Prometryn
Thiobencarb

EPA Method 525.2, 525.3	
Norflurazon	Hexazinone
Phorate	Isophorone
Propazine	Metribuzin
Ametryn	N,N-Diethyl-m-toluamide (DEET)
Bromacil	Phenanthrene
Butyl benzyl phthalate	Prometryn
Chlorothalonil	Pronamide
Cycloate	Pyrene
Dichlorvos	Tebuthiuron
Diethyl phthalate	Trifluralin
Di-n-butyl phthalate	

UCMR 6: Contaminants and Methods Being Considered (slide 2 of 3)

Table Key
CCL 5 Not Yet Monitored
PCCL 5 Not Yet Monitored

EPA Method 528
Phenol

EPA Method 555
2-(2-Methyl-4-chlorophenoxy)propionic acid (MCPP)
2-Methyl-4-chlorophenoxyacetic acid (MCPA)
2,4-Dichlorophenoxybutyric acid (2,4-DB)
Bentazon
Dicamba

EPA Method 531.1, 531.2
Carbaryl
Methomyl
Propoxur

EPA Method 538
Acephate
Dicrotophos

EPA Method 540
Bensulide
Methomyl

EPA Method 532
Fluometuron
Propanil
Tebuthiuron

EPA Method 550, 550.1
Fluoranthene
Naphthalene
Phenanthrene
Pyrene

EPA Method 559
Nonylphenol
4-tert-Octylphenol

EPA Method 535
Dimethenamid oxanilic acid (OA)

EPA Method 542
Carbamazepine
Diazepam
Fluoxetine
Gemfibrozil
Sulfamethoxazole
Triclosan

EPA Methods in Development[1] for UCMR 6: Contaminants Being Considered (slide 3 of 3)

Table Key
CCL 5 Not Yet Monitored
PCCL 5 Not Yet Monitored
CCL 5 Previously Monitored

Draft EPA Method 562
Bromoxynil
Carbendazim
Fipronil
Flufenacet
Iprodione
Thiamethoxam
Clothianidin

Draft EPA Method Purgeable Organic Compounds[2]
1,2,4-Trimethylbenzene
1,2,3-Trichloropropane (UCMR 3)

[1] The EPA methods in development may or may not be validated before UCMR 6; these methods may be candidates for future UCMR cycles. Refer to slides (68-69) for more information about additional method development work (*e.g.*, PFAS methods and microplastics).

[2] 1,2,3-trichloropropane was previously monitored in UCMR 3 using EPA Method 524.3. The method in development is targeting a lower minimum reporting level (MRL).

Data Availability for UCMR 6 Contaminants Being Considered

For each method, the sets of slides that follow will address the following for the 68 contaminants across 18 methods being considered:

- Method number/technology type/name
- PCCL 5 or CCL 5 listing status
- Availability of an EPA health assessment
- Availability of occurrence data
  - National and non-national
  - Finished drinking water and ambient water

Specific contaminant details are in Appendices A and B

EPA Health Data Sources

(slide 1 of 2)

- Office of Pesticide Programs (OPP)
  - https://iaspub.epa.gov/apex/pesticides/f?p=chemicalsearch:1
- Office of Research and Development (ORD)
  - Integrated Risk Information System (IRIS) https://iris.epa.gov/AtoZ/?list_type=alpha
  - Provisional Peer-Reviewed Toxicity Values (PPRTVs) https://www.epa.gov/pprtv/provisional-peer-reviewed-toxicity-values-pprtvs-assessments
- Office of Water Health Advisories (HAs) or Health Effect Support Documents (HESDs)
  - https://www.epa.gov/sdwa/epa-non-regulatory-health-based-drinking-water-levels

Other Health Data Sources

(slide 2 of 2)

- Agency for Toxic Substances and Disease Registry (ATSDR)
  - https://www.atsdr.cdc.gov/az/a.html
- World Health Organization (WHO)
  - https://www.who.int/gho/en/
- Health Canada Guidelines for Canadian Drinking Water Quality (Health Canada)
  - https://www.canada.ca/en/health-canada/services/environmental-workplace-health/reports-publications/water-quality/guidelines-canadian-drinking-water-quality-summary-table.html
- California Environmental Protection Agency's (CalEPA) Public Health Goals (PHGs)
  - https://oehha.ca.gov/water/public-health-goals-phgs
- Minnesota Department of Health (MN DOH) Human Health-Based Water Guidance Table
  - https://www.health.state.mn.us/communities/environment/risk/guidance/gw/table.html

Occurrence Data Sources

(slide 1 of 2)

Finished Drinking Water Data

- Unregulated Contaminant Monitoring Rule (UCMR) (2001 - current)
- Unregulated Contaminant Monitoring (UCM) Round 1 and 2 (1988 - 1997)
- National Inorganics and Radionuclides Survey (NIRS) (1984 – 1986)
- U.S. Department of Agriculture (USDA) Pesticide Data Program (PDP)
- Small-Scale Local Occurrence Studies

Occurrence Data Sources

(slide 2 of 2)

Supplemental Drinking Water and Ambient Water Data

- U.S. Geological Survey (USGS), Ambient Water
  - National Water Quality Assessment Program (NAWQA)
  - National Water Information System (NWIS)
  - Special reports
- U.S. Department of Agriculture (USDA) Pesticide Data Program (PDP)
- Other specialized studies and literature

Metals

EPA Method 200.7[1] (ICP-AES), 1994

Determination of Metals and Trace Elements in Water and Wastes by Inductively Coupled Plasma-Atomic Emission Spectrometry (ICP-AES)

Contaminant Name	PCCL 5/CCL 5 Status	EPA Health Assessment Availability	Occurrence Data Availability
Boron[2]	CCL 5	Yes	National finished[3] and ambient water

[1] Additional PCCL 5 contaminants are also included in this method scope. These include calcium, magnesium, phosphorus, potassium, sodium, and tin.
[2] Boron also has available Standard Methods (SM): SM 3120 B, SM 4500-B B, and SM 4500-B C.
[3] Boron has national finished drinking water occurrence data from the National Inorganics and Radionuclides Survey (NIRS) conducted between 1984 and 1986.

Chlorinated Acids

EPA Method 515.3, 515.4 (LLE-GC/ECD), 1996, 2000

Determination of Chlorinated Acids in Drinking Water by Liquid-liquid Microextraction, Derivatization, and Fast Gas Chromatography With Electron Capture Detection (LLE-GC/ECD)

Contaminant Name	PCCL 5/CCL 5 Status	EPA Health Assessment Availability	Occurrence Data Availability
2,4-Dichlorophenoxybutyric acid (2,4-DB)	PCCL 5	Yes	Non-national finished and ambient
Bentazon	PCCL 5	Yes	Non-national finished and national ambient
Dicamba	PCCL 5	Yes	Non-national finished and national ambient
Lactofen	PCCL 5	Yes	Non-national finished and national ambient

Chlorinated Acids

EPA Method 555 (HPLC), 1992

Determination of Chlorinated Acids in Water By High Performance Liquid Chromatography (HPLC), with a Photodiode Array Ultraviolet Detector

Contaminant Name	PCCL 5/CCL 5 Status	EPA Health Assessment Availability	Occurrence Data Availability
2-(2-Methyl-4-chlorophenoxy)propionic acid (MCPP)	PCCL 5	Yes	Non-national finished and ambient
2-Methyl-4-chlorophenoxyacetic acid (MCPA)	PCCL 5	Yes	Non-national finished and national ambient
2,4-Dichlorophenoxybutyric acid (2,4-DB)	PCCL 5	Yes	Non-national finished and ambient
Bentazon	PCCL 5	Yes	Non-national finished and national ambient
Dicamba	PCCL 5	Yes	Non-national finished and national ambient

Triazine Pesticides and Degradates

EPA Method 523 (GC/MS), 2011

Determination of Triazine Pesticides and their Degradates in Drinking Water by Gas Chromatography/Mass Spectrometry (GC/MS)

Contaminant Name	PCCL 5/CCL 5 Status	EPA Health Assessment Availability	Occurrence Data Availability
6-Chloro-1,3,5-triazine-2,4-diamine (Atrazine-desethyl-desisopropyl)	CCL 5	Yes	Non-national finished and national ambient
Desethylatrazine (Atrazine-desethyl)	CCL 5	Yes	Non-national finished and national ambient
Desisopropylatrazine (Atrazine-desisopropyl)	CCL 5	Yes	Non-national finished and national ambient
Propazine	CCL 5	Yes	Non-national finished and national ambient
Ametryn	PCCL 5	Yes	Non-national finished and national ambient
Prometryn	PCCL 5	Yes	Non-national finished and national ambient

Volatile Organics

EPA Method 524.2, 524.3, 524.4[1] (GC/MS), 1995, 2009, 2013

Measurement of Purgeable Organic Compounds in Water by Capillary Column Gas Chromatography/Mass Spectrometry (GC/MS) Using Nitrogen Purge Gas

Contaminant Name	PCCL 5/CCL 5 Status	EPA Health Assessment Availability	Occurrence Data Availability
1,2,4-Trimethylbenzene	CCL 5	Yes	Non-national finished and national ambient
1,1,2,2-Tetrachloroethane	PCCL 5	Yes	Non-national finished and national ambient
1,3-Dichloropropene (cis- & trans-)[2]	PCCL 5	Yes	Non-national finished and ambient
Carbon disulfide	PCCL 5	Yes	Non-national finished and national ambient
Isopropylbenzene (Cumene)	PCCL 5	Yes	Non-national finished and national ambient
Naphthalene	PCCL 5	Yes	Non-national finished and national ambient

[1] EPA method 524.4 method technology uses nitrogen purge gas. EPA methods 524.2 and 524.3 method technology uses helium gas.
[2] EPA determined cis- & trans-1,3-dichloropropene will be evaluated as total 1,3-dichloropropene (cis- & trans-) with a CASRN of 542-75-6.

Semivolatile Organics (slide 1 of 2)

EPA Method 525.2, 525.3 (GC/MS), 1995, 2012

Determination of Semivolatile Organic Chemicals in Drinking Water by Solid Phase Extraction and Capillary Column Gas Chromatography/Mass Spectrometry (GC/MS)

Contaminant Name	PCCL 5/CCL 5 Status	EPA Health Assessment Availability	Occurrence Data Availability
Norflurazon	CCL 5	Yes	Non-national finished and national ambient
Phorate	CCL 5	Yes	Non-national finished and national ambient
Propazine	CCL 5	Yes	Non-national finished and national ambient
Ametryn	PCCL 5	Yes	Non-national finished and national ambient
Bromacil	PCCL 5	Yes	Non-national finished and national ambient
Butyl benzyl phthalate	PCCL 5	Yes	Non-national finished and national ambient
Chlorothalonil	PCCL 5	Yes	Non-national finished and national ambient
Cycloate	PCCL 5	Yes	Non-national finished and national ambient
Dichlorvos	PCCL 5	Yes	Non-national finished and national ambient
Diethyl phthalate	PCCL 5	Yes	Non-national finished and national ambient
Di-n-butyl phthalate	PCCL 5	Yes	Non-national finished and national ambient

Semivolatile Organics (slide 2 of 2)

EPA Method 525.2, 525.3 (GC/MS), 1995, 2012

Determination of Semivolatile Organic Chemicals in Drinking Water by Solid Phase Extraction and Capillary Column Gas Chromatography/Mass Spectrometry (GC/MS)

Contaminant Name	PCCL 5/CCL 5 Status	EPA Health Assessment Availability	Occurrence Data Availability
Hexazinone	PCCL 5	Yes	Non-national finished and national ambient
Isophorone	PCCL 5	Yes	Non-national finished and national ambient
Metribuzin	PCCL 5	Yes	Non-national finished and national ambient
N,N-Diethyl-m-toluamide (DEET)	PCCL 5	No*	Non-national finished and national ambient
Phenanthrene	PCCL 5	No*	Non-national finished and national ambient
Prometryn	PCCL 5	Yes	Non-national finished and national ambient
Pronamide	PCCL 5	Yes	Non-national finished and national ambient
Pyrene	PCCL 5	Yes	Non-national finished and national ambient
Tebuthiuron	PCCL 5	Yes	Non-national finished and national ambient
Trifluralin	PCCL 5	Yes	Non-national finished and national ambient

* EPA health assessment unavailable but contaminant has additional health information that can be found in Appendix B.

Select Pesticides and Flame Retardants

EPA Method 527 (GC/MS), 2005

Determination of Selected Pesticides and Flame Retardants in Drinking Water by Solid Phase Extraction and Capillary Column Gas Chromatography/ Mass Spectrometry (GC/MS)

Contaminant Name	PCCL 5/CCL 5 Status	EPA Health Assessment Availability	Occurrence Data Availability
Malathion	CCL 5	Yes	Non-national finished and national ambient
Norflurazon[1]	CCL 5	Yes	Non-national finished and national ambient
Propazine	CCL 5	Yes	Non-national finished and national ambient
Bifenthrin	PCCL 5	Yes	Non-national finished and national ambient
Bromacil	PCCL 5	Yes	Non-national finished and national ambient
Esfenvalerate[1]	PCCL 5	Yes	Non-national finished and national ambient
Hexazinone	PCCL 5	Yes	Non-national finished and national ambient
Prometryn	PCCL 5	Yes	Non-national finished and national ambient
Thiobencarb	PCCL 5	Yes	Non-national finished and national ambient

[1] EPA Method 527 identifies there are potential method analysis issues with these compounds

Phenols

EPA Method 528 (GC/MS), 2000

Determination of Phenols in Drinking Water by Solid Phase Extraction and Capillary Column Gas Chromatography/Mass Spectrometry (GC/MS)

Contaminant Name	PCCL 5/CCL 5 Status	EPA Health Assessment Availability	Occurrence Data Availability
Phenol	PCCL 5	Yes	Non-national finished and national ambient

N-Methylcarbamoyloximes and N-Methylcarbamates

EPA Method 531.1, 531.2 (HPLC), 1995, 2001

Measurement of N-Methylcarbamoyloximes and N-Methylcarbamates in Water by Direct Aqueous Injection High Performance Liquid Chromatography (HPLC) with Postcolumn Derivatization

Contaminant Name	PCCL 5/CCL 5 Status	EPA Health Assessment Availability	Occurrence Data Availability
Carbaryl	CCL 5	Yes	Non-national finished and national ambient
Methomyl	CCL 5	Yes	Non-national finished and national ambient
Propoxur	CCL 5	Yes	Non-national finished and ambient

Phenylurea Compounds

EPA Method 532 (HPLC), 2000

Determination of Phenylurea Compounds in Drinking Water by Solid Phase Extraction and High Performance Liquid Chromatography (HPLC) with UV Detection

Contaminant Name	PCCL 5/CCL 5 Status	EPA Health Assessment Availability	Occurrence Data Availability
Fluometuron	CCL 5	Yes	Non-national finished and national ambient
Propanil	CCL 5	Yes	Non-national finished and ambient
Tebuthiuron	PCCL 5	Yes	Non-national finished and national ambient

Herbicide Degradates

EPA Method 535 (LC/MS/MS), 2005

Measurement of Chloroacetanilide and Other Acetamide Herbicide Degradates in Drinking Water by Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometry (LC/MS/MS)

Contaminant Name	PCCL 5/CCL 5 Status	EPA Health Assessment Availability	Occurrence Data Availability
Dimethenamid oxanilic acid (OA)	PCCL 5	No*	Non-national finished and national ambient

* EPA health assessment unavailable but contaminant has additional health information that can be found in Appendix B.

Organics

EPA Method 538 (DAI-LC/MS/MS), 2009

Determination of Selected Organic Contaminants in Drinking Water by Direct Aqueous Injection-Liquid Chromatography/Tandem Mass Spectrometry (DAI-LC/MS/MS)

Contaminant Name	PCCL 5/CCL 5 Status	EPA Health Assessment Availability	Occurrence Data Availability
Acephate	CCL 5	Yes	National ambient
Dicrotophos	CCL 5	Yes	Non-national finished and national ambient

Organics

EPA Method 540 (LC/MS/MS), 2013

Determination of Selected Organic Chemicals in Drinking Water by Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometry (LC/MS/MS)

Contaminant Name	PCCL 5/CCL 5 Status	EPA Health Assessment Availability	Occurrence Data Availability
Bensulide	CCL 5	Yes	Non-national ambient
Methomyl	CCL 5	Yes	Non-national finished and national ambient

Pharmaceuticals

EPA Method 542 (LC/ESI-MS/MS), 2016

Determination of Pharmaceuticals and Personal Care Products in Drinking Water by Solid Phase Extraction and Liquid Chromatography Electrospray Ionization Tandem Mass Spectrometry (LC/ESI-MS/MS)

Contaminant Name	PCCL 5/CCL 5 Status	EPA Health Assessment Availability	Occurrence Data Availability
Carbamazepine	PCCL 5	No*	Non-national finished and national ambient
Diazepam	PCCL 5	No*	Non-national finished and national ambient
Fluoxetine	PCCL 5	No*	Non-national finished and national ambient
Gemfibrozil	PCCL 5	No*	Non-national finished and ambient
Sulfamethoxazole	PCCL 5	No*	Non-national finished and national ambient
Triclosan	PCCL 5	Yes	Non-national finished and national ambient

* EPA health assessment unavailable but contaminant has additional health information that can be found in Appendix B.

Aromatic Hydrocarbons

EPA Method 550, 550.1 (HPLC), 1990

Determination of Polycyclic Aromatic Hydrocarbons in Drinking Water by Liquid-Solid Extraction and High Performance Liquid Chromatography (HPLC) with Coupled Ultraviolet and Fluorescence Detection

Contaminant Name	PCCL 5/CCL 5 Status	EPA Health Assessment Availability	Occurrence Data Availability
Fluoranthene	PCCL 5	Yes	Non-national finished and national ambient
Naphthalene	PCCL 5	Yes	Non-national finished and national ambient
Phenanthrene	PCCL 5	No*	Non-national finished and national ambient
Pyrene	PCCL 5	Yes	Non-national finished and national ambient

* EPA health assessment unavailable but contaminant has additional health information that can be found in Appendix B.

Nonylphenol and 4-Tert-Octylphenol

EPA Method 559 (LC/MS/MS), 2020

Determination of Nonylphenol and 4-Tert-Octylphenol in Drinking Water by Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometry (LC/MS/MS)

Contaminant Name	PCCL 5/CCL 5 Status	EPA Health Assessment Availability	Occurrence Data Availability
Nonylphenol[1]	CCL 5	No*	Non-national finished and national ambient
4-tert-Octylphenol	PCCL 5	No*	Non-national finished and national ambient

[1] EPA method 559 reports technical nonylphenol (CASRN 84852-15-3), comprised mostly of branched C9-alkyl phenols, and not linear nonylphenol (CASRN 104-40-5) which is a laboratory generated chemical not typically found in the environment. CCL 5 lists a general version of nonylphenol with a different CASRN.

* EPA health assessment unavailable but contaminant has additional health information that can be found in Appendix B.

Pesticides

Draft EPA Method 562[1] (LC/MS/MS)

Determination of Selected Pesticides in Drinking Water by Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometry (LC/MS/MS)

Contaminant Name[2]	PCCL 5/CCL 5 Status	EPA Health Assessment Availability	Occurrence Data Availability
Bromoxynil	CCL 5	Yes	Non-national finished and national ambient
Carbendazim	CCL 5	Yes	Non-national finished and national ambient
Fipronil	CCL 5	Yes	Non-national finished and national ambient
Flufenacet	CCL 5	Yes	Non-national finished and national ambient
Iprodione	CCL 5	Yes	Non-national finished and national ambient
Thiamethoxam	CCL 5	Yes	Non-national finished and national ambient
Clothianidin	PCCL 5	Yes	Non-national finished and national ambient

[1] The EPA methods in development may or may not be validated before UCMR 6; these methods may be candidates for future UCMR cycles.

Purgeable Organic Compounds

Draft EPA Method[1] (GC/MS)

Measurement of Purgeable Organic Compounds in Water by Capillary Column Gas Chromatography/Mass Spectrometry (GC/MS)

Contaminant Name	PCCL 5/CCL 5 Status	EPA Health Assessment Availability	Occurrence Data Availability
1,2,4-Trimethylbenzene	CCL 5	Yes	Non-national finished and national ambient
1,2,3-Trichloropropane	CCL 5	Yes	National finished[2] and ambient

[1] The EPA methods in development may or may not be validated before UCMR 6; these methods may be candidates for future UCMR cycles.

[2] 1,2,3-trichloropropane has national finished drinking water occurrence data from UCMR 3 (2013-2015). Its UCMR 3 MRL was above the 10^{-6} cancer risk concentration, so EPA is pursuing the development of a method that would support measurements at lower concentrations.

Break

Appendices

- Appendix A: Data Definitions
- Appendix B: Contaminants Under Consideration: Background, Health, and Occurrence Information
- Appendix C: Abbreviations and Acronyms

Questions Specific to this Presentation

- Click on “?” in the upper part of the control panel (Figure 1) to submit questions or comments
  - Type a question in the box, click send (Figure 2)
- Submit your questions throughout the webinar
  - Questions will be answered on an individual basis throughout the presentation
  - Common and clarifying questions will be shared with the group or discussed after the breaks

Figure 1

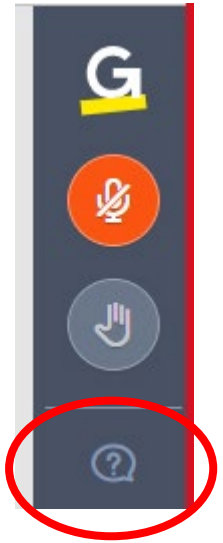
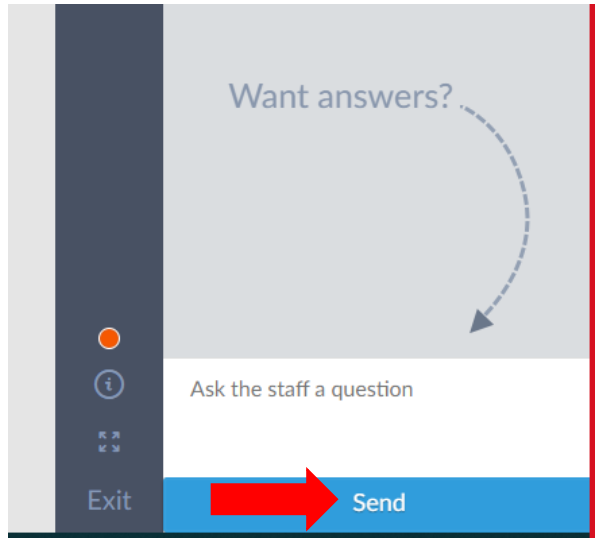
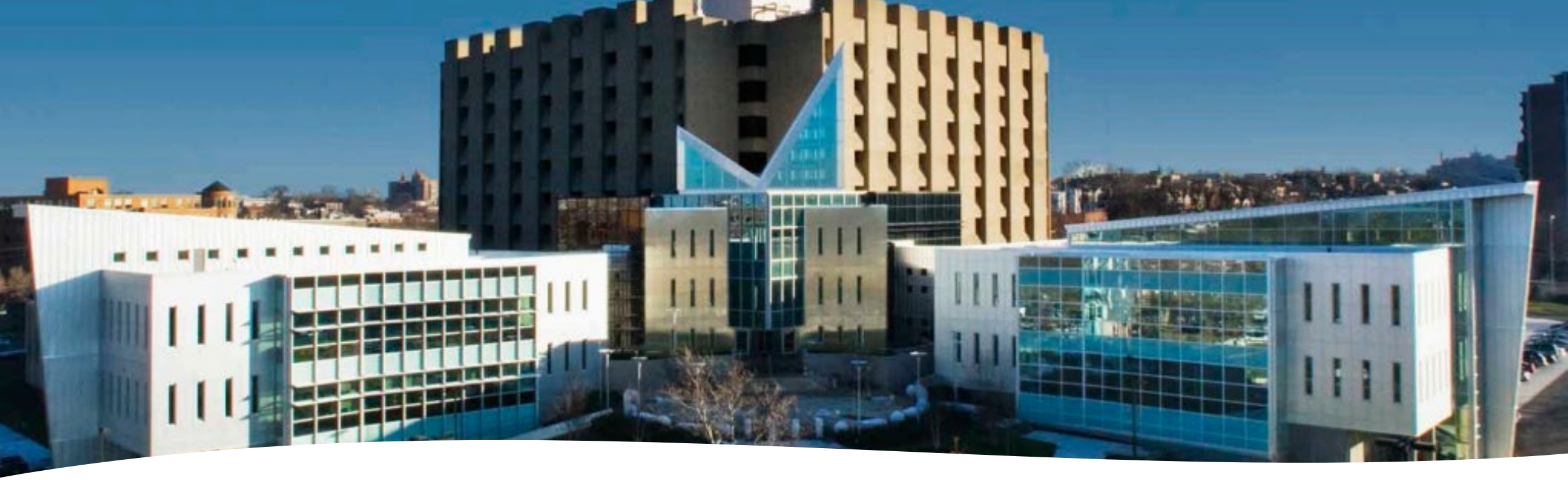


Figure 2





Questions and Discussion

- Statements from participants that registered ahead of time
- Statements from other participants
  - Subject to availability of time
- Additional statements or questions from attendees can be provided to the EPA via email: UCMRWebinar@cadmusgroup.com after the public meeting and webinar

Unregulated Contaminant Monitoring Rule 6

EPA Webinar April 17, 2024

Erik D. Olson
Senior Strategic Director for Health
NRDC (Natural Resources Defense Council)

- **UCMR 6:**

NRDC Has 5 Major Recommendations:

Recommendation #1.

Approve Methods and Require Monitoring for a Broader Array of PFAS Including a Method to Measure Total Organofluorine And a Revised Method 533

Photo: USGS

UCMR 6

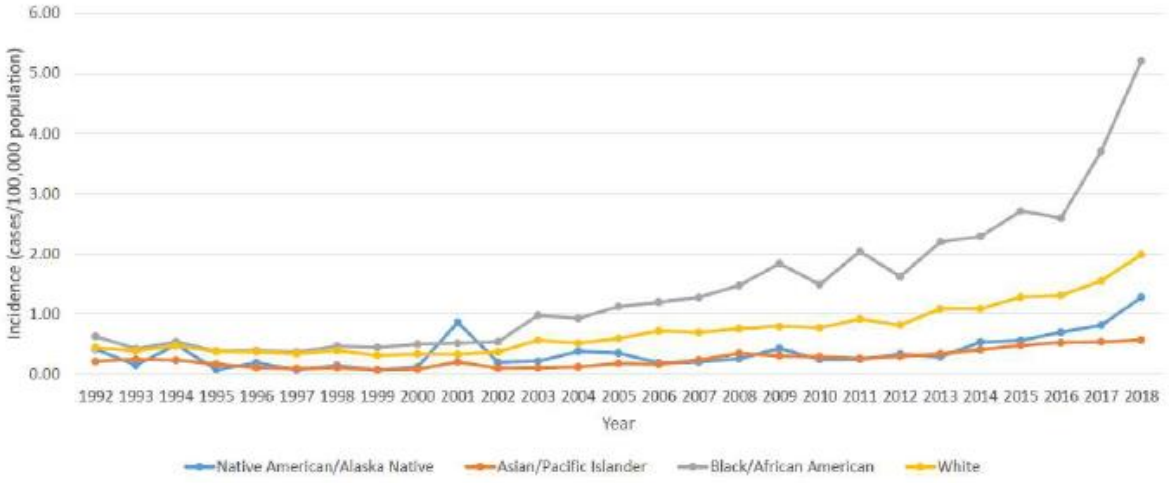
Recommendations (continued)

Recommendation #2.

Approve Methods and Require Monitoring in UCMR 6 for Both a Broad Assay for Legionella spp. and a Specific Assay for L. pneumophila.

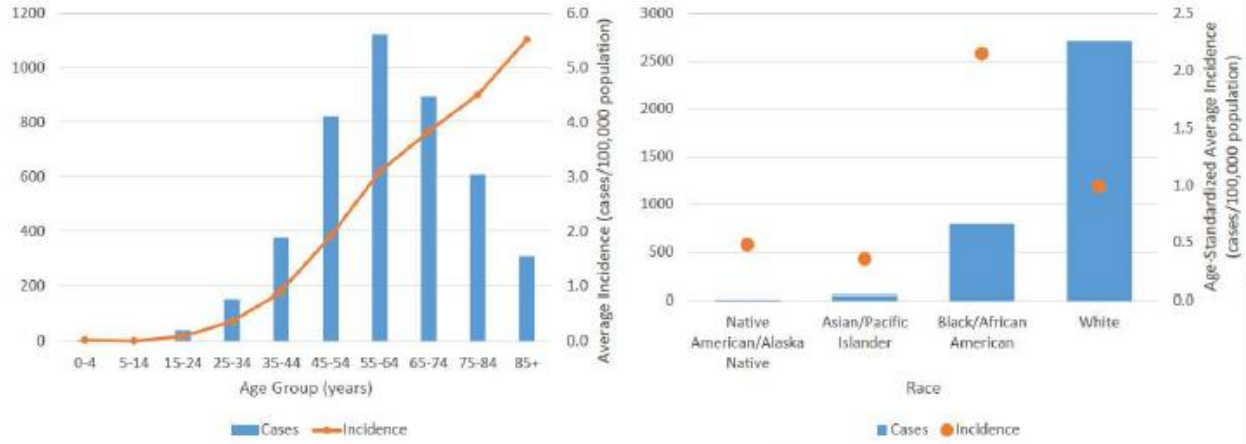
Photo: CDC on Backplash

Figure 1: Age-Standardized Incidence of Legionella by Race & Year



Barskey AE, et al. Rising Incidence of Legionnaires' Disease and Associated Epidemiologic Patterns, United States, 1992–2018. *Emerg Infect Dis*. 2022 Mar;28(3):527-538. 22

Figure 2: Legionella Cases & Incidence by Age & Race

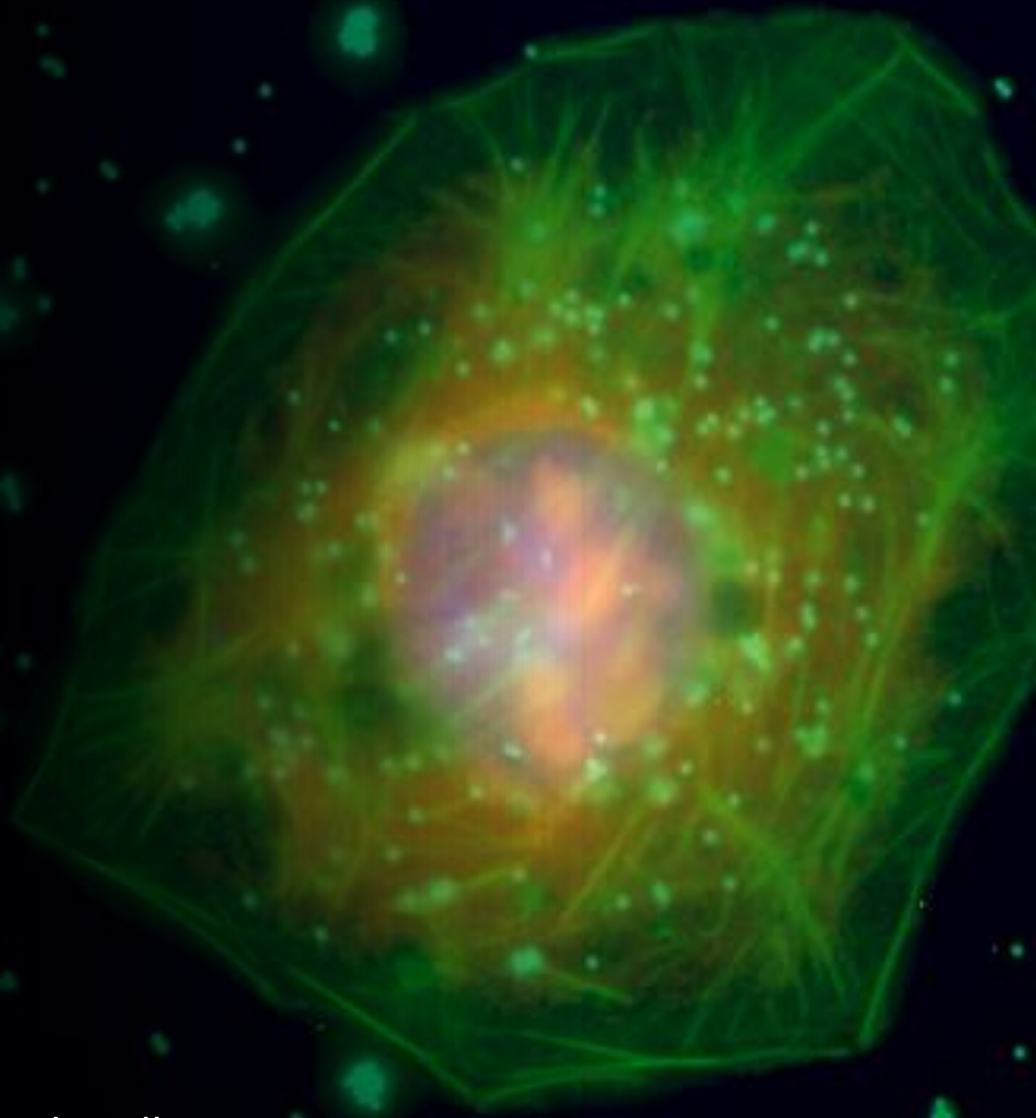


Barskey AE, et al. Rising Incidence of Legionnaires' Disease and Associated Epidemiologic Patterns, United States, 1992–2018. *Emerg Infect Dis*. 2022 Mar;28(3):527-538. 21

UCMR 6
Recommendations (Continued)

Recommendation #3.

Approve Methods and Require Monitoring in UCMR 6 for Microplastics.



Microplastics that have penetrated inside cells

The image shows microplastics with a diameter of 0.5 µm (small green spheres) penetrating the cytoplasm of MH-22a hepatocyte cells. ZEISS Axio Imager 2. Karimov Denis, Valova Iana, Creative Commons Attribution 4.0

UCMR 6

Recommendations (continued)

Recommendation #4.

Require Monitoring in UCMR 6 for Hexavalent Chromium

Eurofins-Using UCMR 3 Data

UCMR 6 Recommendations (continued)

Recommendation #5

Ensure that EPA-Approved Method for Four Haloacetonitriles Have Low MRLs, and Require Monitoring for them in UCMR 6

Photo: Johnny McClung, Upsplash

Conclusion

1. Approve Methods and Require Monitoring for a Broader Array of PFAS Including a Method to Measure Total Organofluorine And a Revised Method 533

2. Approve Methods and Require Monitoring in UCMR 6 for Both a Broad Assay for Legionella spp. and a Specific Assay for L. pneumophila.

3. Approve Methods and Require Monitoring in UCMR 6 for Microplastics.

4. Require Monitoring in UCMR 6 for Hexavalent Chromium

5. Ensure that EPA-Approved Method for Four Haloacetonitriles Have Low MRLs and Require Monitoring for them in UCMR 6.

Thank You

Erik D. Olson
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Unregulated Contaminant Monitoring Rule 6

EPA Webinar April 18, 2024

Katie Pelch
Scientist
NRDC (Natural Resources Defense Council)

Contents lists available at ScienceDirect

Science of the Total Environment

journal homepage: www.elsevier.com/locate/scitotenv

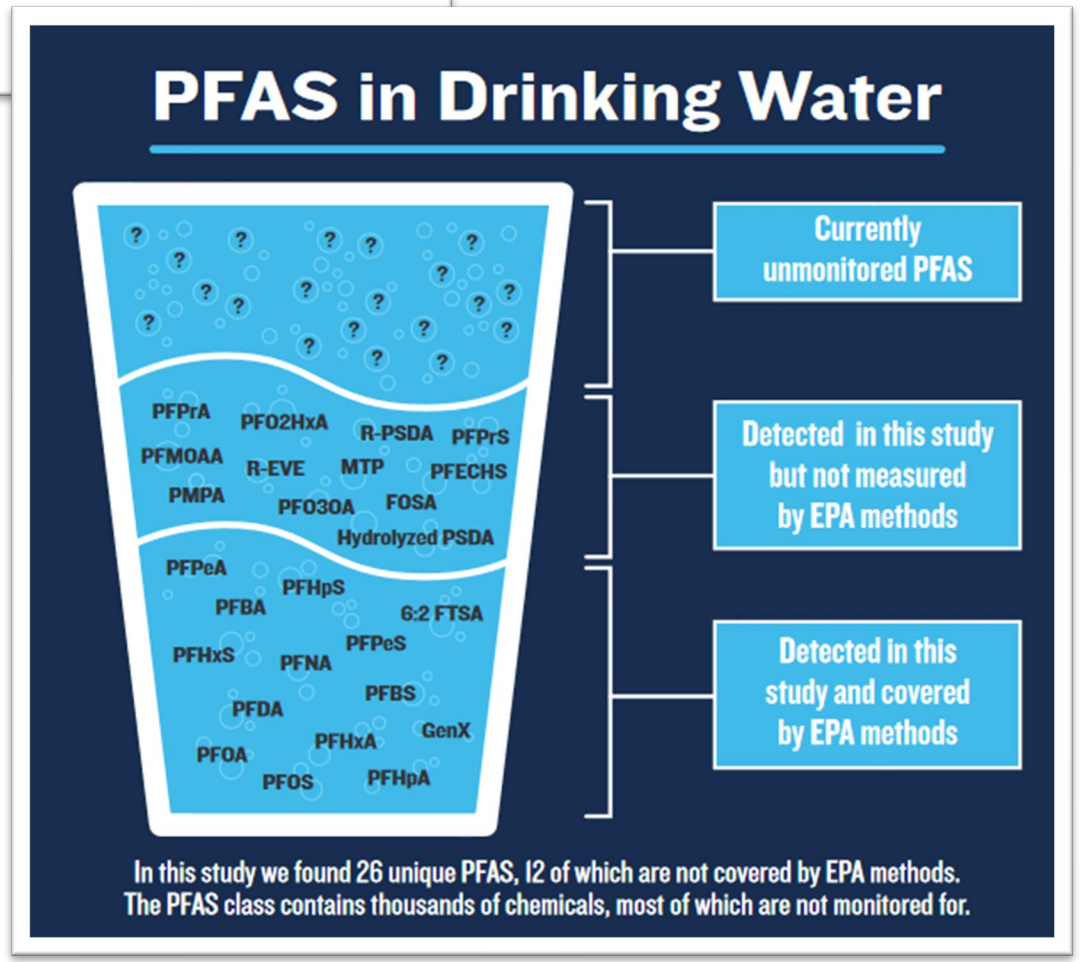
Short Communication

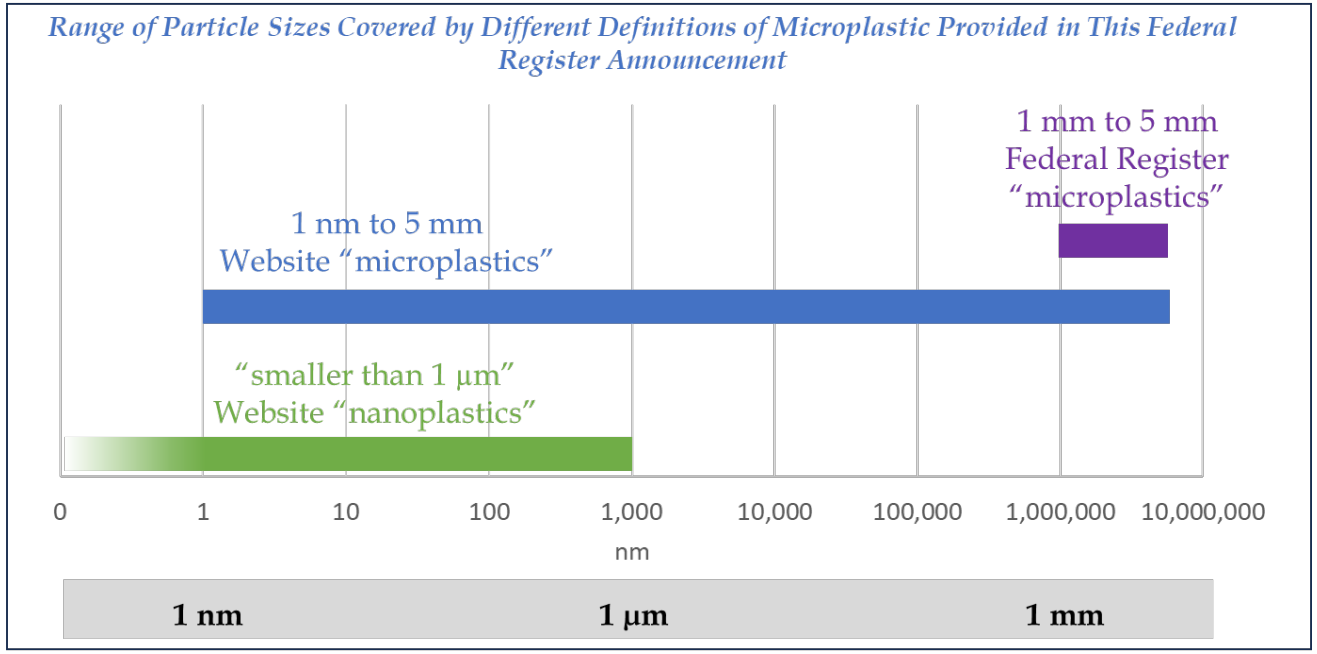
70 analyte PFAS test method highlights need for expanded testing of PFAS in drinking water

Katherine E. Pelch [a], Taryn McKnight [b], Anna Reade [a,*]

[a] Natural Resources Defense Council, 111 Sutter St. Floor 20, San Francisco, CA 94104, USA
[b] Eurofins Environment Testing, 880 Riverside Parkway, West Sacramento, CA 95605, USA

- EPA should validate an expanded Method 533 that covers at a minimum the 40 PFAS included in Method 1633, but preferentially the 70 PFAS covered by multiple commercial laboratories.
- EPA should validate a sensitive total organofluorine method for use in drinking water.

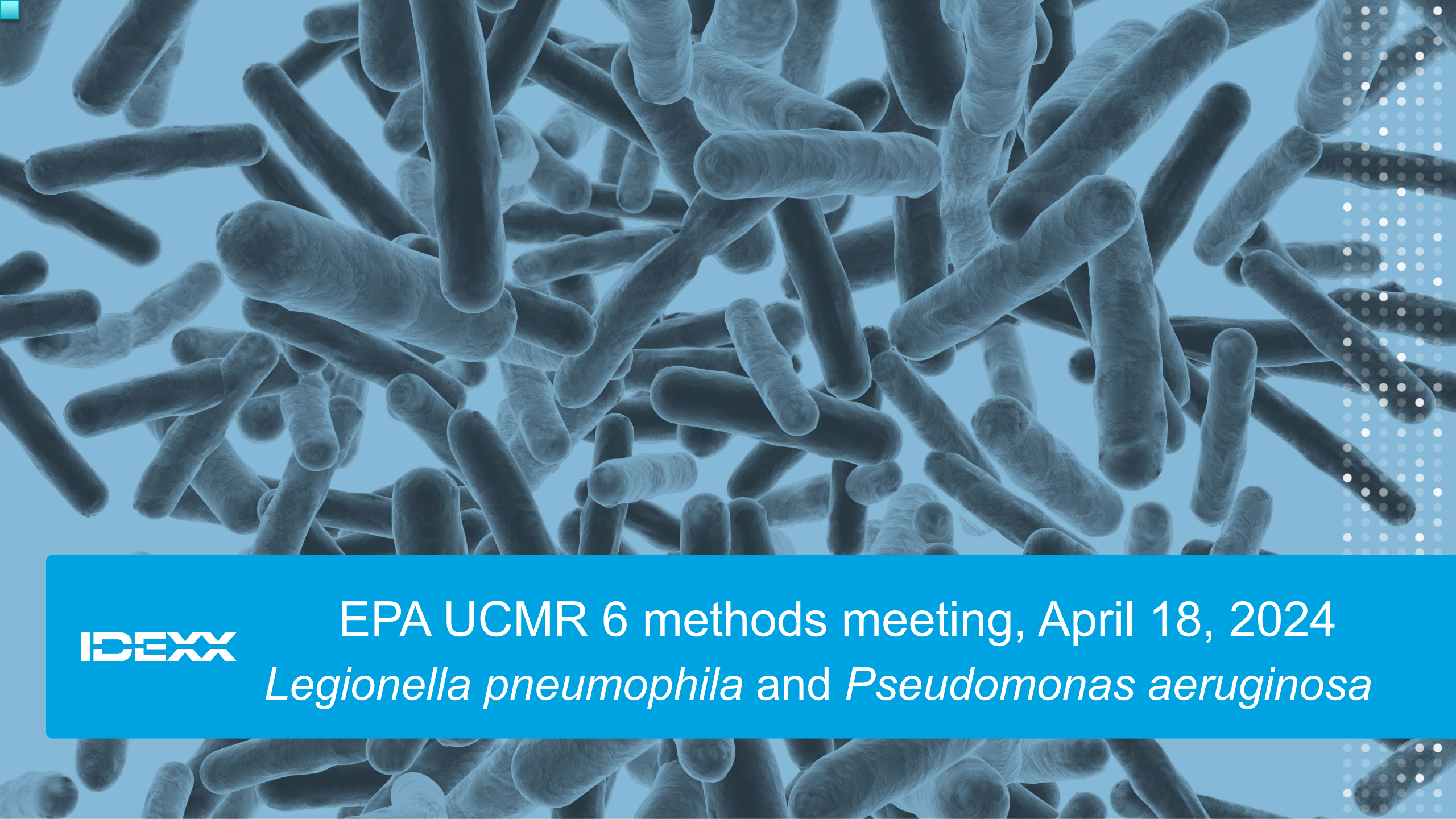




- EPA should validate methods that can detect and quantify smaller microplastics, less than 20 µm.
- EPA should also aim to validate methods for the detection and quantification of microplastics:
  - that are labor and time efficient,
  - that include tire road wear particles, and
  - that include weathered microplastics.

Thank You

Katie Pelch
kpelch@nrdc.org

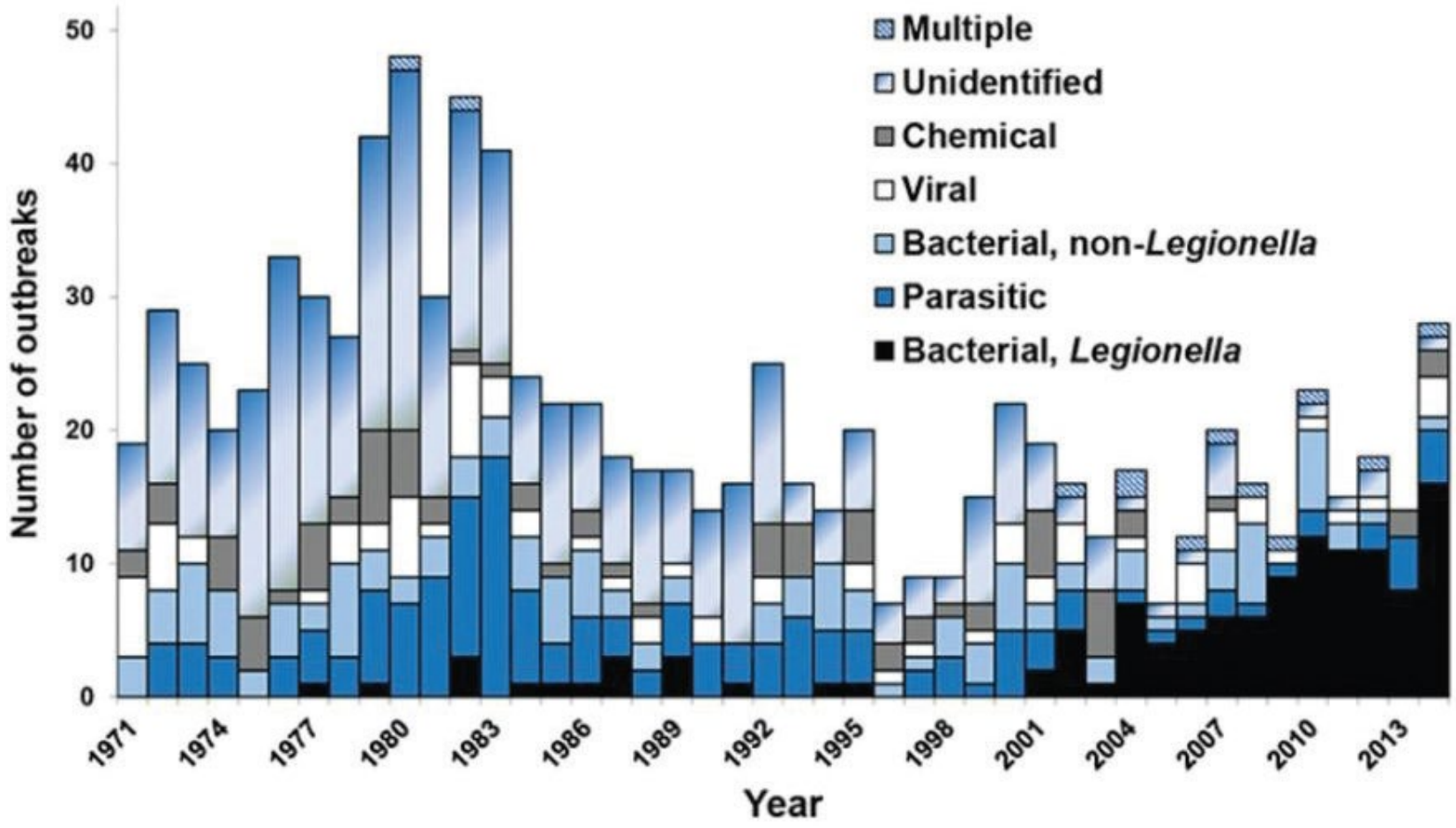


IDEXX

EPA UCMR 6 methods meeting, April 18, 2024

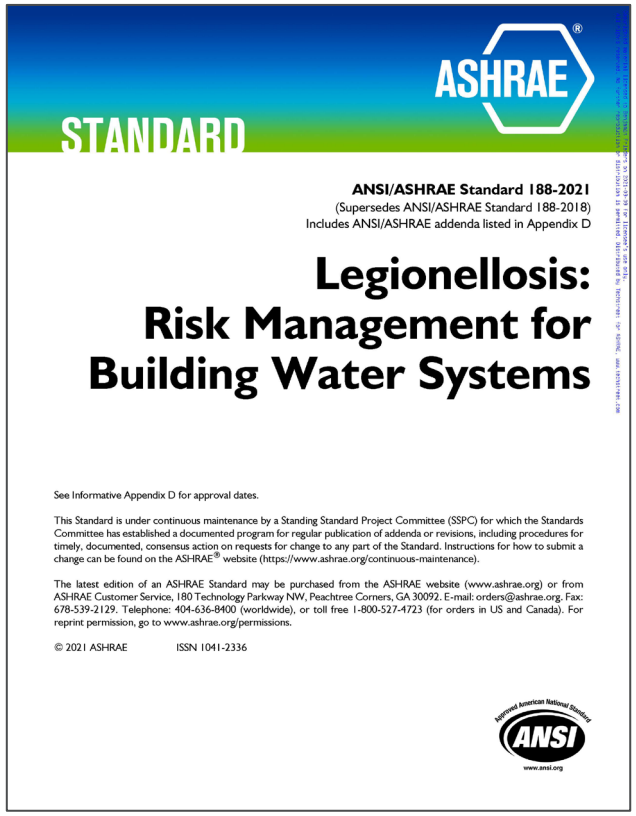
Legionella pneumophila and *Pseudomonas aeruginosa*

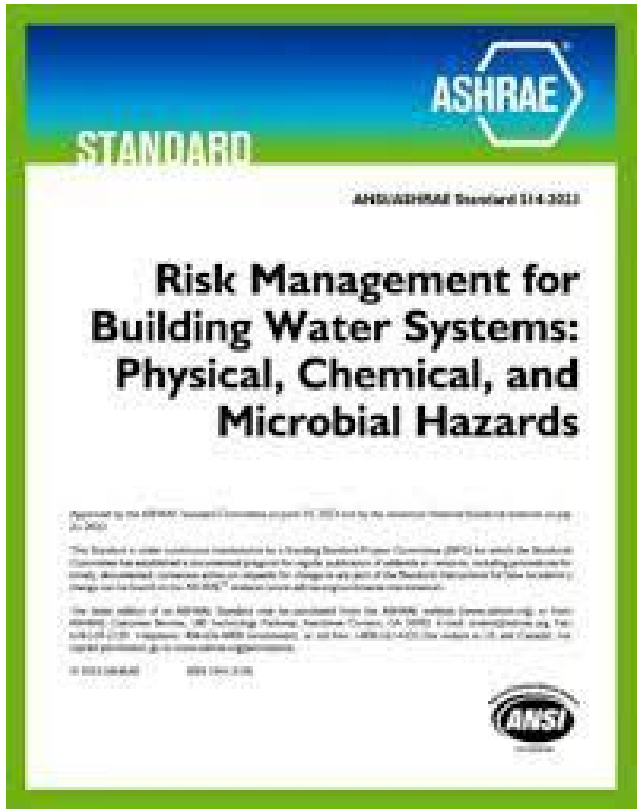
L. pneumophila is now the most common cause of reported drinking water-associated outbreaks



Sources: Benedict et. al., 2017. All sources available on request.

Building owners are already using water management plans to reduce pathogen disease risk





Public water customers are already using WMPs

- **Building owners are already asking their public water systems what they are doing**
- **Recent studies** show that pathogens are present in public water systems, in low levels
- **ASHRAE 188** focus is Legionella
- **ASHRAE 514** focus is *P. aeruginosa* and HPC + other risks

UCMR 6 monitoring could be the most effective way to understand and reduce overall risk

"The potential for finding an opportunistic pathogen in the utility's water system will be a major concern for the legal department whose job it is to protect the utility from risk. However, not knowing about *L. pneumophila* risks has its own set of issues, particularly when simple methods are available and corrective actions can readily be implemented. Overall, **the utility is better protected by identifying and dealing with risks than ignoring them.**"

- LeChevallier, 2020

Focus on *L. pneumophila* in the distribution system is increasing

- **WRF Study # 5118:** Understanding the Mechanisms of Chlorine and Chloramine Impact on Opportunistic Pathogens in Distribution Systems
- **WRF Study # 5156:** Occurrence of Legionella spp. [Lp] in Drinking Water Distribution Systems

Best practices for utilities are evolving but becoming clearer

NASEM Report on Legionella

Utilities should maintain “a disinfectant residual throughout public water systems and validate the treatment performance by **routine monitoring for *Legionella pneumophila*** from water samples representative of the distribution system”

How to implement routine monitoring?

- **Distribution System Handbook:** Developing a drinking water *Legionella pneumophila* monitoring program
- **WRF Project #4664:** Customer Messaging on Opportunistic Pathogens in Plumbing Systems
- **Health Education and Public Health article:** Guidance on Developing a *Legionella pneumophila* Monitoring Program for Utility Distribution Systems
- **IDEXX Water Academy Course:** Developing a Legionella Monitoring Program Companion Course

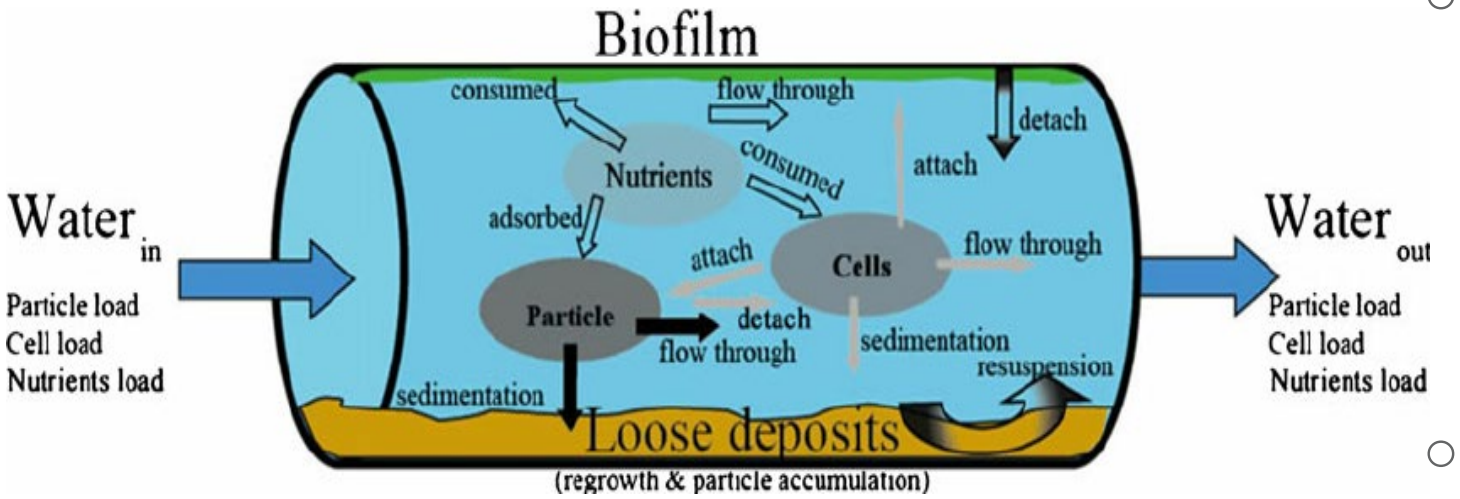
IDEXX

There are several goals that UCMR pathogen monitoring program could achieve

- To understand the adequacy of existing treatment
- To be able to better communicate with stakeholders, especially those who have implemented water management plans and testing
- To become familiar with methods for *Legionella pneumophila* and *Pseudomonas aeruginosa* monitoring
- To be consistent with internal water quality goals

There is one important goal a *P. aeruginosa* UCMR 6 monitoring program could achieve

Biofilm Mitigation, reduction of *Pseudomonas aeruginosa*



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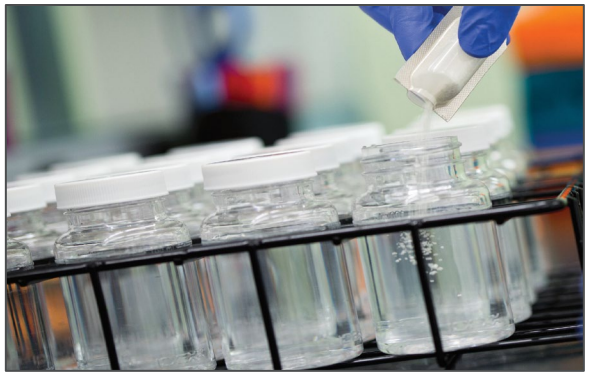
DOI:10.1007/s00253-013-5217-y

- The biofilm produced by *P. aeruginosa* makes a system difficult to disinfect and, as a result, is often where the *L. pneumophila* and other bacteria are found, making it an important target for UCMR 6 assessment.
- Understanding biofilm and *P. aeruginosa* can allow for addressing how to remove the opportunity and presence of several waterborne pathogens.

The Legiolert test method significantly simplifies testing, eliminating variability and opportunities for error

Step 1

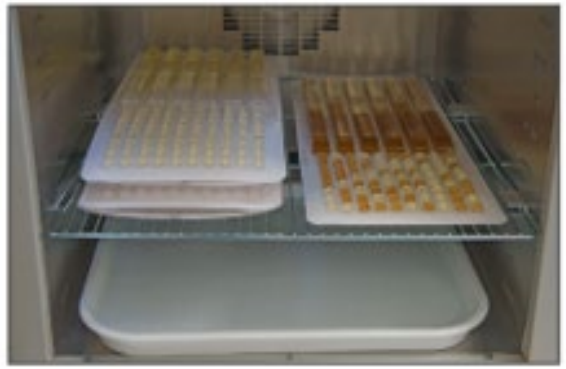


Combine sample with Legiolert reagent

Step 2

Pour mixture into Legiolert Quanti-Tray and seal

Step 3



Incubate for 7 days

Step 4

Read results:
Brown color and/or turbidity is a confirmed positive for *L. pneumophila*

The Pseudalert test method significantly simplifies testing, eliminating variability and opportunities for error

Step 1

Combine sample with Pseudalert reagent

Step 2

Add anti-foam to sample

Step 3

Pour mixture into Legiolert Quanti-Tray and seal

Step 4

Incubate for 24 hours

Step 5

Read results under 365 nm UV: Fluorescent wells are positive for *P. aeruginosa*

Legiolert is a standardized method

- **ASTM** method D8429-21: Standard Test Method for *Legionella pneumophila* in Water Samples Using Legiolert
- **UK's Standing Committee of Analysts, Blue Book**: *The determination of Legionella bacteria in waters and other environmental samples (2020) – Part 2 – Culture Methods for their detection and enumeration*
- **AFNOR NF Validation:** AFNOR certification for hot and cold sanitary water and cooling tower water (Reference No IDX 33/06 06/19)
- **Regulatory Approvals:**
  - Hungary
  - New Brunswick, Canada

Pseudalert is a standardized method

- **Standard Methods for the Examination of Water and Wastewater:** SM9213
- **International Organization for Standards (ISO):** ISO 16266-2:2018, *Water Quality – Detection and enumeration of Pseudomonas aeruginosa – Part 2: Most probable number method*
- **UK Standing Committee of Analysts (SCA) Blue Books**: *The Microbiology of Recreational and Environmental Waters (2015) – Part 7 - Methods for the isolation and enumeration of Aeromonas and Pseudomonas aeruginosa.*
- **UK Standing Committee of Analysts (SCA) Blue Books:** *The Microbiology of Drinking Water (2015) – Part 8 - Methods for the isolation and enumeration of Aeromonas and Pseudomonas aeruginosa*
- **AFNOR NF Validation:** AFNOR certification for the testing of water for *P. aeruginosa* (2016) (Reference No. IDX 33/05-03/16)
- **Regulatory Approvals:** Governmental regulatory approvals in 13 countries

Summary and Request

- *Legionella pneumophila* and *Pseudomonas aeruginosa* are well known, dangerous waterborne pathogens with high disease burden
- Drinking water systems can contribute to these organisms being in buildings and creating disease risk
- These waterborne pathogens contribute to significant disease burden and sometimes death
- Understanding, and then managing, the risk level can only be understood through thoughtful and targeted testing, such as is done under UCMR
- We strongly encourage EPA to add *L. pneumophila* and *P. aeruginosa* to UCMR 6 and use the validated, standardized methods described here

General CCL Comments

David Schiessel, Babcock Labs, Riverside CA
dschiessel@babcocklabs.com

- Recommend development of Ultra-Short Chain PFAS method either using HILIC of IC-MS/MS (similar to EPA 332)
  - Some labs have experience. Currently doing projects in drinking water
- Recommend development of PFAS method using GC-MS/MS (eg: FTOH class) for PFAS coverage
- Support development/implementation EPA 562 using SPE and LC-MS/MS
  - SPE and LC-MS/MS well understood by lab community leaders
- Support development/implementation of 1,2,3-TCP and other analytes by 524.x using SIM
  - Already support 1,2,3-TCP at 5ng/L
  - In CA, currently using a non-EPA method but same technology
- Mycobacterium – Recommend qPCR approach over MALDI-MS.
  - Use same technology as Legionella proposed technique
  - MALDI quantitative precision challenges (anecdotal experience)
  - Cost of MALDI equipment higher than qPCR (MALDI may be 2-3x the cost of qPCR)

EOF and AOF

- Performed analyte fate studies on relevant/emerging PFAS classes using both AOF and EOF
- Both EOF/AOF perform very well for common PFAS analyte lists (C4+ carboxylates, sulfonates C3+, FTS C6+) [1,2]
- Some important differences exist in chemical space captured
  - EOF identical chemical space to EPA 533 (same prep method)
  - AOF has orthogonal chemical space
- There is no OF method that captures everything (trade-offs)
- EOF may have lower achievable reporting levels, but misses relevant PFAS classes (study to be released 2024)

PFAS Class Suitability for EOF and AOF

Parameter	EOF (WAX)	AOF (GAC)
Perfluorosulfonamides (eg: PFOSA) toxic and occur in DW [3,4]	No – Lost at extract dryness	Yes – C4, C6, **C8**, C10 > 85%
Fluorotelomer alcohols (FTOH)	No – Lost via breakthrough	Yes – 6:2 and 8:2 FTOH >70%
Cationic PFAS (AFFF relevant)	No – quat N unretained on WAX	Yes – N-TAmP-FHxSA, N-AP-FHxSA, N-CMAmP-6:2FOSA >80%
Hexafluorophosphate PF_6^- (Not OF)	Yes – retained on WAX, and High Combust. Eff.	No
Tetrafluoroborate BF_4^- (Not OF)	Yes – retained on WAX	No

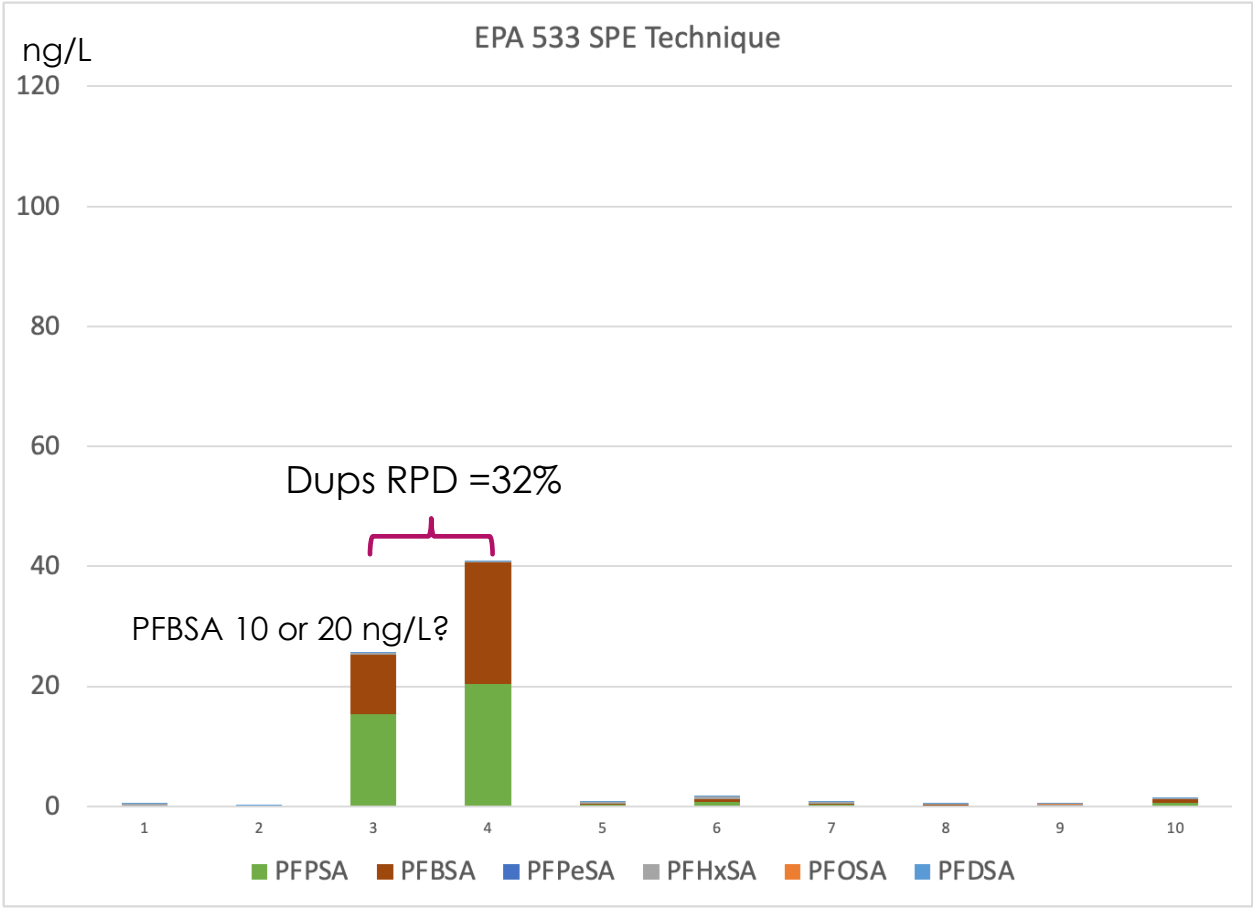
PFAS Class Suitability for EOF and AOF
(Edge Cases)

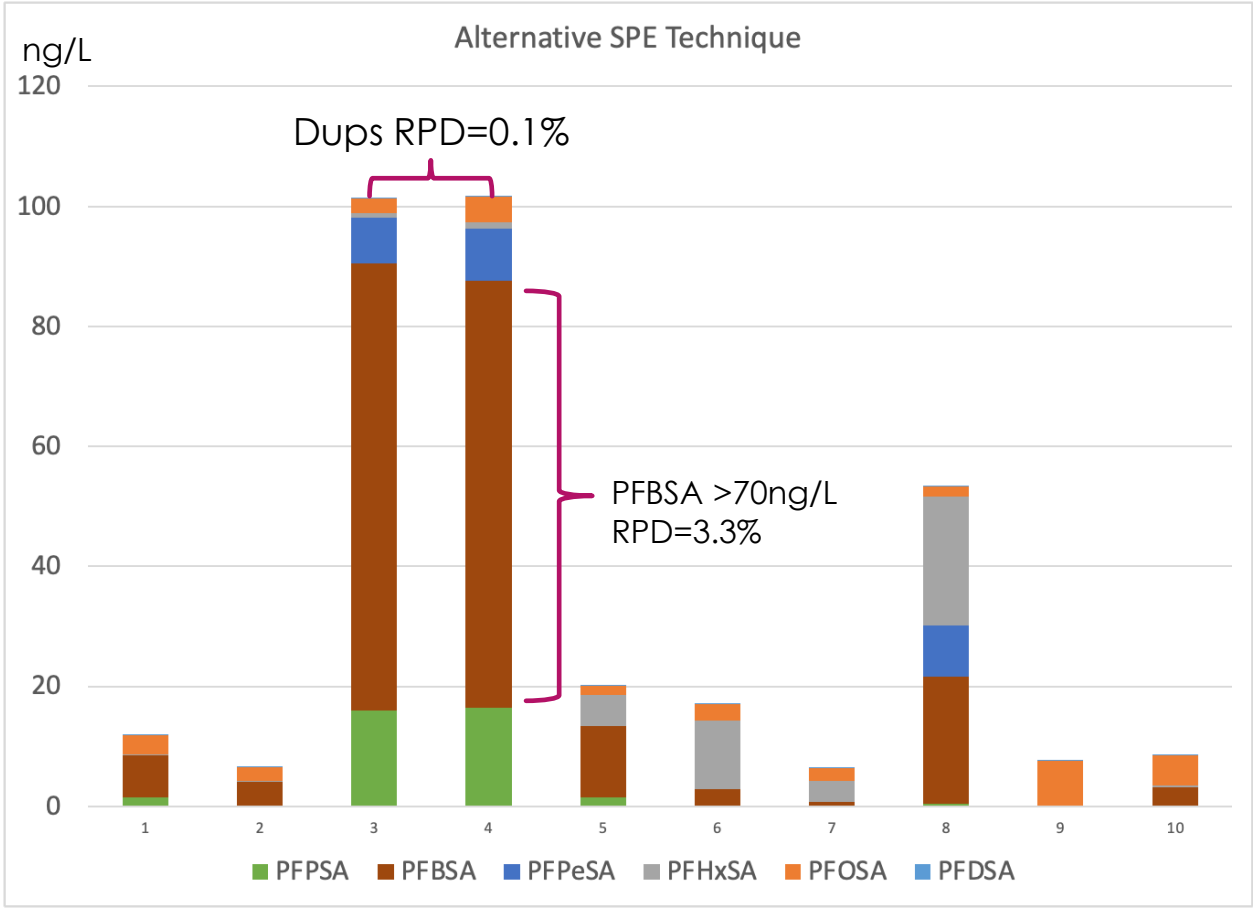
Parameter	EOF (WAX)	AOF (GAC)
Trifluoroacetic acid (TFA)	No – Lost in matrix spikes and during evap/drying	No - Breakthrough (conc dep.)
Perfluoropropanoic acid (PFPrA)	No – Lost in matrix spikes and during evap/drying	No - Breakthrough (conc dep.)
Trifluoromethanesulfonate (TFMS)	Yes	No – removed from nitrate F-removal
Perfluoroethanesulfonate (PFEtS)	Yes	No – removed from nitrate F-removal

- All these analytes may be performed by targeted methods using HILIC or IC-MS/MS
- Some don't meet certain definitions of PFAS

PF-Sulfonamides

Relevant class missed by complete dryness of extract
Detected PFOSA/PFBSA in 9 pre-treated groundwater samples using alternative technique





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Closing Remarks

Brenda Bowden, U.S. EPA

Thank you for participating in the UCMR discussion today

If You Have Questions Following This Webinar

- UCMR Homepage:
  - https://www.epa.gov/dwucmr
- EPA Contacts:
  - Brenda Bowden: bowden.brenda@epa.gov
  - Melissa Simic: simic.melissa@epa.gov
  - Rachel Kaiser: kaiser.rachel@epa.gov
- Lab Approval Program:
  - UCMR_Lab_Approval@epa.gov
- Safe Drinking Water Information:
  - https://www.epa.gov/ground-water-and-drinking-water/safe-drinking-water-information
- Meeting materials were sent to all registered participants
- If you did not receive a copy, please email UCMRwebinar@cadmusgroup.com and we will send you a copy

Thank You

Thank you for participating in the UCMR discussion today. If you have additional statements that you would like to make, please send them to UCMRWebinar@cadmusgroup.com after the public meeting and webinar.

Appendix A: Data Definitions

Overview

- Appendix A defines terms and identifies sources of health and occurrence data
- Persistence/Mobility/Fate/Transport Definitions
- Use/Production/Release Data Sources
- Health Sources of Information
  - EPA and Other Sources
  - Health Data Parameters
- Occurrence Data Sources
  - National and Non-National studies
  - Finished Drinking and Ambient Water

For more information on how these sources were utilized for CCL 5, refer to the CCL 5 Technical Support Documents at https://www.epa.gov/ccl/ccl-5-technical-support-documents

Persistence/Mobility/Fate/Transport Definitions

Biodegradation Half Life ($t_{1/2}$)	The time required to reduce the concentration of a chemical in the environment by 50%.
Henry's Law Coefficient (K_H)	Also called the air-water partition coefficient; the ratio of the concentration of a contaminant that partitions to air relative to the concentration of a contaminant that partitions to water in an air-water system.
Octanol-Water Partitioning Coefficient (log K_{ow})	A partition coefficient for the two-phase system consisting of n-octanol and water, which serves as a measure of the relationship between fat solubility and water solubility of a substance.
Organic Carbon Partitioning Coefficient (K_{oc})	The ratio of the amount of chemical adsorbed per unit weight of organic carbon (oc) in the soil or sediment to the concentration of the chemical in solution at equilibrium.
Water Solubility	The measure of the amount of chemical substance that can dissolve in water at a specific temperature, normally expressed as a concentration.

Use/Production/Release Data Sources

TRI	The Toxics Release Inventory (TRI) Program was developed by the EPA as part of the Emergency Planning and Community Right-to-Know Act to inform citizens of chemical releases from industrial facilities. TRI tracks the industrial management of toxic chemicals that may cause harm to human health and the environment.
CDR	The Chemical Data Reporting (CDR) rule, under the Toxic Substances Control Act (TSCA), requires manufacturers (including importers) to provide EPA with information on the production and use of chemicals in commerce.
USGS Pesticide Application	The United States Geological Survey (USGS) publishes estimates of pesticide application rates using projected county crop acres from the Census of Agriculture.

EPA Health Sources of Information

(slide 1 of 2)

DWSHA	EPA's Drinking Water Standard and Health Advisories (DWSHA) table is a summary of Health Advisory values for contaminants based on non-cancer health effects for different durations of exposure (*e.g.,* one-day, ten-day, and lifetime) as well as the underlying reference dose (RfD) supporting the lifetime Health Advisory or, if applicable, the cancer risk values for drinking water contaminants. The tables also include the contaminants currently regulated under SDWA for which EPA has established National Primary Drinking Water Regulations (NPDWRs). This document is periodically updated to reflect changes in health advisory values or regulatory values.
HHC	Human Health Criteria (HHC) are calculated by the EPA in accordance with the Clean Water Act for consumption of water and/or organisms, such as fish.
IRIS	EPA’s Office of Research and Development houses the Integrated Risk Information System (IRIS) program that supports the EPA by characterizing the toxicity of compounds.
OPP	EPA’s Office of Pesticide Programs (OPP) Reregistration Eligibility Decision (REDs) and Health Effects Division Human Health Risk Assessment (HED HHRAs).
OPP HHBP	The Human Health Benchmarks for Pesticides (HHBPs) are published by EPA’s Office of Pesticide Programs (OPP). The purpose of the benchmarks is to determine whether the detection of a pesticide in drinking water or source waters for drinking water may indicate a potential health risk and help with EPA prioritization of monitoring efforts. HHBPs are available for pesticide active ingredients for which Health Advisories or enforceable National Primary Drinking Water Regulations (NPDWRs) have not been developed. The HHBPs are not legally enforceable federal standards.

EPA Health Sources of Information

(slide 2 of 2)

OW HA	Office of Water Health Advisory documents (HA). HA documents provide technical information on chemical and microbial contaminants that can cause human health effects and are known or anticipated to occur in drinking water. HA values/levels identify the concentration of a contaminant in drinking water at which adverse health effects and/or aesthetic effects are not anticipated to occur over specific exposure durations (*e.g.,* 1 day, 10 days, a lifetime). HAs are not to be construed as legally enforceable federal standards and are subject to change as new information becomes available.
PPRTV	The Provisional Peer-Reviewed Toxicity Value (PPRTV) program supports EPA's Superfund program by generating health assessments for compounds not already assessed under EPA's Integrated Risk Information System (IRIS) program. The health assessments generate provisional toxicity values like provisional- Reference Doses (RfDs) and provisional- Cancer Slope Factors (CSFs). All provisional peer-reviewed toxicity values receive internal review by EPA scientists and external peer review by independent scientific experts.
ToxRefDB	The Toxicity Reference Database (ToxRefDB) contains the results of thousands of in vivo animal toxicity studies conducted over the last 30 years. This database was compiled by EPA and released in 2014. The purpose of the database is to describe dose-response animal toxicity data with a standardized vocabulary so that the results are accessible and searchable.

Other Sources of Health Information

(slide 1 of 2)

CalEPA OEHHA	California EPA's (CalEPA) Office of Environmental Health and Hazard Assessment's (OEHHA) Chemical Database contains all of California's toxicity criteria information developed for chemicals evaluated by OEHHA. This information includes reference exposure levels, California Public Health Goals (PHGs), child-specific reference doses, Proposition 65 safe harbor numbers, soil-screening levels, and fish advisories.
CDC ATSDR	The Centers for Disease Control and Prevention Agency for Toxic Substances and Disease Registry (ATSDR) protects communities from harmful health effects related to exposure to natural and man-made hazardous substances by responding to environmental health emergencies; investigating emerging environmental health threats; conducting research on the health impacts of hazardous waste sites; and building capabilities of and providing actionable guidance to state and local health partners. ATSDR assessments are comparable to EPA assessments (*i.e.*, chronic duration oral minimal risk levels (MRLs) are considered comparable to EPA's reference doses (RfDs)).
CDWG	Canadian Drinking Water Guidelines (CDWG) are established by Health Canada in collaboration with the Federal-Provincial-Territorial Committee on Drinking Water of the Federal-Provincial-Territorial Committee on Health and the Environment, establishes Guidelines for Canadian Drinking Water Quality for drinking water parameters (*i.e.*, chemical, physical, microbial parameters).
FDA	The U.S. Food and Drug Administration (FDA) created the Maximum Recommended Daily Dose (MRDD) database, housed within the National Library of Medicine DSSTox FDA Maximum (Recommended) Daily Dose Database (FDAMDD), which includes MRDDs for over 1,200 pharmaceuticals.

Other Sources of Health Information

(slide 2 of 2)

MN DOH	The Minnesota Department of Health (MN DOH) develops health-based guidance values that can be used to help evaluate potential human health risks from exposures to chemicals in groundwater. The MN DOH calculates guidance values for cancer and non-cancer endpoints of various exposure durations including acute, short-term, subchronic, and chronic durations.
NIH CPDB	The National Institutes of Health (NIH) Carcinogenic Potency Database (CPDB) synthesized the results of 50 years of chronic, long-term carcinogenesis bioassays. Information recorded included the strain, sex, route of compound administration, target organ, histopathology, author's opinion about carcinogenicity, quantitative data on tumor incidence, dose-response, the tumorigenic dose-rate for 50% of experimental animals (TD50), statistical significance of the dose-response, length of experiment, duration of dosing, and average daily dose-rate. This database was last updated in August 2007. For more information on how CCL 5 utilized this source, please refer to the CCL 5 Technical Support Documents at https://www.epa.gov/ccl/ccl-5-technical-support-documents.
NIH HSDB	The National Institutes of Health (NIH) Hazardous Substances Data Bank (HSDB) is a toxicology database that includes information on human exposure, industrial hygiene, emergency handling procedures, environmental fate, regulatory requirements, toxicity values, and other relevant information. The information in HSDB has been assessed by a Scientific Review Panel. For more information on how CCL 5 utilized this source, please refer to the CCL 5 Technical Support Documents at https://www.epa.gov/ccl/ccl-5-technical-support-documents.
WHO	The World Health Organization (WHO) publishes health-based guidance values for drinking water quality.
WHO IARC	The World Health Organization International Agency for Research on Cancer (IARC) classifies compounds into groups based on available toxicity data. The dataset contains cancer classifications for over 1,000 contaminants.

Health Data Parameters

(slide 1 of 3)

Benchmark/Chronic Benchmark	Health-based concentration in water for a chronic exposure duration – *e.g.*, Lifetime Health Advisories, 10^{-6} cancer risk concentrations, Cancer Health Risk Limits or Chronic Health Risk Limits guidance values from the MN DOH, Chronic Minimal Risk Levels from ATSDR, and chronic HHBP.
Acute Benchmark	Health-based concentration in water for a short-term exposure duration – *e.g.*, 10-day Health Advisories, acute, short-term, or subchronic guidance values from the MN DOH, Intermediate Minimal Risk Levels from ATSDR, and acute HHBPs.
CSF	Cancer Slope Factor (CSF). This is the cancer risk per unit dose determined during a health assessment.
CCL-HRL	Health reference levels (HRLs) are derived during the CCL 5 process and are non-regulatory health-based toxicity values that are expressed as concentrations of a chemical in drinking water that a person could consume over a lifetime and be unlikely to experience adverse health effects. HRLs are not legally enforceable federal standards. For more information on how CCL 5 utilized this source, please refer to the CCL 5 Technical Support Documents at https://www.epa.gov/ccl/ccl-5-technical-support-documents.
CCL-SL	CCL screening levels (SLs) are derived during the CCL 5 process similar to CCL-HRLs for chemicals with no available qualifying or non-qualifying health assessments (publicly available assessments published by health agencies to provide valuable health information, but do not necessarily follow standard EPA methodologies and/or are not peer-reviewed by experts outside the publishing agency). For more information on how CCL 5 utilized this source, please refer to the CCL 5 Technical Support Documents at https://www.epa.gov/ccl/ccl-5-technical-support-documents.

Health Data Parameters

(slide 2 of 3)

RfD	A reference dose (RfD), also referred to as a Population-Adjusted Dose or Minimal Risk Level, is an estimate (with uncertainty spanning perhaps an order of magnitude) of a chronic daily oral exposure to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime. The RfD can also be an estimate for acute or short-term exposures. It can be derived from a no observed adverse effect level (NOAEL), lowest observed adverse effect level (LOAEL), or benchmark dose, with uncertainty factors generally applied to reflect limitations of the data used.
Risk Assessment Advice	MN DOH establishes Risk Assessment Advice (RAA) for water, which is technical guidance concerning exposures and risks to human health. RAA may be quantitative (e.g., a concentration of a chemical that is likely to pose little or no health risk to humans) or qualitative (e.g., a written description of how toxic a chemical is in comparison to a similar chemical). Generally, RAA contains greater uncertainty than Health Risk Levels because the available information is more limited. These can be chronic or acute.
LD50	The lethal dose of a chemical for 50% of tested animals after a specified exposure duration.
TD50	The dose of a chemical associated with 50% of animals developing tumors.
LOAEL	The lowest observed adverse effect level (LOAEL) from a study with a chronic or subchronic exposure duration, at which there are biologically significant increases in frequency or severity of adverse effects between the exposed population and its appropriate control group.
NOAEL	The no observed adverse effect level (NOAEL) from a study with a chronic or subchronic exposure duration at which there are no biologically significant increases in the frequency or severity of adverse effect between the exposed population and its appropriate control; some effects may be produced at this level, but they are not considered adverse or precursors of adverse effects.

Health Data Parameters

(slide 3 of 3)

WHO Drinking Water Guideline Value	Recommended drinking water standards built on over 50 years of guidance by WHO on drinking-water quality, which has formed an authoritative basis for the setting of national regulations and standards for water safety in support of public health.
MAC	Canadian Drinking Water Guidelines (CDWG) establish Maximum Allowable Concentrations (MACs) based on a comprehensive review of the known health effects associated with each contaminant, on exposure levels and on the availability of treatment and analytical technologies.
MADL	CalEPA establishes "maximum allowable daily levels" (MADLs) for reproductive toxicants representing the level at which the chemical would have no observable adverse reproductive effect assuming exposure 1,000 times that level.
PHG	CalEPA develops Public Health Goals (PHGs) defined as the level of a chemical contaminant in drinking water that does not pose a significant risk to health. PHGs are not regulatory standards.
MRDD	FDA Maximum Recommended Daily Dose (MRDDs) for pharmaceuticals are not comparable to reference doses (RfDs) or lowest observed adverse effect levels (LOAELs). For more information on how CCL 5 utilized this source, please refer to the CCL 5 Technical Support Documents at https://www.epa.gov/ccl/ccl-5-technical-support-documents.
HHC	Human Health Ambient Water Quality Criteria (HHC) represent specific levels of chemicals or conditions in a water body that are not expected to cause adverse effects to human health. EPA calculates criteria for an exposure scenario, assuming the target population could be drinking contaminated water and consuming contaminated fish or could be consuming only contaminated fish.

Sources of National Occurrence Data– Finished Drinking Water

NIRS	In the mid-1980s, EPA implemented the National Inorganics and Radionuclides Survey (NIRS) to provide a statistically representative sample of the national occurrence of select inorganic and radionuclide contaminants in community water systems (CWSs) served by groundwater. The survey is stratified based on system size (population served by the system). Most of the NIRS data are from smaller systems (92% from systems serving 3,300 persons or fewer). The NIRS database includes findings for 42 radionuclides and inorganic compounds. NIRS provides contaminant occurrence data from 989 groundwater CWSs in 49 states (all except Hawaii) as well as Puerto Rico. Each of the 989 randomly selected CWSs was sampled once between 1984 and 1986. The NIRS data were collected in a randomly designed sample survey; therefore, the summary statistics are representative of national occurrence in groundwater CWSs. One limitation of the NIRS is a lack of occurrence data for surface water systems.
UCMR 1, 2, 3, 4	Under the Unregulated Contaminant Monitoring Rule (UCMR), the EPA leads a nationally representative survey of public drinking water systems (PWSs) designed to provide a basis for future drinking water regulatory actions. UCMR 1 included monitoring for 26 contaminants between 2001 and 2003. UCMR 2 including monitoring for 25 contaminants between 2008 and 2010. UCMR 3 included monitoring for 28 chemical contaminants and 2 microbes between 2013 and 2015. UCMR 4 included monitoring for 30 chemical contaminants between 2018 and 2020. UCMR 4 data collection was still underway during the CCL 5 development.

Sources of National Occurrence Data– Ambient Water

USGS NAWQA	The Water Quality Portal is a collaborative tool sponsored by EPA, United States Geological Survey (USGS), and the National Water Quality Monitoring Council (NWQMC) that allows access to water quality data collected by state, tribal, local and federal agencies. The Water Quality Portal is used to access the National Water-Quality Assessment (NAWQA) program. The goal of the NAWQA program is to assess the condition of the nation's ambient waters. The NAWQA program is designed to be statistically representative of water conditions in the nation. The NAWQA data are considered nationally representative.

Sources of Non-National Occurrence Data – Finished Drinking Water (slide 1 of 3)

UCM-State Rounds 1 & 2	The Unregulated Contaminant Monitoring (UCM) program was a drinking water monitoring effort that was a precursor to the Unregulated Contaminant Monitoring Rule (UCMR) program established in the 1996 amendments to the Safe Drinking Water Act. Round 1 UCM data are from approximately 1988 to 1992 and were extracted from the Unregulated Contaminant Monitoring Information System (URCIS). The UCM Round 2 data are from 1993 to 1997 and were extracted from the Safe Drinking Water Information System (SDWIS).
USDA PDP - Finished	The United States Department of Agriculture (USDA) Pesticide Data Program (PDP) maintains a national pesticide residue database. PDP was initiated in 1991 to collect data on pesticide residues in food with sampling conducted on a statistically defensible representation of pesticide residuals in the U.S. food supply. As of 2001, sampling and testing are conducted on finished drinking water. For more information on how CCL 5 utilized this source, please refer to the CCL 5 Technical Support Documents at https://www.epa.gov/ccl/ccl-5-technical-support-documents.
Batt et al. 2016	This is an EPA Office of Research and Development publication focusing on active pharmaceutical ingredients and potential risks to aquatic life. The authors sampled 182 sites in rivers proximal to urban streams and measured the concentrations of 46 contaminants representing many classes of active pharmaceutical ingredients.
Bradley et al. 2018	This article was published by the United States Geological Survey (USGS), the National Institute of Health (NIH), and the EPA's Office of Research and Development. The authors sampled tap water from 13 homes and 12 workplaces across 11 states. The samples were analyzed for 482 organic compounds and 19 inorganic compounds.

Sources of Non-National Occurrence Data– Finished Drinking Water

(slide 2 of 3)

CWSS	The 2006 Community Water System Survey (CWSS) gathered data on the financial and operating characteristics of a random sample of community water systems (CWSs) nationwide. All systems serving more than 500,000 people (94 systems in 2006) were included in the survey, and systems in that size category were asked questions about concentrations of unregulated contaminants in their raw and finished water. Not all systems responded to the survey and, of the systems that responded, not all answered every question. EPA supplemented the dataset by gathering additional information about contaminant occurrence at the systems in this size category from publicly available sources (*e.g.,* consumer confidence reports). Note that, because reported results are incomplete, they are only illustrative, not statistically representative, and used only as supplemental information. This data source was used as a supplemental data source for CCL 5.
Furlong et al. 2017	This is an EPA Office of Research and Development and USGS publication focusing on active pharmaceutical ingredients and their concentrations in water samples collected from 25 drinking water treatment plants (DWTPs) between 2007 and 2012. This was a two-phase study and includes sampling results in source water and finished drinking water. Phase II of the study included more analytes and sometimes used more sensitive methods than Phase I. There were 24 pharmaceuticals in Phase I and 118 in Phase II. This study is part of a series of papers published using the dataset of source and treated water samples from 25 DWTPs.
Glassmeyer et al. 2017	This is an EPA Office of Research and Development and United States Geological Survey (USGS) publication describing source water and drinking water concentrations of emerging contaminants. This was a two-phase study and sampling occurred between 2007 and 2012. Phase II of the study included more contaminants and sometimes used more sensitive methods than Phase I. In Phase I, 87 compounds were monitored at nine treatment plants. In Phase II, 247 contaminants were monitored at 25 drinking water treatment plants.

Sources of Non-National Occurrence Data– Finished Drinking Water

(slide 3 of 3)

Klarich et al. 2017	This study collected periodic tap water grab samples at the University of Iowa over seven weeks in 2016 (May-July) after maize/soy planting to understand the persistence of three neonicotinoids and their potential for transformation during water treatment and distribution.
Padhye et al. 2013	This study collected water samples at five locations in an urban drinking water treatment plant (DWTP) with a total of eight sampling events over a period of one year. Thirty representative pharmaceutical and personal care products (PPCPs) and endocrine disrupting chemicals (EDCs) were investigated to evaluate the current system's treatment efficacy and assess occurrence of PPCPs and EDCs in finished drinking water.
State Drinking Water Monitoring Data	For EPA's Third Six-Year Review (SYR 3) of drinking water regulations, some states submitted PWS occurrence data for unregulated contaminants along with the requested data on regulated contaminants. For SYR 3, the dataset of unregulated contaminant monitoring data included results from 14 states/entities. These unregulated data provide varying degrees of completeness in their coverage of the states/entities and are not necessarily representative of occurrence in those states/entities. For more details on the SYR 3 ICR dataset, refer to the EPA's SYR 3 occurrence analysis at https://www.epa.gov/dwsixyearreview/support-documents-epas-third-review-existing-drinking-water-standards.
USGS, Sioux Falls Area, 2012	A cooperative study between the city of Sioux Falls, South Dakota, and the U.S. Geological Survey (USGS) was initiated in 2009 to (1) characterize the occurrence of anthropogenic organic compounds in the source waters (groundwater and surface water) to water supplies in the Sioux Falls area, (2) determine if the compounds detected in the source waters also are present in the finished water, and (3) identify probable sources of nitrate in the Big Sioux River Basin and determine if sources change seasonally or under different hydrologic conditions. This report presents analytical results of water-quality samples collected from source waters and finished waters in the Sioux Falls area.

Sources of Non-National Occurrence Data– Ambient Water

(slide 1 of 3)

NWIS	The Water Quality Portal is a collaborative tool sponsored by EPA, the United States Geological Survey (USGS), and the National Water Quality Monitoring Council (NWQMC) that allows access to water quality data collected by state, tribal, local and federal agencies. The Water Quality Portal is used to access the USGS National Water Information Services (NWIS) database. The NWIS relational database houses every piece of data that USGS collects, including information like gauge heights and compound concentration data. NWIS results are not expected to be statistically representative of the U.S.
USDA PDP – Untreated and Ground Water	The United States Department of Agriculture (USDA) Pesticide Data Program (PDP) maintains a national pesticide residue database. PDP was initiated in 1991 to collect data on pesticide residues in food with sampling conducted on a statistically defensible representation of pesticide residuals in the U.S. food supply (USDA, 2018). As of 2001, sampling and testing are conducted on untreated water and ground water. For more information on how CCL 5 utilized this source, please refer to the CCL 5 Technical Support Documents at https://www.epa.gov/ccl/ccl-5-technical-support-documents.
Arnold et al. 2016	Groundwater-quality data were collected from 748 wells as part of the National Water-Quality Assessment Project of the U.S. Geological Survey National Water-Quality Program from May 2012 through December 2013. Groundwater samples were analyzed for a large number of water-quality indicators and constituents, including major ions, nutrients, trace elements, volatile organic compounds, pesticides, and radionuclides.
Bexfield et al. 2019	This study assessed occurrence from 21 hormones and 103 pharmaceuticals in groundwater used as a drinking water source across the United States. Samples were taken from 1091 sites in Principal Aquifers representing 60% of the volume pumped for drinking-water supply.

Sources of Non-National Occurrence Data – Ambient Water

(slide 2 of 3)

Bradley et al. 2017	This study, published by the United States Geological Survey (USGS) and the EPA's Office of Research and Development, provides water data for 719 compounds sampled in 38 streams across the U.S. using 14 different methods. Study locations include a mixture of urban and agricultural watersheds.
Padhye et al. 2013	This study collected water samples at five locations in an urban drinking water treatment plant (DWTP) with a total of eight sampling events over a period of one year. Thirty representative pharmaceutical and personal care products (PPCPs) and endocrine disrupting chemicals (EDCs) were investigated to evaluate the current system's treatment efficacy and assess occurrence of PPCPs and EDCs in finished drinking water.
SESQA	In 2014, the U.S. Geological Survey (USGS) National Water-Quality Assessment Program (NAWQA) assessed stream quality across the Piedmont and southern Appalachian Mountains in the southeastern United States. The goal of the Southeast Stream Quality Assessment (SESQA) was to characterize multiple water-quality factors that are stressors to aquatic life—contaminants, nutrients, sediment, and streamflow alteration—and the relation of these stressors to ecological conditions in streams throughout the region.
State Drinking Water Monitoring Data	For EPA's Third Six-Year Review (SYR 3) of drinking water regulations, some states submitted PWS occurrence data for unregulated contaminants in ambient water along with the requested data on regulated contaminants. For SYR 3, the dataset of unregulated contaminant monitoring data included results from 14 states/entities. These unregulated data provide varying degrees of completeness in their coverage of the states/entities and are not necessarily representative of occurrence in those states/entities. For more details on the SYR 3 ICR dataset, refer to the EPA's SYR 3 occurrence analysis at https://www.epa.gov/dwsixyearreview/support-documents-epas-third-review-existing-drinking-water-standards.

Non-National Occurrence Data Assessments – Ambient Water

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SURF	California's Department of Pesticide Regulation Surface Water (SURF) Database was developed in 1997 to make information concerning the presence of pesticides in California surface waters available to the public. The database includes pesticide monitoring results from rivers, creeks, agricultural drains, urban streams, and estuaries in California. The database houses monitoring results collected by federal, state, and local agencies, private industry, and environmental groups. This data source contains monitoring information for 334 pesticides and pesticide metabolites.
USGS, McKenzie River, Oregon, 2012	In the spring of 2002, the Eugene Water and Electric Board (Eugene, Oregon) initiated a pesticide monitoring program in cooperation with the U.S. Geological Survey (USGS) as part of their Drinking Water Source Protection Plan. Approximately twice yearly pesticide samples were collected from 2002 to 2010 at a suite of sampling sites representing varying land uses in the lower McKenzie River basin in Oregon. A total of 117 ambient samples were collected from 28 tributary and mainstem sites, including those dominated by forestry, urban, and agricultural activities, as well as the mouths of major tributaries characterized by a mixture of upstream land use. Constituents tested included 175 compounds in filtered water (72 herbicides, 43 insecticides, 10 fungicides, and 36 of their degradation products, as well as 14 pharmaceutical compounds).
USGS, Sioux Falls Area, 2012	A cooperative study between the city of Sioux Falls, South Dakota, and the U.S. Geological Survey (USGS) was initiated in 2009 to (1) characterize the occurrence of anthropogenic organic compounds in the source waters (groundwater and surface water) to water supplies in the Sioux Falls area, (2) determine if the compounds detected in the source waters also are present in the finished water, and (3) identify probable sources of nitrate in the Big Sioux River Basin and determine if sources change seasonally or under different hydrologic conditions. This report presents analytical results of water-quality samples collected from source waters and finished waters in the Sioux Falls area.

Appendix B: Contaminants Under Consideration: Background, Health, and Occurrence Information

Contaminant Information - Background

CASRN	Chemical Abstracts Service Registry Number (CASRN) is a unique identifier assigned by the Chemical Abstracts Service (a division of the American Chemical Society) to every chemical substance in the open scientific literature
DTXSID	Distributed Structure Searchable Toxicity Substance Identifiers (DTXSID) is a unique substance identifier used in EPA's CompTox Chemicals database, where a substance can be any single chemical, mixture or polymer
Contaminant Group/Use	Chemical group (*e.g.*, pesticide, metal, disinfection byproduct (DBP)), or contaminant use.
PCCL 5/CCL 5 Status	Contaminants status on the fifth Preliminary and/or Final Contaminant Candidate List
Health and Occurrence Information Status	Availability of an EPA health assessment as well as a finished and/or ambient drinking water occurrence data
Persistence/Mobility/Fate/ Transport	Measures to determine the longevity of contaminants and their potential migration in the environment and water systems
Use/Production/Release	Different ways that toxic chemicals are used, produced, and released into the air, water, and land
PubMed Articles	Count of research articles from a PubMed search for a contaminant (through December 2019)

Health Assessment Values

- The health values are calculated drinking water concentrations based on publicly-available information:
  - 2018 Edition of Drinking Water Standards and Health Advisories (DWSHA) Tables
    - https://www.epa.gov/system/files/documents/2022-01/dwtable2018.pdf
  - CCL 5 Technical Support Documents
    - https://www.epa.gov/ccl/ccl-5-technical-support-documents
  - Human Health Benchmarks for Pesticides (HHBP)
    - https://www.epa.gov/sdwa/human-health-benchmarks
  - Other non-EPA sources (*e.g.*, Health Canada)
- The health values are:
  - Not *federally* enforceable
  - Subject to change as health effects information becomes available
  - Calculated using different assumptions (*e.g.*, body weight, intake, population group)

1,1,2,2-Tetrachloroethane: Background

CASRN	79-34-5
DTXSID	DTXSID7021318
Contaminant Group/Use	Industrial solvent; former pesticide; in manufacture of paints, varnish, rust removers; in soil sterilization and weed killer, insecticide formulations; chemical intermediate
PCCL 5/CCL 5 Status	PCCL 5
Health and Occurrence Information Status	• EPA health assessment available • Non-national finished and national ambient water occurrence data available
Persistence/Mobility/Fate/Transport	Biodegradation Half-Life ($t_{1/2}$) = 18.2 days Henry's Law Coefficient (K_H) = $3.72x10^{-4}$ atm-m^3/mol Octanol-Water Partitioning Coefficient (log K_{ow}) = 2.34 Organic Carbon Partitioning Coefficient (K_{oc}) = 99.0 L/kg Water Solubility = $8.59x10^{-3}$ mol/L
Use/Production/Release	TRI (2016): 5,936 lbs
PubMed Article Count	53

1,1,2,2-Tetrachloroethane: Health Effects

(slide 1 of 2)

EPA Health Assessment	IRIS (2010)
Critical Effect	Hepatocellular carcinomas
Target Population	General Population
Cancer Slope Factor (CSF)	0.2 $(mg/kg/day)^{-1}$
Health Value	CCL-HRL = 0.148 µg/L

Additional Health Information

EPA:

- OW (2008):
  - CCL-HRL = 0.348 µg/L; CSF = 0.085 $(mg/kg/day)^{-1}$
  - CCL-HRL = 63.3 µg/L; RfD = 0.01 mg/kg/day
  - CCL-HRL = 63.4 µg/L; RfD = 0.01 mg/kg/day
- IRIS (2010): CCL-HRL = 118 µg/L; RfD = 0.02 mg/kg/day
- DWSHA (accessed 2018):
  - 10-day Health Advisory = 3 mg/L (3,000 µg/L)
- HHC (2015): Human Health Ambient Water Quality Criteria = 0.0002 mg/L (0.2 µg/L)

1,1,2,2-Tetrachloroethane: Health Effects

(slide 2 of 2)

Additional Health Information (cont'd)

Other:

- CalEPA OEHHA (2003):
  - CCL-HRL = 0.197 µg/L; CSF = 0.2 $(mg/kg/day)^{-1}$
  - CCL-HRL = 6.51 µg/L; RfD = 0.0011 mg/kg/day
- CDC ATSDR (2008):
  - Intermediate Minimal Risk Level = 0.5 mg/kg/day
- MN DOH (accessed 2018):
  - Cancer Health Risk Limit = 0.002 mg/L (2 µg/L)
- CalEPA OEHHA (2003): Public Health Goal = 0.0001 mg/L (0.1 µg/L)
- NIH HSDB (accessed 2019): LD50 = 250 mg/kg
- NIH CPDB (accessed 2018): TD50 = 35.4 mg/kg/day

Cancer Classification:

- WHO IARC (2012): 2B (Possibly carcinogenic to humans)
- IRIS (2010): L (Likely to be carcinogenic to humans)
- OW (2008): L (Likely to be carcinogenic to humans)

1,1,2,2-Tetrachloroethane: Occurrence

Best Available Occurrence Information	NA

Additional Occurrence Information

Finished Drinking Water

- UCM-State Round 1 (1988-1992): Detected in 91 of 20,407 (0.45%) sites; Concentration range = 0.05 – 200 µg/L
- UCM-State Round 2 (1993-1997): Detected in 19 of 24,800 (0.08%) sites; Concentration range = 0.1 – 2 µg/L
- Drinking Water Monitoring Data - CA (2006-2020): Not detected in 466 (0%) sites
- Drinking Water Monitoring Data - MA (2006-2020): Not detected in 885 (0%) sites
- Drinking Water Monitoring Data - WA (2006-2011): Not detected in 1,098 (0%) sites

Ambient Water

- USGS NAWQA (1991-2017): Detected in 4 of 6,771 (0.06%) sites; Concentration range = 0.02 – 0.38 µg/L
- USGS NWIS (2008-2017): Detected in 2 of 3,039 (0.07%) sites; Concentration range = 2.1 – 18 µg/L
- Drinking Water Monitoring Data - CA (2006-2020): Detected in 4 of 4,714 (0.08%) sites; Concentration range = 0.8 – 4.28 µg/L
- Drinking Water Monitoring Data - FL (2006-2011): Not detected in 3 (0%) sites
- Drinking Water Monitoring Data - MA (2006-2020): Not detected in 130 (0%) sites
- Drinking Water Monitoring Data - PA (2006-2011): Not detected in 13 (0%) sites
- Drinking Water Monitoring Data - WA (2006-2011): Not detected in 1,521 (0%) sites
- Drinking Water Monitoring Data - WI (2012-2019): Not detected in 112 (0%) sites
- Arnold et al. 2016 (2012-2013): Not detected in 158 (0%) sites

1,2,3-Trichloropropane: Background

CASRN	96-18-4
DTXSID	DTXSID9021390
Contaminant Group/Use	Paint ingredient
PCCL 5/CCL 5 Status	CCL 5
Health and Occurrence Information Status	• EPA health assessment available • National finished and ambient water occurrence data available
Persistence/Mobility/Fate/Transport	Biodegradation Half-Life ($t_{1/2}$) = 4.57 days Henry's Law Coefficient (K_H) = 3.47×10^{-4} atm-m^3/mol Octanol-Water Partitioning Coefficient (log K_{ow}) = 2.22 Organic Carbon Partitioning Coefficient (K_{oc}) = 172 L/kg Water Solubility = 9.96×10^{-3} mol/L
Use/Production/Release	TRI (2016): 5,040 lbs
PubMed Article Count	50

1,2,3-Trichloropropane: Health Effects

(slide 1 of 2)

EPA Health Assessment	IRIS (2009)
Critical Effect	Forestomach neoplasms
Target Population	General Population
Cancer Slope Factor (CSF)	30 $(mg/kg/day)^{-1}$
Health Value	CCL-HRL = 0.00230 µg/L

Additional Health Information

EPA:

- IRIS (2009): CCL-HRL = 23.7 µg/L; RfD = 0.004 mg/kg/day
- OW (1989): CCL-HRL = 35.5 µg/L; RfD = 0.006 mg/kg/day
- DWSHA (accessed 2018):
  - 10-day Health Advisory = 0.6 mg/L (600 µg/L)

Other:

- CalEPA OEHHA (2009):
  - CCL-HRL = 0.00118 µg/L; CSF = 25 $(mg/kg/day)^{-1}$
  - CCL-HRL = 33.7 µg/L; RfD = 0.004 mg/kg/day

1,2,3-Trichloropropane: Health Effects

(slide 2 of 2)

Additional Health Information (cont'd)

Other:

- CalEPA OEHHA (2009):
  - Public Health Goal = 0.0000007 mg/L (0.0007 µg/L)
  - Benchmark = 0.000005 mg/L (0.005 µg/L)
- MN DOH (accessed 2018):
  - Cancer Health Risk Limit = 0.000003 mg/L (0.003 µg/L)
  - Chronic Health Risk Limit = 0.007 mg/L (7 µg/L)
  - Subchronic Health Risk Limit = 0.007 mg/L (7 µg/L)
  - Short-Term Health Risk Limit = 0.007 mg/L (7 µg/L)
  - Acute Health Risk Limit = 0.007 mg/L (7 µg/L)
- CDC ATSDR (2021): Chronic Minimal Risk Level = 0.01 mg/kg/day; Intermediate Minimal Risk Level = 0.03 mg/kg/day
- NIH HSDB (accessed 2019): LD50 = 320 mg/kg
- NIH CPDB (accessed 2018): TD50 = 0.806 mg/kg/day

Cancer Classification:

- IRIS (2009): L (likely to be carcinogenic to humans)
- WHO IARC (1995): 2A (Probably carcinogenic to humans)

1,2,3-Trichloropropane: Occurrence

(slide 1 of 2)

Best Available Occurrence Information	UCMR 3 (2013-2015): Detected in 67 of 4,916 (1.36%) sites; Concentration range = 0.03 – 1.02 µg/L

Additional Occurrence Information

Finished Drinking Water

- UCM-State Round 1 (1988-1992): Detected in 44 of 17,392 (0.25%) sites; Concentration range = 0.1 – 112 µg/L
- UCM-State Round 2 (1993-1997): Detected in 19 of 24,088 (0.08%) sites; Concentration range = 0.03 – 3,000 µg/L
- Drinking Water Monitoring Data - CA (2006-2020): Detected in 69 of 502 (14%) sites; Concentration range = 0.001 – 29 µg/L
- Drinking Water Monitoring Data - MA (2006-2020): Not detected in 885 (0%) sites
- Drinking Water Monitoring Data - WA (2006-2011): Not detected in 1,204 (0%) sites
- CWSS (2006): Not detected in 1 (0%) site; Median and 90th percentile concentrations are 400 µg/L

1,2,3-Trichloropropane: Occurrence

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Additional Occurrence Information (cont'd)

Ambient Water

- USGS NAWQA (1991-2017): Detected in 83 of 7,695 (1.08%) sites; Concentration range = 0.002 µg/L – 2.92 µg/L
- USGS NWIS (2008-2017): Detected in 51 of 3,640 (1.4%) sites; Concentration range = 0.002 µg/L – 1.16 µg/L
- Drinking Water Monitoring Data - CA (2006-2020): Detected in 373 of 4,640 (8.04%) sites; Concentration range = 0.0018 µg/L – 270 µg/L
- Drinking Water Monitoring Data - FL (2006-2011): Detected in 1 of 3 (33%) sites; Concentration = 1.9 µg/L
- Drinking Water Monitoring Data - MA (2006-2020): Not detected in 130 (0%) sites
- Drinking Water Monitoring Data - PA (2006-2011): Not detected in 14 (0%) sites
- Drinking Water Monitoring Data - WA (2006-2011): Detected in 1 of 1,690 (0.06%) sites; Concentration range = 0.0322 µg/L – 0.0348 µg/L
- Drinking Water Monitoring Data - WI (2012-2019): Detected in 1 of 112 (0.89%) sites; Concentration = 0.33 µg/L
- Arnold et al. 2016 (2012-2013): Detected in 12 of 685 (1.75%) sites; Concentration range = 0.005 µg/L – 0.526 µg/L

1,2,4-Trimethylbenzene: Background

CASRN	95-63-6
DTXSID	DTXSID6021402
Contaminant Group/Use	Chemical intermediate; vermifuge
PCCL 5/CCL 5 Status	CCL 5
Health and Occurrence Information Status	• EPA health assessment available • Non-national finished and finished ambient water occurrence data available
Persistence/Mobility/Fate/Transport	Biodegradation Half-Life ($t_{1/2}$) = 3.98 days Henry's Law Coefficient (K_H) = 6.17×10^{-3} atm-m^3/mol Octanol-Water Partitioning Coefficient (log K_{ow}) = 3.67 Organic Carbon Partitioning Coefficient (K_{oc}) = 1.13×10^3 L/kg Water Solubility = 7.61×10^{-4} mol/L
Use/Production/Release	CDR (2015): 250,000,000 - <500,000,000 lbs TRI (2016): 6,705,334 lbs
PubMed Article Count	61

1,2,4-Trimethylbenzene: Health Effects

EPA Health Assessment	IRIS (2016)
Critical Effect	Decreased pain sensitivity
Target Population	General Population
Reference Dose (RfD) or Equivalent	0.01 mg/kg/day
Health Value	CCL-HRL = 59.2 µg/L

Additional Health Information

Other:

- MN DOH (2023):
  - Chronic Health Risk Limit = 0.3 mg/L (30 µg/L)
  - Subchronic Health Risk Limit = 0.3 mg/L (30 µg/L)
  - Short-Term Health Risk Limit = 0.3 mg/L (30 µg/L)
- CalEPA OEHHA (accessed 2019): Benchmark = 0.33 mg/L (330 µg/L)
- NIH HSDB (accessed 2019): LD50 = 3280 mg/kg

Cancer Classification:

- IRIS (2016): I (Inadequate information to assess carcinogenic potential)
- PPRTV (2007): D (Not classifiable as to human carcinogenicity)
- OW (1987): D (Not classifiable as to human carcinogenicity)

1,2,4-Trimethylbenzene: Occurrence

Best Available Occurrence Information	NA

Additional Occurrence Information

Finished Drinking Water

- UCM-State Round 1 (1988-1992): Detected in 106 of 12,755 (0.83%) sites; Concentration range = 0.02 – 77 µg/L
- UCM-State Round 2 (1993-1997): Detected in 174 of 22,965 (0.76%) sites; Concentration range = 0.1 – 137 µg/L
- Drinking Water Monitoring Data - CA (2006-2020): Detected in 5 of 405 (1.23%) sites; Concentration range = 0.039 – 22.3 µg/L
- Drinking Water Monitoring Data - MA (2006-2020): Detected in 11 of 884 (1.24%) sites; Concentration range = 0.5 – 2.4 µg/L
- Drinking Water Monitoring Data - WA (2006-2011): Detected in 1 of 1,188 (0.08%) sites; Concentration = 1.4 µg/L

Ambient Water

- USGS NAWQA (1991-2017): Detected in 695 of 7,705 (9.02%) sites; Concentration range = 0.004 – 260 µg/L
- USGS NWIS (2008-2017): Detected in 217 of 3,703 (5.86%) sites; Concentration range = 0.01 – 180 µg/L
- Drinking Water Monitoring Data - CA (2006-2020): Detected in 14 of 4,250 (0.33%) sites; Concentration range = 0.034 – 3.5 µg/L
- Drinking Water Monitoring Data - MA (2006-2020): Detected in 2 of 130 (1.54%) sites; Concentration range = 0.6 – 0.8 µg/L
- Drinking Water Monitoring Data - PA (2006-2011): Not detected in 13 (0%) sites
- Drinking Water Monitoring Data - WA (2006-2011): Not detected in 1,665 (0%) sites
- Drinking Water Monitoring Data - WI (2012-2019): Not detected in 101 (0%) sites
- Arnold et al. 2016 (2012-2013): Detected in 18 of 685 (2.63%) sites; Concentration range = 0.012 – 0.274 µg/L

1,3-Dichloropropene: Background

CASRN	542-75-6
DTXSID	DTXSID1022057
Contaminant Group/Use	Pesticide
PCCL 5/CCL 5 Status	PCCL 5
Health and Occurrence Information Status	• EPA health assessment available • Non-national finished and ambient water occurrence data available
Persistence/Mobility/Fate/Transport	Biodegradation Half-Life ($t_{1/2}$) = 5.37 days Henry's Law Coefficient (K_H) = 2.34×10^{-3} atm-m^3/mol Octanol-Water Partitioning Coefficient (log K_{ow}) = 2.11 Organic Carbon Partitioning Coefficient (K_{oc}) = 52.2 L/kg Water Solubility = 1.96×10^{-2} mol/L
Use/Production/Release	TRI (2016): 7,907 lbs USGS (2016): 59,344,846 lbs
PubMed Article Count	185

1,3-Dichloropropene: Health Effects

(slide 1 of 2)

EPA Health Assessment	OPP (2008)
Critical Effect	Forestomach, liver, adrenal, and thyroid tumors found in male rats
Target Population	General Population
Cancer Slope Factor (CSF)	0.122 $(mg/kg/day)^{-1}$
Health Value	CCL-HRL = 0.243 µg/L

Additional Health Information

EPA:

- OPP (2008): CCL-HRL= 148 µg/L; RfD = 0.025 mg/kg/day
- DWHSA (2018):
  - 10-day Health Advisory = 0.03 mg/L (30 µg/L)
- HHC (2015): Human Health Ambient Water Quality Criteria = 0.00027 (0.27 µg/L)

1,3-Dichloropropene: Health Effects

(slide 2 of 2)

Additional Health Information (cont'd)

Other:

- CDC ATSDR (2008):
  - Chronic Minimal Risk Level = 0.03 mg/kg/day
  - Intermediate Minimal Risk Level = 0.04 mg/kg/day
- CalEPA OEHHA (accessed 2019):
  - Public Health Goal = 0.0002 mg/L (0.2 µg/L)
  - CSF = 0.091 $(mg/kg/day)^{-1}$
- WHO (2017): Drinking Water Guideline Value = 0.02 mg/L (20 µg/L)
- MN DOH (accessed 2018): Cancer Health Risk Limit = 0.002 mg/L (2 µg/L)
- NIH HSDB (accessed 2019): LD50 = 94 mg/kg
- NIH CPDB (accessed 2018): TD50 = 33.2 mg/kg/day

Cancer Classification:

- OPP (2008): L (likely to be carcinogenic to humans)
- WHO IARC (1998): 2B (Possibly carcinogenic to humans)

1,3-Dichloropropene: Occurrence

Best Available Occurrence Information	NA

Additional Occurrence Information

Finished Drinking Water

- UCMR 1 Small Systems (2001-2003): Not detected in 796 (0%) sites
- UCM-State Round 1 (1988-1992): Detected in 15 of 9,164 (0.16%) sites; Concentration range = 0.5 – 2 µg/L
- UCM-State Round 2 (1993-1997): Detected in 58 of 16,787 (0.35%) sites; Concentration range = 0.2 – 39 µg/L
- Drinking Water Monitoring Data - CA (2006-2020): Detected in 2 of 464 (0.43%) sites; Concentration range = 0.5 – 1 µg/L
- Drinking Water Monitoring Data - MA (2006-2020): Detected in 1 of 879 (0.11%) sites; Concentration = 1.3 µg/L

Ambient Water

- Drinking Water Monitoring Data - CA (2006-2020): Detected in 5 of 4,667 (0.11%) sites; Concentration range = 0.52 – 10 µg/L
- Drinking Water Monitoring Data - FL (2006-2011): Not detected in 2 (0%) sites
- Drinking Water Monitoring Data - MA (2006-2020): Not detected in 129 (0%) sites
- Drinking Water Monitoring Data - PA (2006-2011): Not detected in 13 (0%) sites
- Drinking Water Monitoring Data - WI (2012-2019): Not detected in 112 (0%) sites
- SURF (1990-2018): Not detected in 94 (0%) sites

2-(2-Methyl-4-chlorophenoxy)propionic acid (MCPP): Background

CASRN	93-65-2
DTXSID	DTXSID9024194
Contaminant Group/Use	Herbicide
PCCL 5/CCL 5 Status	PCCL 5
Health and Occurrence Information Status	• EPA health assessment available • Non-national finished and ambient water occurrence data available
Persistence/Mobility/Fate/Transport	Biodegradation Half-Life ($t_{1/2}$) = 3.55 days Henry's Law Coefficient (K_H) = 1.66×10^{-9} atm-m^3/mol Octanol-Water Partitioning Coefficient (log K_{ow}) = 2.97 Organic Carbon Partitioning Coefficient (K_{oc}) = 57.9 L/kg Water Solubility = 3.72×10^{-3} mol/L
Use/Production/Release	TRI (2016): 254 lbs USGS (2016): 2,823 lbs
PubMed Article Count	120

2-(2-Methyl-4-chlorophenoxy)propionic acid (MCPP): Health Effects

EPA Health Assessment	OPP (2019)
Critical Effect	Increased kidney weights and chronic nephropathy
Target Population	General Population
Reference Dose (RfD) or Equivalent	0.04 mg/kg/day
Health Value	CCL-HRL = 237 µg/L

Additional Health Information

EPA:

- ToxRefDB (accessed 2018): NOAEL = 50 mg/kg/day; LOAEL = 50.7 mg/kg/day; Subchronic NOAEL = 3.00 mg/kg/day; Subchronic LOAEL = 9.00 mg/kg/day

Other:

- WHO (2017): Drinking Water Guideline Value = 0.01 mg/L (10 µg/L)
- NIH HSDB (accessed 2019): LD50 = 369 mg/kg

Cancer Classification:

- OPP (2019): S (Suggestive evidence for carcinogenicity)

2-(2-Methyl-4-chlorophenoxy)propionic acid (MCPP): Occurrence

Best Available Occurrence Information	NA

Additional Occurrence Information

Finished Drinking Water

- USDA PDP (2001-2013): Detected in 6 of 12 (50%) sites; Concentration range = 0.00052 – 0.19 µg/L

Ambient Water

- USDA PDP (2001-2013): Detected in 27 of 229 (12%) sites; Concentration range = 0.00052 – 0.16 µg/L
- SURF (1990-2018): Not detected in 107 (0%) sites

2-(4-Chloro-2-methylphenoxy)acetic acid (MCPA): Background

CASRN	94-74-6
DTXSID	DTXSID4024195
Contaminant Group/Use	Herbicide
PCCL 5/CCL 5 Status	PCCL 5
Health and Occurrence Information Status	• EPA health assessment available • Non-national finished and national ambient water occurrence data available
Persistence/Mobility/Fate/Transport	Biodegradation Half-Life ($t_{1/2}$) = 3.55 days Henry's Law Coefficient (K_H) = 7.08×10^{-9} atm-m^3/mol Octanol-Water Partitioning Coefficient (log K_{ow}) = 2.70 Organic Carbon Partitioning Coefficient (K_{oc}) = 77.9 L/kg Water Solubility = 5.28×10^{-3} mol/L
Use/Production/Release	TRI (2016): 474 lbs USGS (2016): 4,113,376 lbs
PubMed Article Count	419

2-(4-Chloro-2-methylphenoxy)acetic acid (MCPA): Health Effects

(slide 1 of 2)

EPA Health Assessment	OPP (2018)
Critical Effect	Nephrotoxicity
Target Population	General Population
Reference Dose (RfD) or Equivalent	0.044 mg/kg/day
Health Value	CCL-HRL = 260 µg/L

Additional Health Information

EPA:

- DWSHA (accessed 2018):
  - Lifetime Health Advisory = 0.03 mg/L (30 µg/L)
  - 10-day Health Advisory = 0.1 mg/L (100 µg/L)
- ToxRefDB (accessed 2018): NOAEL = 0.210 mg/kg/day; LOAEL = 1.02 mg/kg/day; Subchronic NOAEL = 1.00 mg/kg/day; Subchronic LOAEL = 3.00 mg/kg/day

2-(4-Chloro-2-methylphenoxy)acetic acid (MCPA): Health Effects

(slide 2 of 2)

Additional Health Information (cont'd)

Other:

- MN DOH (accessed 2018):
  - Chronic Health Risk Limit = 0.003 mg/L (3 µg/L)
- NIH HSDB (accessed 2019): LD50 = 439 mg/kg
- CDWG (2022): Maximum Allowable Concentration = 0.35 mg/L (350 µg/L)

Cancer Classification:

- OPP (2018): NL (Not likely to be carcinogenetic to humans)

2-(4-Chloro-2-methylphenoxy)acetic acid (MCPA): Occurrence

Best Available Occurrence Information	NA

Additional Occurrence Information

Finished Drinking Water

- USDA PDP (2001-2013): Detected in 7 of 17 (41%) sites; Concentration range = 0.00065 – 0.24 µg/L
- Drinking Water Monitoring - CA (2006-2020): Not detected in 2 (0%) sites

Ambient Water

- USGS NAWQA (1991-2017): Detected in 142 of 7,656 (1.85%) sites; Concentration range = 0.01 – 18.6 µg/L
- USGS NWIS (2008-2017): Detected in 41 of 1,411 (2.91%) sites; Concentration range = 0.01 – 1.69 µg/L
- USDA PDP (2001-2013): Detected in 13 of 229 (5.68%) sites; Concentration range = 0.00065 – 0.86 µg/L
- Drinking Water Monitoring - CA (2006-2020): Detected in 1 of 61 (1.64%) sites; Concentration = 13 µg/L
- Arnold et al. 2016 (2012-2013): Not detected in 690 (0%) sites
- Bradley et al. 2017 (2012-2014): Detected in 4 of 38 (11%) sites; Concentration range = 0.0217 – 0.1057 µg/L
- SURF (1990-2018): Detected in 101 of 702 (14%) sites; Concentration range = 0.052 – 13.59 µg/L

2,4-Dichlorophenoxybutyric acid (2,4-DB): Background

CASRN	94-82-6
DTXSID	DTXSID7024035
Contaminant Group/Use	Disinfection Byproduct
PCCL 5/CCL 5 Status	PCCL 5
Health and Occurrence Information Status	• EPA health assessment available • Non-national finished and ambient water occurrence data available
Persistence/Mobility/Fate/Transport	Biodegradation Half-Life ($t_{1/2}$) = 3.55 days Henry's Law Coefficient (K_H) = $1.48x10^{-9}$ atm-m^3/mol Octanol-Water Partitioning Coefficient (log K_{ow}) = 3.50 Organic Carbon Partitioning Coefficient (K_{oc}) = 214 L/kg Water Solubility = $4.14x10^{-4}$ mol/L
Use/Production/Release	USGS (2016): 1,445,891 lbs
PubMed Article Count	32

2,4-Dichlorophenoxybutyric acid (2,4-DB): Health Effects

(slide 1 of 2)

EPA Health Assessment	OPP (2018)
Critical Effect	Increased early resorptions; decreased body weight, increased kidney weight, increased incidence of tubular degeneration in females
Target Population	Women of childbearing age
Reference Dose (RfD) or Equivalent	0.15 mg/kg/day
Health Value	CCL-HRL = 847 µg/L

Additional Health Information

EPA:

- OPP HHBP (2021):
  - Chronic Benchmark = 0.15 mg/L (150 µg/L); Population-Adjustment Dose (RfD) = 0.89 mg/kg/day
  - Acute Benchmark = 4.2 mg/L (4,200 µg/L); Acute Population-Adjustment Dose (RfD) = 0.15 mg/kg/day
- ToxRefDB (accessed 2018): NOAEL = 3.00 mg/kg/day; LOAEL = 30.0 mg/kg/day; Subchronic NOAEL = 4.96 mg/kg/day; Subchronic LOAEL = 25.0 mg/kg/day

2,4-Dichlorophenoxybutyric acid (2,4-DB): Health Effects

(slide 2 of 2)

Additional Health Information (cont'd)

Other:

- WHO (2017): Drinking Water Guideline Value = 0.09 mg/L (90 µg/L)
- NIH HSDB (accessed 2019): LD50 = 400 mg/kg

Cancer Classification:

- OPP (2018): NL (Not likely to be carcinogenetic to humans)

2,4-Dichlorophenoxybutyric acid (2,4-DB): Occurrence

Best Available Occurrence Information	NA

Additional Occurrence Information

Finished Drinking Water

- USDA PDP (2001-2013): Detected in 1 of 12 (8.33%) sites; Concentration = 0.023 µg/L
- Drinking Water Monitoring - CA (2006-2020): Not detected in 60 (0%) sites

Ambient Water

- USGS NWIS (2008-2017): Detected in 3 of 760 (0.39%) sites; Concentration range = 0.01 – 0.13 µg/L
- USDA PDP (2001-2013): Not detected in 229 (0%) sites
- Drinking Water Monitoring - CA (2006-2020): Detected in 1 of 620 (0.16%) sites; Concentration = 6.2 µg/L
- Arnold et al. 2016 (2012-2013): Not detected in 106 (0%) sites
- Bradley et al. 2017 (2012-2014): Detected in 2 of 38 (5.26%) sites; Concentration range = 0.0281 – 0.1255 µg/L
- SURF (1990-2018): Detected in 4 of 212 (1.89%) sites; Concentration range = 0.22 – 1.08 µg/L
- USGS, McKenzie River, Oregon, 2012 (2002-2010): Detected in 14 of 125 (11%) samples; Maximum concentration = 0.1 µg/L

4-tert-Octylphenol: Background

CASRN	140-66-9
DTXSID	DTXSID9022360
Contaminant Group/Use	Used in nonionic surfactants, plasticizers, antioxidants, fuel oil stabilizer, intermediate for resins, fungicides, bactericides, dyestuffs, adhesives, rubber chemicals
PCCL 5/CCL 5 Status	PCCL 5
Health and Occurrence Information Status	• No EPA Health Assessment Available • Non-national finished and national ambient water occurrence data available
Persistence/Mobility/Fate/Transport	Biodegradation Half-Life ($t_{1/2}$) = 4.07 days Henry's Law Coefficient (K_H) = 7.94×10^{-6} atm-m^3/mol Octanol-Water Partitioning Coefficient (log K_{ow}) = 4.94 Organic Carbon Partitioning Coefficient (K_{oc}) = 2.45×10^3 L/kg Water Solubility = 1.58×10^{-4} mol/L
Use/Production/Release	CDR (2015): 50,000,000 - <100,000,000 lbs
PubMed Article Count	204

4-tert-Octylphenol: Health Effects

EPA Health Assessment	NA
Critical Effect	NA
Target Population	NA
Reference Dose (RfD) or Equivalent	NA
Health Value	NA

Additional Health Information

Other:

- MN DOH (2015): CCL-SL = 67.6 µg/L; RfD = 0.051 mg/kg/day
- MN DOH (accessed 2018):
  - Chronic Health Risk Limit = 0.1 mg/L (100 µg/L)
  - Subchronic Health Risk Limit = 0.1 mg/L (100 µg/L)
  - Short-Term Health Risk Limit = 0.1 mg/L (100 µg/L)
- NIH HSDB (accessed 2019): LD50 = 2,000 mg/kg

4-tert-Octylphenol: Occurrence

Best Available Occurrence Information	NA

Additional Occurrence Information

Finished Drinking Water

- USGS, Sioux Falls Area, 2012 (2009-2010): Not detected in 1 (0%) sites

Ambient Water

- USGS NAWQA (1991-2017): Detected in 38 of 567 (6.7%) sites; Concentration range = 0.01 – 0.59 µg/L
- USGS NWIS (2008-2017): Detected in 90 of 1,406 (6.4%) sites; Concentration range = 0.01 – 42.6 µg/L
- Bradley et al. 2017 (2012-2014): Detected in 8 of 38 (21%) sites; Concentration range = 0.0204 – 0.355 µg/L
- USGS, Sioux Falls Area, 2012 (2011-2017): Not detected in 2 (0%) sites

6-Chloro-1,3,5-triazine-2,4-diamine: Background

CASRN	3397-62-4
DTXSID	DTXSID1037806
Contaminant Group/Use	Herbicide
PCCL 5/CCL 5 Status	CCL 5
Health and Occurrence Information Status	• EPA health assessment available • Non-national finished and national ambient water occurrence data available
Persistence/Mobility/Fate/Transport	Biodegradation Half-Life ($t_{1/2}$) = 8.32 days Henry's Law Coefficient (K_H) = $1.12x10^{-7}$ atm-m^3/mol Octanol-Water Partitioning Coefficient (log K_{ow}) = $-4.82x10^{-2}$ Organic Carbon Partitioning Coefficient (K_{oc}) = 20.5 L/kg Water Solubility = $9.55x10^{-2}$ mol/L
Use/Production/Release	NA
PubMed Article Count	7

6-Chloro-1,3,5-triazine-2,4-diamine: Health Effects

EPA Health Assessment	OPP (2018)
Critical Effect	Attenuation of luteinizing hormone surge in females ages 13-49 (estrous cycle disruption)
Target Population	Women of childbearing age
Reference Dose (RfD) or Equivalent	0.0676 mg/kg/day
Health Value	CCL-HRL = 429 µg/L

Additional Health Information

EPA:

- OPP HHBP (2021):
  - Chronic Benchmark = 0.011 mg/L (11 µg/L); Population-Adjusted Dose (RfD) = 0.0018 mg/kg/day
  - Acute Benchmark = 0.3 mg/L (300 µg/L); Acute Population-Adjusted Dose = 0.01 mg/kg/day
- ToxRefDB (2014): NOAEL = 2.50 mg/kg/day; LOAEL = 25.0 mg/kg/day; Subchronic NOAEL = 0.700 mg/kg/day; Subchronic LOAEL = 7.60 mg/kg/day

Other:

- CalEPA OEHHA (accessed 2019): Maximum Allowable Daily Level (MADL) = 100 µg/day

6-Chloro-1,3,5-triazine-2,4-diamine: Occurrence

Best Available Occurrence Information	NA

Additional Occurrence Information

Finished Drinking Water

- USDA PDP (2001-2013): Detected in 3 of 10 (30%) sites; Concentration range = 0.025 – 0.05 µg/L

Ambient Water

- USGS NAWQA (1991-2017): Detected in 656 of 3,405 (19%) sites; Concentration range = 0.0012 – 6.68 µg/L
- USGS NWIS (2008-2017): Detected in 325 of 1,085 (30%) sites; Concentration range = 0.0032 – 2.45 µg/L
- USDA PDP (2001-2013): Detected in 76 of 227 (33%) sites; Concentration range = 0.015 – 2.9 µg/L
- Drinking Water Monitoring - WI (2012-2019): Not detected in 2 (0%) sites
- Arnold et al. 2016 (2012-2013): Detected in 86 of 584 (15%) sites; Concentration range = 0.0012 – 6.3 µg/L
- Bradley et al. 2017 (2012-2014): Detected in 7 of 38 (18%) sites; Concentration range = 0.027 – 0.17 µg/L

Acephate: Background

CASRN	30560-19-1
DTXSID	DTXSID8023846
Contaminant Group	Insecticide
Contaminant Group/Use	CCL 5
Health and Occurrence Information Status	• EPA health assessment available • National ambient water occurrence data available
Persistence/Mobility/Fate/Transport	Biodegradation Half-Life ($t_{1/2}$) = 3.55 days Henry's Law Coefficient (K_H) = 4.90×10^{-9} atm-m^3/mol Octanol-Water Partitioning Coefficient (log K_{ow}) = -0.783 Organic Carbon Partitioning Coefficient (K_{oc}) = 2.79 L/kg Water Solubility = 2.11 mol/L
Use/Production/Release	CDR (2015): 74,970 lbs TRI (2016): 27,210 lbs USGS (2016): 4,373,575 lbs
PubMed Article Count	160

Acephate: Health Effects

EPA Health Assessment	OPP (2018)
Critical Effect	Inhibition of brain acetylcholinesterase in male pups on postnatal day 11
Target Population	Bottle-fed Infants
Reference Dose (RfD) or Equivalent	0.0003 mg/kg/day
Health Value	CCL-HRL = 0.397 µg/L

Additional Health Information

EPA:

- OPP HHBP (2021):
  - Chronic Benchmark = 0.002 mg/L (2 µg/L) ; Population-Adjusted Dose (RfD) = 0.0003 mg/kg/day
  - Acute Benchmark = 0.002 mg/L (2 µg/L); Acute Population-Adjusted Dose (RfD) = 0.0003 mg/kg/day
- ToxRefDB (2014): NOAEL = 2.50 mg/kg/day; LOAEL = 0.250 mg/kg/day; subchronic LOAEL = 0.120 mg/kg/day

Other:

- NIH HSDB (accessed 2019): LD50 = 233 mg/kg

Cancer Classification:

- OPP (2018): C (Possible human carcinogen)

Acephate: Occurrence

Best Available Occurrence Information	NA

Additional Occurrence Information

Ambient Water

- USGS NAWQA (1991-2017): Detected in 135 of 1760 (7.67%) sites; Concentration range = 0.00051 – 10.4 µg/L
- USGS NWIS (2008-2017): Detected in 35 of 835 (4.19%) sites; Concentration range = 0.00082 – 10.4 µg/L
- Drinking Water Monitoring - CA (2006-2020): Not detected in 3 (0%) sites
- Arnold et al. 2016 (2012-2013): Not detected in 584 (0%) sites
- SURF (1990-2018): Detected in 34 of 118 (29%) sites; Concentration range = 0.132 – 13.5 µg/L

Ametryn: Background

CASRN	834-12-8
DTXSID	DTXSID1023869
Contaminant Group/Use	Herbicide
PCCL 5/CCL 5 Status	PCCL 5
Health and Occurrence Information Status	• EPA health assessment available • Non-national finished and national ambient water occurrence data available
Persistence/Mobility/Fate/Transport	Biodegradation Half-Life ($t_{1/2}$) = 3.39 days Henry's Law Coefficient (K_H) = 2.34×10^{-8} atm-m^3/mol Octanol-Water Partitioning Coefficient (log K_{ow}) = 3.11 Organic Carbon Partitioning Coefficient (K_{oc}) = 310 L/kg Water Solubility = 7.51×10^{-4} mol/L
Use/Production/Release	TRI (2016): 33,682 lbs USGS (2016): 188,062 lbs
PubMed Article Count	68

Ametryn: Health Effects

EPA Health Assessment	OPP (2017)
Critical Effect	Degenerative and inflammatory liver effects
Target Population	General Population
Reference Dose (RfD) or Equivalent	0.072 mg/kg/day
Health Value	CCL-HRL = 426 µg/L

Additional Health Information

EPA:

- DWSHA (accessed 2018):
  - Lifetime Health Advisory = 0.06 mg/L (60 µg/L)
  - 10-day Health Advisory = 9 mg/L (9,000 µg/L)
- ToxRefDB: NOAEL = 2.50 mg/kg/day; LOAEL = 20.9 mg/kg/day; Subchronic NOAEL = 7.60 mg/kg/day; Subchronic LOAEL = 36.1 mg/kg/day

Other:

- HSDB (accessed 2019): LD50 = 508 mg/kg

Cancer Classification:

- OPP (2017): S (Suggestive evidence of carcinogenic potential)

Ametryn: Occurrence

Best Available Occurrence Information	NA

Additional Occurrence Information

Finished Drinking Water

- Drinking Water Monitoring Data - CA: Not detected in 3 (0%) sites

Ambient Water

- USGS NAWQA (1991-2017): Detected in 141 of 2,091 (6.74%) sites; Concentration range = $1x10^{-4}$ µg/L – 1.05 µg/L
- USGS NWIS (2008-2017): Detected in 43 of 1,003 (4.29%) sites; Concentration range = 0.00092 µg/L – 0.266 µg/L
- Drinking Water Monitoring - CA (2006-2020): Not detected in 17 (0%) sites
- Arnold et al. 2016 (2012-2013): Not detected in 584 (0%) sites
- SURF (1990-2018): Not detected in 71 (0%) sites

Bensulide: Background

CASRN	741-58-2
DTXSID	DTXSID9032329
Contaminant Group/Use	Herbicide
PCCL 5/CCL 5 Status	CCL 5
Health and Occurrence Information Status	• EPA health assessment available • Non-national ambient water occurrence data available
Persistence/Mobility/Fate/Transport	Biodegradation Half-Life ($t_{1/2}$) = 200 days Henry's Law Coefficient (K_H) = 1.58×10^{-6} atm-m^3/mol Octanol-Water Partitioning Coefficient (log K_{ow}) = 4.17 Organic Carbon Partitioning Coefficient (K_{oc}) = 1.49×10^3 L/kg Water Solubility = 3.45×10^{-5} mol/L
Use/Production/Release	USGS (2016): 710,457 lbs
PubMed Article Count	4

Bensulide: Health Effects

EPA Health Assessment	OPP (2016)
Critical Effect	Inhibition of red blood cell cholinesterase in pups
Target Population	Bottle-fed infants
Reference Dose (RfD) or Equivalent	0.006 mg/kg/day
Health Value	CCL-HRL = 7.95 µg/L

Additional Health Information

EPA:

- OPP HHBP (2021):
  - Chronic Benchmark = 0.03 mg/L (30 µg/L); Population-Adjusted Dose (RfD) = 0.005 mg/kg/day
  - Acute Benchmark = 1 mg/L (1,000 µg/L); Acute Population-Adjusted Dose (RfD) = 0.15 mg/kg/day
- ToxRefDB (2014): NOAEL = 0.500 mg/kg/day; LOAEL = 4.00 mg/kg/day; Subchronic NOAEL = 5.00 mg/kg/day; Subchronic LOAEL = 1.00 mg/kg/day

Other:

- NIH HSDB (accessed 2019): LD50 = 270 mg/kg

Cancer Classification:

- OPP (2016): E (Evidence of non-carcinogenicity for humans)

Bensulide: Occurrence

Best Available Occurrence Information	NA

Additional Occurrence Information

Ambient Water

- SURF (1990-2018): Detected in 320 of 544 (59%) sites; Concentration range = 0.02 µg/L – 142 µg/L

Bentazon: Background

CASRN	25057-89-0
DTXSID	DTXSID0023901
Contaminant Group/Use	Former herbicide
PCCL 5/CCL 5 Status	PCCL 5
Health and Occurrence Information Status	• EPA health assessment available • Non-national finished and national ambient water occurrence data available
Persistence/Mobility/Fate/Transport	Biodegradation Half-Life ($t_{1/2}$) = 4.90 days Henry's Law Coefficient (K_H) = $2.57x10^{-10}$ atm-m^3/mol Octanol-Water Partitioning Coefficient (log K_{ow}) = 2.21 Organic Carbon Partitioning Coefficient (K_{oc}) = 81.1 L/kg Water Solubility = $1.02x10^{-3}$ mol/L
Use/Production/Release	USGS (2016): 2,631,678 lbs
PubMed Article Count	118

Bentazon: Health Effects

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EPA Health Assessment	OPP (2014)
Critical Effect	Decreased pup body weight during lactation
Target Population	Bottle-fed Infants
Reference Dose (RfD) or Equivalent	0.15 mg/kg/day
Health Value	CCL-HRL = 199 µg/L

Additional Health Information

EPA:

- DWSHA (accessed 2018):
  - Lifetime Health Advisory = 0.2 mg/L (200 µg/L)
  - 10-day Health Advisory = 0.3 mg/L (300 µg/L)
- ToxRefDB (accessed 2018): NOAEL = 3.20 mg/kg/day; LOAEL = 13.1 mg/kg/day; Subchronic LOAEL = 243.3 mg/kg/day

Bentazon: Health Effects

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Additional Health Information (cont'd)

Other:

- MN DOH (accessed 2018):
  - Chronic Health Risk Limit = 0.03 mg/L (30 µg/L)
  - Subchronic Health Risk Limit = 0.05 mg/L (50 µg/L)
  - Short-Term Health Risk Limit = 0.06 mg/L (60 µg/L)
  - Acute Health Risk Limit = 0.4 mg/L (400 µg/L)
- CalEPA OEHHA (2009): Public Health Goal = 0.2 mg/L (200 µg/L)
- NIH HSDB (accessed 2019): LD50 = 383.2 mg/kg

Cancer Classification:

- OPP (2014): E (Evidence of non-carcinogenicity for humans)

Bentazon: Occurrence

Best Available Occurrence Information	NA

Additional Occurrence Information

Finished Drinking Water

- USDA PDP (2001-2013): Detected in 8 of 17 (47%) sites; Concentration range = $3x10^{-4}$ µg/L – 0.1 µg/L
- Drinking Water Monitoring - CA (2006-2020): Not detected in 211 (0%) sites

Ambient Water

- USGS NAWQA (1991-2017): Detected in 470 of 7,741 (6.07%) sites; Concentration range = 0.00051 µg/L – 19 µg/L
- USGS NWIS (2008-2017): Detected in 135 of 1,535 (8.79%) sites; Concentration range = 0.00117 µg/L – 13.2 µg/L
- USDA PDP (2001-2013): Detected in 79 of 229 (34%) sites; Concentration range = $3x10^{-4}$ µg/L – 1.31 µg/L
- Drinking Water Monitoring - CA (2006-2020): Detected in 3 of 2,231 (0.13%) sites; Concentration range = 4.6 µg/L – 9.2 µg/L
- Arnold et al. 2016 (2012-2013): Detected in 13 of 690 (1.88%) sites; Concentration range = 0.0019 µg/L – 0.398 µg/L
- Bradley et al. 2017 (2012-2014): Detected in 5 of 38 (13%) sites; Concentration range = 0.0116 µg/L – 0.088 µg/L
- USGS, McKenzie River, Oregon, 2012 (2002-2010): Detected in 4 of 126 (3.2%) sites; Maximum concentration = 0.03 µg/L

Bifenthrin: Background

CASRN	82657-04-3
DTXSID	DTXSID9020160
Contaminant Group/Use	Insecticide
PCCL 5/CCL 5 Status	PCCL 5
Health and Occurrence Information Status	• EPA health assessment available • Non-national finished and national ambient water occurrence data available
Persistence/Mobility/Fate/Transport	Biodegradation Half-Life ($t_{1/2}$) = 3.55 days Henry's Law Coefficient (K_H) = 4.90×10^{-8} atm-m^3/mol Octanol-Water Partitioning Coefficient (log K_{ow}) = 7.14 Organic Carbon Partitioning Coefficient (K_{oc}) = 2.29×10^5 L/kg Water Solubility = 9.76×10^{-8} mol/L
Use/Production/Release	TRI (2016): 16,519 lbs USGS (2016): 1,403,807 lbs
PubMed Article Count	246

Bifenthrin: Health Effects

EPA Health Assessment	OPP (2012)
Critical Effect	Reduced locomotor activity
Target Population	Bottle-fed Infants
Reference Dose (RfD) or Equivalent	0.010 mg/kg/day
Health Value	CCL-HRL = 13.2 µg/L

Additional Health Information

EPA:

- OPP HHBP (2021):
  - Acute Benchmark = 0.21 mg/L (210 µg/L); Acute Population-Adjusted Dose (RfD) = 0.031 mg/kg/day
- ToxRefDB (accessed 2018): NOAEL = 1.00 mg/kg/day; LOAEL = 2.00 mg/kg/day; Subchronic NOAEL = 2.50 mg/kg/day; Subchronic LOAEL = 5.00 mg/kg/day

Other:

- NIH HSDB (accessed 2019): LD50 = 54.5 mg/kg

Cancer Classification:

- OPP (2012): C (Possible human carcinogen)

Bifenthrin: Occurrence

Best Available Occurrence Information	NA

Additional Occurrence Information

Finished Drinking Water

- USDA PDP (2001-2013): Detected in 2 of 17 (12%) sites; Concentration range = 0.0053 – 0.036 µg/L

Ambient Water

- USGS NAWQA (1991-2017): Detected in 21 of 1,994 (1.05%) sites; Concentration range = 5.00×10^{-5} – 0.129 µg/L
- USGS NWIS (2008-2017): Detected in 21 of 966 (2.17%) sites; Concentration range = 0.00148 – 0.35 µg/L
- USDA PDP (2001-2013): Detected in 1 of 201 (0.5%) sites; Concentration = 0.008 µg/L
- Arnold et al. 2016 (2012-2013): Detected in 1 of 584 (0.17%) sites; Concentration = 1×10^{-4} µg/L
- Bradley et al. 2017 (2012-2014): Detected in 1 of 38 (2.63%) sites; Concentration = 0.0218 µg/L
- SURF (1990-2018): Detected in 970 of 4,917 (20%) sites; Concentration range = 0.00062 – 5.633527 µg/L

Boron: Background

CASRN	7440-42-8
DTXSID	DTXSID3023922
Contaminant Group/Use	Former pesticide; oxygen scavenger; catalyst; in composite structural materials
PCCL 5/CCL 5 Status	CCL 5
Health and Occurrence Information Status	• EPA health assessment available • National finished and ambient water occurrence data available
Persistence/Mobility/Fate/Transport	Biodegradation Half-Life ($t_{1/2}$) = NA Henry's Law Coefficient (K_H) = NA Octanol-Water Partitioning Coefficient (log K_{ow}) = 0.230 Organic Carbon Partitioning Coefficient (K_{oc}) = NA Water Solubility = 4.04 mol/L
Use/Production/Release	CDR (2015): 64,606 lbs
PubMed Article Count	3,232

Boron: Health Effects

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EPA Health Assessment	OW HA (2008)
Critical Effect	Decreased fetal body weights
Target Population	Women of childbearing age
Reference Dose (RfD) or Equivalent	0.17 mg/kg/day
Health Value	CCL-HRL = 960 µg/L

Additional Health Information

EPA:

- IRIS (2004): CCL-HRL = 1,130 µg/L; RfD = 0.2 mg/kg/day
- DWSHA (accessed 2018):
  - Lifetime Health Advisory = 6 mg/L (6,000 µg/L)
  - 10-day Health Advisory = 3 mg/L (3,000 µg/L)

Boron: Health Effects

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Additional Health Information (cont'd)

Other:

- CDWG:
  - (1990): CCL-HRL = 207 µg/L; RfD = 0.035 mg/kg/day
  - (2023): Maximum Allowable Concentration (MAC) = 5 mg/L (5,000 µg/L); (Proposed MAC = 2mg/L (2,000 µg/L))
    - Health Based Value = 0.1 mg/L (100 µg/L)
- WHO (2009):
  - CCL-HRL = 960 µg/L; Total Daily Intake (RfD) = 0.17 mg/kg/day
  - Drinking water Guideline Value = 2.4 mg/L (2,400 µg/L)
- CDC ATSDR (2010): CCL-HRL = 1,180 µg/L; RfD = 0.2 mg/kg/day
- MN DOH (accessed 2018):
  - Chronic Risk Assessment Advice = 0.5 mg/L (500 µg/L)
  - Subchronic Risk Assessment Advice = 0.5 mg/L (500 µg/L)
  - Short-Term Risk Assessment Advice = 0.5 mg/L (500 µg/L)

Cancer Classification:

- IRIS (2004): I (Inadequate information to assess carcinogenic potential)

Boron: Occurrence

Best Available Occurrence Information	NIRS (1984-1986): Detected in 810 of 989 (82%) sites; Concentration range = 5 – 3,950 µg/L

Additional Occurrence Information

Finished Drinking Water

- Drinking Water Monitoring Data - CA (2006-2020): Detected in 192 of 273 (70%) sites; Concentration range = 0.076 – 9,000 µg/L
- CWSS (2006): Not detected in 5 (0%) sites; Median concentration = 140 µg/L, 90th percentile concentration = 200 µg/L

Ambient Water

- USGS NAWQA (1991-2017): Detected in 6,014 of 6,327 (95%) sites; Concentration range = 0 – 8,470 µg/L
- USGS NWIS (2008-2017): Detected in 9,526 of 10,148 (94%) sites; Concentration range = 1 – 564,000 µg/L
- Drinking Water Monitoring Data - CA (2006-2020): Detected in 1,184 of 1,929 (61%) sites; Concentration range = 0.0151 – 235,000 µg/L
- Drinking Water Monitoring Data - WI (2012-2019): Not detected in 1 (0%) site
- Arnold et al. 2016 (2012-2013): Detected in 738 of 757 (97%) sites; Concentration range = 3 – 4080 µg/L

Bromacil: Background

CASRN	314-40-9
DTXSID	DTXSID4022020
Contaminant Group/Use	Herbicide
PCCL 5/CCL 5 Status	PCCL 5
Health and Occurrence Information Status	• EPA health assessment available • Non-national finished and national ambient water occurrence data available
Persistence/Mobility/Fate/Transport	Biodegradation Half-Life ($t_{1/2}$) = 4.90 days Henry's Law Coefficient (K_H) = 1.35×10^{-6} atm-m^3/mol Octanol-Water Partitioning Coefficient (log K_{ow}) = 1.95 Organic Carbon Partitioning Coefficient (K_{oc}) = 39.8 L/kg Water Solubility = 1.63×10^{-3} mol/L
Use/Production/Release	USGS (2016): 253,973 lbs
PubMed Article Count	47

Bromacil: Health Effects

EPA Health Assessment	OPP (2016)
Critical Effect	Decreases in mean absolute body weight and decreased food efficiency
Target Population	General Population
Reference Dose (RfD) or Equivalent	0.0196 mg/kg/day
Health Value	CCL-HRL = 116 µg/L

Additional Health Information

EPA:

- DWSHA (2018):
  - Lifetime Health Advisory = 0.07 mg/L (70 µg/L)
  - 10-day Health Advisory = 5 mg/L (5,000 µg/L)
- ToxRefDB (accessed 2018): NOAEL = 2.64 mg/kg/day; LOAEL = 9.82 mg/kg/day

Other:

- NIH HSDB (accessed 2019): LD50 = 641 mg/kg

Cancer Classification:

- OPP (2016): C (Possible human carcinogen)

Bromacil: Occurrence

Best Available Occurrence Information	NA

Additional Occurrence Information

Finished Drinking Water

- USDA PDP (2001-2013): Detected in 4 of 15 (27%) sites; Concentration range = 0.0086 – 0.069 µg/L
- Drinking Water Monitoring - CA (2006-2020): Not detected in 174 (0%) sites
- Glassmeyer et al. 2017 (2007-2012): Not detected in 25 (0%) sites
- USGS, Sioux Falls Area, 2012 (2009-2010): Not detected in 1 (0%) site

Ambient Water

- USGS NAWQA (1991-2017): Detected in 482 of 7,914 (6.09%) sites; Concentration range = 0.00043 – 21.7 µg/L
- USDA PDP (2001-2013): Detected in 53 of 227 (23%) sites; Concentration range = 0.002 – 21.8 µg/L
- Drinking Water Monitoring - CA (2006-2020): Detected in 1 of 2,117 (0.05%) sites; Concentration = 1.5 µg/L
- Arnold et al. 2016 (2012-2013): Detected in 32 of 690 (4.64%) sites; Concentration range = $4x10^{-4}$ – 7.76 µg/L
- Bradley et al. 2017 (2012-2014): Detected in 5 of 38 (13%) sites; Concentration range = 0.02 – 0.1 µg/L
- Glassmeyer et al. 2017 (2007-2012): Not detected in 25 (0%) sites
- SURF (1990-2018): Detected in 100 of 2,953 (3.39%) sites; Concentration range = 0.027 – 68 µg/L
- USGS, Sioux Falls Area, 2012 (2009-2010): Not detected in 2 (0%) sites

Bromoxynil: Background

CASRN	1689-84-5
DTXSID	DTXSID3022162
Contaminant Group/Use	Herbicide
PCCL 5/CCL 5 Status	CCL 5
Health and Occurrence Information Status	• EPA health assessment available • Non-national finished and national ambient water occurrence data available
Persistence/Mobility/Fate/Transport	Biodegradation Half-Life ($t_{1/2}$) = 4.90 days Henry's Law Coefficient (K_H) = 2.29×10^{-7} atm-m^3/mol Octanol-Water Partitioning Coefficient (log K_{ow}) = 3.03 Organic Carbon Partitioning Coefficient (K_{oc}) = 1.38×10^3 L/kg Water Solubility = 3.96×10^{-4} mol/L
Use/Production/Release	TRI (2016): 31 lbs USGS (2016): 2,957,908 lbs
PubMed Article Count	73

Bromoxynil: Health Effects

(slide 1 of 2)

EPA Health Assessment	OPP (2018)
Critical Effect	Hepatocellular tumors
Target Population	General Population
Cancer Slope Factor (CSF)	0.103 $(mg/kg/day)^{-1}$
Health Value	CCL-HRL = 0.287 µg/L

Additional Health Information

EPA:

- OPP (2018): CCL-HRL = 88.8 µg/L; RfD = 0.015 mg/kg/day
- OPP HHBP (2021):
  - Chronic Benchmark = 0.089 mg/L (89 µg/L); Population-Adjusted Dose (RfD) = 0.015 mg/kg/day
  - Acute Benchmark = 0.5 mg/L (500 µg/L); Acute Population-Adjusted Dose (RfD) = 0.08 mg/kg/day
- ToxRefDB (accessed 2018): NOAEL = 0.300 mg/kg/day; LOAEL = 1.50 mg/kg/day

Bromoxynil: Health Effects

(slide 1 of 2)

Additional Health Information (cont'd)

Other:

- CDWG (2022): Maximum Allowable Concentration = 0.03 mg/L (30 µg/L)
- NIH HSDB (accessed 2019): LD50 = 63 mg/kg

Cancer Classification:

- OPP (2018): C (Possible human carcinogen)

Bromoxynil: Occurrence

Best Available Occurrence Information	NA

Additional Occurrence Information

Finished Drinking Water

- USDA PDP (2001-2013): Not detected in 13 (0%) sites

Ambient Water

- USGS NAWQA (1991-2017): Detected in 60 of 7,736 (0.78%) sites; Concentration range = 6.00×10^{-4} – 6.1 µg/L
- USGS NWIS (2008-2017): Detected in 10 of 1,535 (0.65%) sites; Concentration range = 0.0056 – 0.269 µg/L
- USDA PDP (2001-2013): Detected in 1 of 8 (12%) sites; Concentration = 0.065 µg/L
- Arnold et al. 2016 (2012-2013): Not detected in 690 (0%) sites
- Bradley et al. 2017 (2012-2014): Detected in 4 of 38 (11%) sites; Concentration range = 0.0128 – 0.1185 µg/L

Butyl Benzyl Phthalate: Background

CASRN	85-68-7
DTXSID	DTXSID3020205
Contaminant Group/Use	Chemical intermediate; plasticizer
PCCL 5/CCL 5 Status	PCCL 5
Health and Occurrence Information Status	• EPA health assessment available • Non-national finished and national ambient water occurrence data available
Persistence/Mobility/Fate/Transport	Biodegradation Half-Life ($t_{1/2}$) = 3.39 days Henry's Law Coefficient (K_H) = 2.88×10^{-8} atm-m^3/mol Octanol-Water Partitioning Coefficient (log K_{ow}) = 4.83 Organic Carbon Partitioning Coefficient (K_{oc}) = 3.91×10^3 L/kg Water Solubility = 1.30×10^{-5} mol/L
Use/Production/Release	CDR (2015): 10,000,000 - <50,000,000 lbs
PubMed Article Count	179

Butyl Benzyl Phthalate: Health Effects

(slide 1 of 2)

EPA Health Assessment	PPRTV (2002)
Critical Effect	Increased incidence of pancreatic cancer in male F334 rats
Target Population	General Population
Cancer Slope Factor (CSF)	0.0019 $(mg/kg/day)^{-1}$
Health Value	CCL-HRL = 15.6 µg/L

Additional Health Information

EPA:

- OW (1991): CCL-HRL = 1,180 µg/L; RfD = 0.2 mg/kg/day
- IRIS (1989): CCL-HRL = 1,180 µg/L; Chronic RfD = 0.2 mg/kg/day
- HHC (2015): Human Health Ambient Water Quality Criteria = 0.0001 (0.10 µg/L)
- ToxRefDB (accessed 2018): LOAEL = 100 mg/kg/day

Butyl Benzyl Phthalate: Health Effects

(slide 2 of 2)

Additional Health Information (cont'd)

Other:

- MN DOH (accessed 2018):
  - Chronic Health Risk Limit = 0.1 mg/L (100 µg/L)
  - Subchronic Health Risk Limit = 0.1 mg/L (100 µg/L)
  - Short-Term Health Risk Limit = 0.1 mg/L (100 µg/L)
  - Acute Health Risk Limit = 0.1 mg/L (100 µg/L)
- CalEPA OEHHA (accessed 2019): MADL = 1,200 µg/day
- NIH HSDB (accessed 2019): LD50 = 2,000 mg/kg
- CPDB (accessed 2018): TD50 = 347 mg/kg/day

Cancer Classification:

- PPRTV (2002): C (Possible human carcinogen)
- WHO IARC (1998): 3 (Unclassifiable as to carcinogenicity in humans)
- OW (1991): C (Possible human carcinogen)

Butyl Benzyl Phthalate: Occurrence

Best Available Occurrence Information	NA

Additional Occurrence Information

Finished Drinking Water

- Drinking Water Monitoring - CA (2006-2020): Detected in 1 of 21 (4.76%) sites; Concentration range = 0.005 – 0.077 µg/L
- Drinking Water Monitoring - WA (2006-2011): Not detected in 484 (0%) sites

Ambient Water

- USGS NAWQA (1991-2017): Detected in 2 of 22 (9.09%) sites; Concentration = 1.3 µg/L
- USGS NWIS (2008-2017): Detected in 32 of 487 (6.57%) sites; Concentration range = 0.2 – 5 µg/L
- Drinking Water Monitoring - CA (2006-2020): Detected in 2 of 221 (0.9%) sites; Concentration range = 0.003 – 8.5 µg/L
- Drinking Water Monitoring - WA (2006-2011): Detected in 1 of 638 (0.16%) sites; Concentration range = 4.7 – 5.7 µg/L

Carbamazepine: Background

CASRN	298-46-4
DTXSID	DTXSID4022731
Contaminant Group/Use	Analgesic; anticonvulsant
PCCL 5/CCL 5 Status	PCCL 5
Health and Occurrence Information Status	• EPA Health Assessment Available • Non-national finished and national ambient water occurrence data available
Persistence/Mobility/Fate/Transport	Biodegradation Half-Life ($t_{1/2}$) = 6.61 days Henry's Law Coefficient (K_H) = $2.24x10^{-10}$ atm-m^3/mol Octanol-Water Partitioning Coefficient (log K_{ow}) = 2.41 Organic Carbon Partitioning Coefficient (K_{oc}) = 550 L/kg Water Solubility = $2.30x10^{-4}$ mol/L
Use/Production/Release	NA
PubMed Article Count	10,111

Carbamazepine: Health Effects

EPA Health Assessment	OW (FDA/NIH (2018))
Critical Effect	Lowest therapeutic dose: anticonvulsant/ seizure therapy
Target Population	Bottle-fed Infants
Reference Dose (RfD) or Equivalent	0.0008 mg/kg/day
Health Value	CCL-SL = 5.60 µg/L

Additional Health Information

EPA:

- OW FDA/NIH (2018): CCL-SL = 20.0 µg/L; RfD = 0.0008 mg/kg/day (General Population)

Other:

- MN DOH (accessed 2018):
  - Chronic Health Risk Limit = 0.04 mg/L (40 µg/L)
  - Subchronic Health Risk Limit = 0.04 mg/L (40 µg/L)
  - Short-Term Health Risk Limit = 0.04 mg/L (40 µg/L)
  - Acute Health Risk Limit = 0.04 mg/L (40 µg/L)
- FDA (2008): MRDD = 26.7 mg/kg/day

Carbamazepine: Occurrence

(slide 1 of 2)

Best Available Occurrence Information	NA

Additional Occurrence Information

Finished Drinking Water

- Drinking Water Monitoring - CA (2006-2020): Not detected in 1 (0%) site
- Bradley et al. 2018 (2016): Detected in 2 of 26 (7.69%) sites; Concentration range = 0.0005503 µg/L - 0.0007611 µg/L
- Glassmeyer et al. 2017 (2007-2012): Detected in 2 of 25 (8%) sites; Maximum concentration = 0.0265 µg/L
- Padhye et al. 2013 (2009-2010): Detected in 1 of 8 (12.5%) samples; Concentration range = 0 µg/L – $2.5 \times 10^{-5} \pm 8.8 \times 10^{-6}$ µg/L
- USGS, Sioux Falls Area, 2012 (2009-2010): Not detected in 1 (0%) site

Carbamazepine: Occurrence

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Additional Occurrence Information (cont'd)

Ambient Water

- USGS NAWQA (1991-2017): Detected in 62 of 626 (9.9%) sites; Concentration range = 0.00021 – 0.468 µg/L
- USGS NWIS (2008-2017): Detected in 304 of 1,441 (21%) sites; Concentration range = 0.00018 – 1 µg/L
- Drinking Water Monitoring - CA (2006-2020): Not detected in 1 (0%) site
- Batt et al. 2016 (2008-2009): Detected in 74 of 182 (41%) sites; Concentration range = 0.0015 – 0.2493 µg/L
- Bexfield et al. 2019 (2013-2015): Detected in 18 of 1,106 (1.63%) sites; Concentration range = 0.0029133 – 0.1620862 µg/L
- Bradley et al. 2017 (2012-2014): Detected in 22 of 38 (58%) sites; Concentration range = 0.0008717 – 0.3827473 µg/L
- Glassmeyer et al. 2017 (2007-2012): Not detected in 7 of 25 (28%) sites; Maximum concentration 0.0357 µg/L
- Padhye et al. 2013 (2009-2010): Detected in 8 of 8 (100%) samples; Concentration range = $5x10^{-7} \pm 1x10^{-7}$ – $4.1x10^{-6} \pm 1.2x10^{-6}$ µg/L
- USGS, Sioux Falls Area, 2012 (2009-2010): Detected in 2 of 2 (100%) sites; Concentration range = 0.001 – 0.014 µg/L

Carbaryl: Background

CASRN	63-25-2
DTXSID	DTXSID9020247
Contaminant Group/Use	Insecticide; Veterinary Medication
PCCL 5/CCL 5 Status	CCL 5
Health and Occurrence Information Status	• EPA health assessment available • Non-national finished and national ambient water occurrence data available
Persistence/Mobility/Fate/Transport	Biodegradation Half-Life ($t_{1/2}$) = 3.55 days Henry's Law Coefficient (K_H) = 1.38×10^{-8} atm-m^3/mol Octanol-Water Partitioning Coefficient (log K_{ow}) = 2.39 Organic Carbon Partitioning Coefficient (K_{oc}) = 194 L/kg Water Solubility = 8.18×10^{-4} mol/L
Use/Production/Release	TRI (2016): 872 lbs USGS (2016): 1,981,350 lbs
PubMed Article Count	1,135

Carbaryl: Health Effects

EPA Health Assessment	OPP (2017)
Critical Effect	Brain acetylcholinesterase inhibition in pups
Target Population	Bottle-fed Infants
Reference Dose	0.01 mg/kg/day
Health Value	CCL-HRL = 13.2 µg/L

Additional Health Information

EPA:

- OPP (2017): CCL-HRL = 33.8 µg/L; CSF = 0.000875 $(mg/kg/day)^{-1}$
- DWSHA (2018):
  - 10-day Health Advisory = 1 mg/L (1,000 µg/L)

Other:

- CDWG (accessed 2019): Maximum Allowable Concentration = 0.09 mg/L (90 µg/L)
- HSDB (accessed 2019): LD50 = 128 mg/kg
- ToxRefDB (accessed 2018): NOAEL = 4.00 mg/kg/day; LOAEL = 3.10 mg/kg/day

Cancer Classification:

- OPP (2017): L (Likely to be carcinogenic to humans)
- WHO IARC (1987): 3 (Unclassifiable as to carcinogenicity in humans)

Carbaryl: Occurrence

(slide 1 of 2)

Best Available Occurrence Information	NA

Additional Occurrence Information

Finished Drinking Water

- UCM-State Round 2 (1993-1997): Detected in 4 of 12,623 sites (0.03%); Concentration range = 0.68 – 3 µg/L
- USDA PDP (2001-2013): Detected in 5 of 17 sites (29%); Concentration range = 0.002 – 0.3 µg/L
- Drinking Water Monitoring Data - CA (2006-2020): Not detected in 171 (0%) sites
- Drinking Water Monitoring Data - MA (2006-2020): Not detected in 820 (0%) sites
- Drinking Water Monitoring Data - WA (2006-2011): Not detected in 255 (0%) sites
- USGS, Sioux Falls Area, 2012 (2009-2010): Not detected in 1 (0%) site

Carbaryl: Occurrence

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Additional Occurrence Information (cont'd)

Ambient Water

- USGS NAWQA (1991-2017): Detected in 820 of 11,274 (7.27%) of sites; Concentration range = 0.00038 – 23.5 µg/L
- USGS NWIS (2008-2017): Detected in 387 of 5,221 sites (7.41%); Concentration range = 0.00037 – 3.13 µg/L
- USDA PDP (2001-2013): Detected in 7 of 229 sites (3.06%); Concentration range = 0.002 – 0.33 µg/L
- Drinking Water Monitoring Data - CA (2006-2020): Not detected in 1,747 (0%) sites
- Drinking Water Monitoring Data - MA (2006-2020): Detected in 1 of 77 (1.3%) sites; Concentration = 0.75 µg/L
- Drinking Water Monitoring Data - PA (2006-2011): Not detected in 1 (0%) site
- Drinking Water Monitoring Data - WA (2006-2011): Not detected in 422 (0%) sites
- Drinking Water Monitoring Data - WI (2012-2019): Not detected in 92 (0%) sites
- Arnold et al. 2016 (2012-2013): Detected in 6 of 796 sites (0.75%); Concentration range = $5x10^{-4}$ – 0.0033 µg/L
- Bradley et al. 2017 (2012-2014): Detected in 11 of 38 sites (29%); Concentration range = 0.0032 – 0.257 µg/L
- SURF (1990-2018): Detected in 332 of 9,207 sites (3.61%); Concentration range = 0.003 – 13 µg/L
- USGS, McKenzie River, Oregon, 2012 (2002-2010): Detected in 35 of 133 (26%) samples; Maximum concentration = 1.3 µg/L
- USGS, Sioux Falls Area, 2012 (2009-2010): Not detected in 2 (0%) sites

Carbendazim: Background

CASRN	10605-21-7
DTXSID	DTXSID4024729
Contaminant Group/Use	Fungicide
PCCL 5/CCL 5 Status	CCL 5
Health and Occurrence Information Status	• EPA health assessment available • Non-national finished and national ambient water occurrence data available
Persistence/Mobility/Fate/Transport	Biodegradation Half-Life ($t_{1/2}$) = 4.47 days Henry's Law Coefficient (K_H) = 1.41×10^{-9} atm-m^3/mol Octanol-Water Partitioning Coefficient (log K_{ow}) = 1.55 Organic Carbon Partitioning Coefficient (K_{oc}) = 172 L/kg Water Solubility = 3.67×10^{-3} mol/L
Use/Production/Release	NA
PubMed Article Count	519

Carbendazim: Health Effects

(slide 1 of 2)

EPA Health Assessment	OPP (2014)
Critical Effect	Hepatocellular adenoma and/or carcinoma
Target Population	General Population
Cancer Slope Factor	0.00239 $(mg/kg/day)^{-1}$
Health Value	CCL-HRL = 12.4 µg/L

Additional Health Information

EPA:

- OPP (2014): CCL-HRL = 148 µg/L; RfD = 0.025 mg/kg/day
- OPP (HHBP) (2021):
  - Chronic Benchmark = 0.83 mg/L (830 µg/L); Population-Adjusted Dose (RfD) = 0.14 mg/kg/day
  - Acute Benchmark = 0.93 mg/L (930 µg/L); Acute Population-Adjusted Dose (RfD) = 0.014 mg/kg/day
- ToxRefDB: NOAEL = 7.19 mg/kg/day; LOAEL = 16.5 mg/kg/day

Carbendazim: Health Effects

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Additional Health Information (cont'd)

Other:

- HSDB (accessed 2019): LD50 = 5,000 mg/kg

Cancer classification:

- OPP (2014): C (Possible human carcinogen)

Carbendazim: Occurrence

Best Available Occurrence Information	NA

Additional Occurrence Information

Finished Drinking Water

- USDA PDP (2001-2013): Detected in 1 of 7 sites (14%); Concentration = 0.003 µg/L

Ambient Water

- USGS NAWQA (1991-2017): Detected in 212 of 1,757 sites (12%); Concentration range = 0.00014 – 1.79 µg/L
- USDA PDP (2001-2013): Detected in 4 of 115 sites (3.48%); Concentration range = 0.003 – 0.121 µg/L
- Arnold et al. (2016): Detected in 5 of 584 (0.86%) of sites; Concentration range = 0.0013 – 0.157 µg/L
- SURF (1990-2018): Detected in 33 of 122 sites (27%); Concentration range = 0.0043 – 0.1559 µg/L

Carbon disulfide: Background

CASRN	75-15-0
DTXSID	DTXSID6023947
Contaminant Group/Use	Former insecticide/fumigant; rubber additive; industrial solvent; chemical intermediate
PCCL 5/CCL 5 Status	PCCL 5
Health and Occurrence Information Status	• EPA health assessment available • Non-national finished and national ambient water occurrence data available
Persistence/Mobility/Fate/Transport	Biodegradation Half-Life ($t_{1/2}$) = 17.8 days Henry's Law Coefficient (K_H) = $1.45x10^{-2}$ atm-m^3/mol Octanol-Water Partitioning Coefficient (log K_{ow}) = 1.94 Organic Carbon Partitioning Coefficient (K_{oc}) = 133 L/kg Water Solubility = $1.96x10^{-2}$ mol/L
Use/Production/Release	CDR (2015): 250,000,000 - <500,000,000 lbs TRI (2016): 76,858,325 lbs
PubMed Article Count	1,770

Carbon disulfide: Health Effects

EPA Health Assessment	IRIS (1987)
Critical Effect	Fetal toxicity and fetal malformations
Target Population	Women of childbearing age
Reference Dose (RfD) or Equivalent	0.1 mg/kg/day
Health Value	CCL-HRL = 565 µg/L

Additional Health Information

Other:

- CDC ATSDR (1996):
  - Acute Minimal Risk Level = 0.01 mg/kg/day
- MN DOH (accessed 2018):
  - Chronic Health Risk Limit = 0.7 mg/L (700 µg/L)
- CalEPA OEHHA (accessed 2019): Benchmark = 0.16 mg/L (160 µg/L)
- NIH HSDB (accessed 2019): LD50 = 2,125 mg/kg

Carbon disulfide: Occurrence

Best Available Occurrence Information	NA

Additional Occurrence Information

Finished Drinking Water

- Drinking Water Monitoring - CA (2006-2020): Detected in 8 of 127 (6.3%) sites; Concentration range = 0.5 – 8.72 µg/L
- Bradley et al. 2018 (2016): Detected in 9 of 26 (35%) sites; Concentration range = 0.01649 – 0.2946 µg/L

Ambient Water

- USGS NAWQA (1991-2017): Detected in 723 of 6,049 (12%) sites; Concentration range = 0.01 – 34 µg/L
- USGS NWIS (2008-2017): Detected in 183 of 3,385 (5.41%) sites; Concentration range = 0.1 – 12.4 µg/L
- Drinking Water Monitoring - CA (2006-2020): Detected in 20 of 799 (2.5%) sites; Concentration range = 0.51 – 240 µg/L
- Arnold et al. 2016 (2012-2013): Detected in 120 of 685 (18%) sites; Concentration range = 0.0102 – 4.2 µg/L
- Bradley et al. 2017 (2012-2014): Detected in 14 of 38 (37%) sites; Concentration range = 0.01248 – 0.2378 µg/L

Chlorothalonil: Background

CASRN	1897-45-6
DTXSID	DTXSID0020319
Contaminant Group/Use	Fungicide; bacteriocide
PCCL 5/CCL 5 Status	PCCL 5
Health and Occurrence Information Status	• EPA health assessment available • Non-national finished and national ambient water occurrence data available
Persistence/Mobility/Fate/Transport	Biodegradation Half-Life ($t_{1/2}$) = 4.68 days Henry's Law Coefficient (K_H) = 2.00×10^{-6} atm-m^3/mol Octanol-Water Partitioning Coefficient (log K_{ow}) = 3.16 Organic Carbon Partitioning Coefficient (K_{oc}) = 2.65×10^3 L/kg Water Solubility = 4.10×10^{-5} mol/L
Use/Production/Release	TRI (2016): 1,036,631 lbs USGS (2016): 11,506,189 lbs
PubMed Article Count	251

Chlorothalonil: Health Effects

(slide 1 of 2)

EPA Health Assessment	OPP (2010)
Critical Effect	Renal epithelial hyperplasia in the proximal convoluted tubules of females
Target Population	General Population
Reference Dose (RfD) or Equivalent	0.02 mg/kg/day
Health Value	CCL-HRL = 118 µg/L

Additional Health Information

EPA:

- DWSHA (accessed 2018):
  - 10-day Health Advisory = 0.2 mg/L (200 µg/L)
- ToxRefDB (accessed 2018): NOAEL = 1.80 mg/kg/day; LOAEL = 0.900 mg/kg/day; Subchronic NOAEL = 1.50 mg/kg/day; Subchronic LOAEL = 2.30 mg/kg/day

Chlorothalonil: Health Effects

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Additional Health Information (cont'd)

Other:

- CalEPA OEHHA (accessed 2019): CSF = 0.017 $(mg/kg/day)^{-1}$
- MN DOH (accessed 2018):
  - Cancer Health Risk Limit = 0.03 mg/L (30 µg/L)
- NIH HSDB (accessed 2019): LD50 = 242 mg/kg
- CPDB (accessed 2018): TD50 = 1,180 mg/kg/day

Cancer Classification:

- OPP (2010): L (Likely to be carcinogenic to humans)
- WHO IARC (1998): 2B (Possibly carcinogenic to humans)

Chlorothalonil: Occurrence

Best Available Occurrence Information	NA

Additional Occurrence Information

Finished Drinking Water

- USDA PDP (2001-2013): Not detected in 12 (0%) sites
- Drinking Water Monitoring - CA (2006-2020): Not detected in 69 (0%) sites

Ambient Water

- USGS NAWQA (1991-2017): Detected in 21 of 5,787 (0.36%) sites; Concentration range = 0.01 – 3.33 µg/L
- USGS NWIS (2008-2017): Detected in 22 of 207 (11%) sites; Concentration range = 1.00×10^{-4} – 0.158 µg/L
- USDA PDP (2001-2013): Detected in 1 of 229 (0.44%) sites; Concentration = 3.2 µg/L
- Drinking Water Monitoring - CA (2006-2020): Detected in 3 of 739 (0.41%) sites; Concentration range = 0.018 – 0.036 µg/L
- Bradley et al. 2017 (2012-2014): Detected in 5 of 38 (13%) sites; Concentration range = 0.0033 – 0.0065 µg/L
- SURF (1990-2018): Detected in 5 of 565 (0.88%) sites; Concentration range = 0.0067 – 0.187 µg/L

Clothianidin: Background

CASRN	210880-92-5
DTXSID	DTXSID2034465
Contaminant Group/Use	Insecticide
PCCL 5/CCL 5 Status	PCCL 5
Health and Occurrence Information Status	• EPA health assessment available • Non-national finished and national ambient water occurrence data available
Persistence/Mobility/Fate/Transport	Biodegradation Half-Life ($t_{1/2}$) = 3.55 days Henry's Law Coefficient (K_H) = 1.86×10^{-9} atm-m^3/mol Octanol-Water Partitioning Coefficient (log K_{ow}) = 0.290 Organic Carbon Partitioning Coefficient (K_{oc}) = 17.1 L/kg Water Solubility = 9.06×10^{-3} mol/L
Use/Production/Release	USGS (2016): 163,492 lbs
PubMed Article Count	121

Clothianidin: Health Effects

(slide 1 of 2)

EPA Health Assessment	OPP (2019)
Critical Effect	Decreased body weight gain, delayed sexual maturation, decreased thymus weights in first filial generation pups, increased stillbirths in F1 and F2
Target Population	Bottle-fed Infants
Reference Dose (RfD) or Equivalent	0.098 mg/kg/day
Health Value	CCL-HRL = 130 µg/L

Additional Health Information

EPA:

- OPP HHBP (2021):
  - Chronic Benchmark = 0.58 mg/L (580 µg/L); Population-Adjusted Dose (RfD) = 0.098 mg/kg/day
  - Acute Benchmark = 1.7 mg/L (1,700 µg/L); Acute Population-Adjusted Dose (RfD) = 0.25 mg/kg/day
- ToxRefDB: NOAEL = 10.0 mg/kg/day; LOAEL = 31.2 mg/kg/day; Subchronic NOAEL = 21.2 mg/kg/day; Subchronic LOAEL = 40.90000153 mg/kg/day

Clothianidin: Health Effects

(slide 2 of 2)

Additional Health Information (cont'd)

Other:

- MN DOH (accessed 2018):
  - Chronic Health Risk Limit = 0.2 mg/L (200 µg/L)
  - Subchronic Health Risk Limit = 0.2 mg/L (200 µg/L)
  - Short-Term Health Risk Limit = 0.2 mg/L (200 µg/L)
- HSDB (accessed 2019): LD50 = 389 mg/kg

Cancer Classification:

- OPP (2019): NL (Not likely to be carcinogenic to humans)

Clothianidin: Occurrence

Best Available Occurrence Information	NA

Additional Occurrence Information

Finished Drinking Water

- USDA PDP (2001-2013): Detected in 3 of 10 sites (30%); Concentration range = 0.008 – 0.018 µg/L
- Klarich et al. (2016): Detected in 16 of 20 sites (80%); Concentration range = 0.00389 – 0.03346 µg/L

Ambient Water

- USGS NAWQA (1991-2017): Detected in 1 of 5 sites (20%); Concentration range = 9.00×10^{-4} – 0.0019 µg/L
- USGS NWIS (2008-2017): Detected in 59 of 143 sites (41%); Concentration range = 9.00×10^{-4} – 1.34 µg/L
- USDA PDP (2001-2013): Detected in 3 of 227 sites (1.32%); Concentration range = 0.008 – 0.045 µg/L
- Bradley at al. (2012-2014): Detected in 9 of 38 sites (24%); Concentration range = 0.0026 – 0.0663 µg/L
- SURF (1990-2018): Detected in 5 of 279 sites (1.79%); Concentration range = 0.0311 – 0.0675 µg/L

Cycloate: Background

CASRN	1134-23-2
DTXSID	DTXSID6032356
Contaminant Group/Use	Herbicide for annual grasses, nutgrass, many broadleafweeds in sugar beets, table beets, spinach
PCCL 5/CCL 5 Status	PCCL 5
Health and Occurrence Information Status	• EPA health assessment available • Non-national finished and national ambient water occurrence data available
Persistence/Mobility/Fate/Transport	Biodegradation Half-Life ($t_{1/2}$) = 2.69 days Henry's Law Coefficient (K_H) = 1.70×10^{-7} atm-m^3/mol Octanol-Water Partitioning Coefficient (log K_{ow}) = 3.82 Organic Carbon Partitioning Coefficient (K_{oc}) = 377 L/kg Water Solubility = 3.33×10^{-4} mol/L
Use/Production/Release	TRI (2016): 10 lbs USGS (2016): 48,166 lbs
PubMed Article Count	9

Cycloate: Health Effects

EPA Health Assessment	OPP (2015)
Critical Effect	Spinal nerve axonal atrophy and femoral nerve alteration in females
Target Population	General Population
Reference Dose (RfD) or Equivalent	0.0005 mg/kg/day
Health Value	CCL-HRL = 2.96 µg/L

Additional Health Information

EPA:

- OPP HHBP (2021):
  - Chronic Benchmark = 0.03 mg/L (30 µg/L); Population-Adjusted Dose (RfD) = 0.005 mg/kg/day
  - Acute Benchmark = 0.44 mg/L (440 µg/L); Acute Population-Adjusted Dose (RfD) = 0.066 mg/kg/day
- ToxRefDB: NOAEL = 0.500 mg/kg/day; LOAEL = 3.10 mg/kg/day

Other:

- HSDB (accessed 2019): LD50 = 1,275 mg/kg

Cancer Classification:

- OPP (2015): NL (Not likely to be carcinogenic to humans)

Cycloate: Occurrence

Best Available Occurrence Information	NA

Additional Occurrence Information

Finished Drinking Water

- USDA PDP (2001-2013): Not detected in 13 (0%) sites
- Drinking Water Monitoring - CA (2006-2020): Not detected in 3 (0%) sites

Ambient Water

- USGS NAWQA (1991-2017): Detected in 4 of 2,751 sites (0.15%); Concentration range = 0.009 – 0.48 µg/L
- USGS NWIS (2008-2017): Detected in 2 of 984 sites (0.2%); Concentration range = 0.0016 – 0.128 µg/L
- USDA PDP (2001-2013): Not detected in 121 (0%) sites
- Drinking Water Monitoring - CA (2006-2020): Not detected in 16 (0%) sites
- Arnold et al. 2016 (2012-2013) Not detected in 106 (0%) sites
- Bradley et al. 2017 (2012-2014): Detected in 1 of 38 (2.63%) sites; Concentration = 0.0287 µg/L
- SURF (1990-2018): Detected in 31 of 180 (17%) sites; Concentration range = 0.0136 – 0.601 µg/L

Deisopropylatrazine: Background

CASRN	1007-28-9
DTXSID	DTXSID0037495
Contaminant Group/Use	Degradation product of atrazine
PCCL 5/CCL 5 Status	CCL 5 List
Health and Occurrence Information Status	• EPA health assessment available • Non-national finished and national ambient water occurrence data available
Persistence/Mobility/Fate/Transport	Biodegradation Half-Life ($t_{1/2}$) = 3.31 days Henry's Law Coefficient (K_H) = $1.00x10^{-8}$ atm-m^3/mol Octanol-Water Partitioning Coefficient (log K_{ow}) = 1.23 Organic Carbon Partitioning Coefficient (K_{oc}) = 51.3 L/kg Water Solubility = $1.52x10^{-2}$ mol/L
Use/Production/Release	NA
PubMed Article Count	12

Deisopropylatrazine: Health Effects

EPA Health Assessment	OPP (2018)
Critical Effect	Attenuation of luteinizing hormone surge (estrous cycle disruption)
Target Population	Woman of childbearing age
Reference Dose (RfD) or Equivalent	0.076 mg/kg/day
Health Value	CCL-HRL = 429 µg/L

Additional Health Information

EPA:

- ToxRefDB (accessed 2018): NOAEL = 5.00 mg/kg/day; LOAEL = 25.0 mg/kg/day; Subchronic NOAEL = 3.80 mg/kg/day; Subchronic LOAEL = 18.0 mg/kg/day

Other:

- CalEPA OEHHA (accessed 2019): MADL = 100 µg/day

Cancer Classification:

- OPP (2018): NL (Not likely to be carcinogenic to humans)

Deisopropylatrazine: Occurrence

Best Available Occurrence Information	NA

Additional Occurrence Information

Finished Drinking Water

- USDA PDP (2001-2013): Detected in 9 of 17 (53%) sites; Concentration range = 0.0027 – 0.469 µg/L

Ambient Water

- USGS NAWQA (1991-2017): Detected in 802 of 4,489 (18%) sites; Concentration range = 0.001 – 4.44 µg/L
- USGS NWIS (2008-2017): Detected in 374 of 2,038 (18%) sites; Concentration range = 0 – 2.66 µg/L
- USDA PDP (2001-2013): Detected in 68 of 229 (30%) sites; Concentration range = 0.0027 – 1.03 µg/L
- Arnold et al. 2016 (2012-2013): Detected in 61 of 690 (8.84%) sites; Concentration range = 0.0032 – 0.489 µg/L

Desethylatrazine: Background

CASRN	6190-65-4
DTXSID	DTXSID5037494
Contaminant Group/Use	Degradation product of atrazine
PCCL 5/CCL 5 Status	CCL 5 List
Health and Occurrence Information Status	• EPA health assessment available • Non-national finished and national ambient water occurrence data available
Persistence/Mobility/Fate/Transport	Biodegradation Half-Life ($t_{1/2}$) = 3.39 days Henry's Law Coefficient (K_H) = 1.86×10^{-8} atm-m^3/mol Octanol-Water Partitioning Coefficient (log K_{ow}) = 1.58 Organic Carbon Partitioning Coefficient (K_{oc}) = 97.7 L/kg Water Solubility = 8.77×10^{-3} mol/L
Use/Production/Release	NA
PubMed Article Count	15

Desethylatrazine: Health Effects

EPA Health Assessment	OPP (2018)
Critical Effect	Attenuation of luteinizing hormone surge (estrous cycle disruption)
Target Population	Woman of childbearing age
Reference Dose (RfD) or Equivalent	0.076 mg/kg/day
Health Value	CCL-HRL = 429 µg/L

Additional Health Information

EPA:

- ToxRefDB (accessed 2018): NOAEL = 5.00 mg/kg/day; Subchronic NOAEL = 3.30 mg/kg/day; Subchronic LOAEL = 35.1 mg/kg/day

Other:

- CalEPA OEHHA (accessed 2019): MADL = 100 µg/day

Cancer Classification:

- OPP (2018): NL (Not likely to be carcinogenic to humans)

Desethylatrazine: Occurrence

Best Available Occurrence Information	NA

Additional Occurrence Information

Finished Drinking Water

- USDA PDP (2001-2013): Detected in 9 of 17 (53%) sites; Concentration range = 0.00072 – 0.928 µg/L
- USGS, Sioux Falls Area, 2012 (2009-2010): Detected in 1 of 1 (100%) sites; Concentration range = 0.006 – 0.032 µg/L

Ambient Water

- USGS NAWQA (1991-2017): Detected in 4,408 of 11,386 (39%) sites; Concentration range = 0.00068 – 6.08 µg/L
- USGS NWIS (2008-2017): Detected in 1,628 of 4,228 (39%) sites; Concentration range = 0.00075 – 3.63 µg/L
- USDA PDP (2001-2013): Detected in 155 of 229 (68%) sites; Concentration range = 0.000716 – 1.55 µg/L
- Arnold et al. 2016 (2012-2013): Detected in 115 of 690 (17%) sites; Concentration range = 0.002 – 0.802 µg/L
- Bradley et al. 2017 (2012-2014): Detected in 26 of 38 (68%) sites; Concentration range = 0.0047 – 0.851 µg/L
- USGS, McKenzie River, Oregon, 2012 (2002-2010): Detected in 21 of 134 (16%) samples; Maximum concentration = 0.013 µg/L
- USGS, Sioux Falls Area, 2012 (2009-2010): Detected in 2 of 2 (100%) sites; Concentration range = 0.008 – 0.114 µg/L

Diazepam: Background

CASRN	439-14-5
DTXSID	DTXSID4020406
Contaminant Group/Use	Anxiolytic; skeletal muscle relaxant
PCCL 5/CCL 5 Status	PCCL 5
Health and Occurrence Information Status	• EPA Health Assessment Available • Non-national finished and national ambient water occurrence data available
Persistence/Mobility/Fate/Transport	Biodegradation Half-Life ($t_{1/2}$) = 3.39 days Henry's Law Coefficient (K_H) = 2.51×10^{-7} atm-m^3/mol Octanol-Water Partitioning Coefficient (log K_{ow}) = 2.86 Organic Carbon Partitioning Coefficient (K_{oc}) = 776 L/kg Water Solubility = 1.59×10^{-4} mol/L
Use/Production/Release	NA
PubMed Article Count	25,902

Diazepam: Health Effects

EPA Health Assessment	OW (FDA/NIH (2018))
Critical Effect	Lowest therapeutic dose: anxiolytic, sedative, muscle-relaxant, anticonvulsant and amnestic effects
Target Population	Bottle-fed Infants
Reference Dose (RfD) or Equivalent	1.66667×10^{-5} mg/kg/day
Health Value	CCL-SL = 0.110 µg/L

Additional Health Information

EPA:

- OW FDA/NIH (2018): CCL-SL = 0.390 µg/L; RfD = 1.66667×10^{-5} mg/kg/day (General Population)

Other:

- FDA (2008): MRDD = 0.667 mg/kg/day
- NIH HSDB (accessed 2019): LD50 = 48 mg/kg

Cancer Classification:

- WHO IARC (1996): 3 (Possibly carcinogenic to humans)

Diazepam: Occurrence

Best Available Occurrence Information	NA

Additional Occurrence Information

Finished Drinking Water

- Glassmeyer et al. 2017 (2007-2012): Detected in 1 of 25 (4%) sites; Maximum concentration = 0.00085 µg/L

Ambient Water

- USGS NAWQA (1991-2017): Detected in 2 of 556 (0.36%) sites; Concentration range = 0.00047 – 0.00115 µg/L
- USGS NWIS (2008-2017): Detected in 4 of 611 (0.65%) sites; Concentration range = 0.00035 – 0.18 µg/L
- Bexfield et al. 2019 (2013-2015): Not detected in 1,106 (0%) sites
- Bradley et al. 2017 (2012-2014): Detected in 6 of 38 (16%) sites; Concentration range = 0.001681 – 0.0047434 µg/L
- Glassmeyer et al. 2017 (2007-2012): Not detected in 25 (0%) sites

Dicamba: Background

CASRN	1918-00-9
DTXSID	DTXSID4024018
Contaminant Group/Use	Herbicide
PCCL 5/CCL 5 Status	PCCL 5
Health and Occurrence Information Status	• EPA health assessment available • Non-national finished and national ambient water occurrence data available
Persistence/Mobility/Fate/Transport	Biodegradation Half-Life ($t_{1/2}$) = 3.55 days Henry's Law Coefficient (K_H) = 2.51×10^{-9} atm-m^3/mol Octanol-Water Partitioning Coefficient (log K_{ow}) = 2.47 Organic Carbon Partitioning Coefficient (K_{oc}) = 29.4 L/kg Water Solubility = 2.04×10^{-2} mol/L
Use/Production/Release	TRI (2016): 103,389 lbs USGS (2016): 9,773,162 lbs
PubMed Article Count	148

Dicamba: Health Effects

EPA Health Assessment	OPP (2016)
Critical Effect	Decreased pup weight
Target Population	Bottle-fed Infants
Reference Dose (RfD) or Equivalent	0.04 mg/kg/day
Health Value	CCL-HRL = 53.0 µg/L

Additional Health Information

EPA:

- DWSHA (accessed 2018):
  - Lifetime Health Advisory = 4 mg/L (4,000 µg/L)
- ToxRefDB (accessed 2018): NOAEL = 30.0 mg/kg/day; LOAEL = 122 mg/kg/day

Other:

- CDWG (2022): Maximum Allowable Concentration = 0.11 mg/L (110 µg/L)
- MN DOH (accessed 2018):
  - Chronic Health Risk Limit = 0.2 mg/L (200 µg/L)
- NIH HSDB (accessed 2019): LD50 = 757 mg/kg

Cancer Classification:

- OPP (2016): NL (Not likely to be carcinogenic to humans)

Dicamba: Occurrence

(slide 1 of 2)

Best Available Occurrence Information	NA

Additional Occurrence Information

Finished Drinking Water

- UCM-State Round 2 (1993-1997): Detected in 48 of 14,034 (0.34%) sites; Concentration range = 0.02 – 4.06 µg/L
- USDA PDP (2001-2013): Detected in 2 of 12 (17%) sites; Concentration range = 0.025 – 0.094 µg/L
- Drinking Water Monitoring Data - CA (2006-2020): Not detected in 185 (0%) sites
- Drinking Water Monitoring Data - MA (2006-2020): Detected in 3 of 819 (0.37%) sites; Concentration range = 0.1 – 0.7 µg/L
- Drinking Water Monitoring Data - WA (2006-2011): Not detected in 782 (0%) sites
- CWSS (2006): Not detected in 3 (0%) sites

Dicamba: Occurrence

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Additional Health Information (cont'd)

Ambient Water

- USGS NAWQA (1991 – 2017): Detected in 133 of 7,759 (1.71%) sites; Concentration range = 0.01 – 9.97 µg/L
- USGS NWIS (2008 – 2017): Detected 26 of 1,539 (1.69%) sites; Concentration range = 0.01 – 16.6 µg/L
- USDA PDP (2001-2013): Detected in 6 of 229 (2.62%) sites; Concentration range= 0.0165 – 0.112 µg/L
- Drinking Water Monitoring Data - CA (2006-2020): Detected in 5 of 1,936 (0.26%) sites; Concentration range = 0.21 – 3 µg/L
- Drinking Water Monitoring Data - MA (2006-2020): Not detected in 77 (0%) sites
- Drinking Water Monitoring Data - PA (2006-2011): Detected in 1 of 2 (50%) sites; Concentration = 0.44 µg/L
- Drinking Water Monitoring Data - WA (2006-2011): Not detected in 968 (0%) sites
- Drinking Water Monitoring Data - WI (2012-2019): Not detected in 117 (0%) sites
- Arnold et al. 2016 (2012-2013): Detected in 1 of 690 (0.14%) sites; Concentration = 0.474 µg/L
- Bradley et al. 2017 (2012-2014): Detected in 1 of 38 (2.63%) sites; Concentration = 0.1453 µg/L
- SURF (1990-2018): Detected in 286 of 1,058 (27%) sites; Concentration range = 0.05 – 14 µg/L
- USGS, McKenzie River, Oregon, 2012 (2002-2010): Detected in 1 of 126 (0.8%) samples; Maximum concentration = 0.58 µg/L

Dichlorvos (DDVP): Background

CASRN	62-73-7
DTXSID	DTXSID5020449
Contaminant Group/Use	Insecticide; veterinary medicine
PCCL 5/CCL 5 Status	PCCL 5
Health and Occurrence Information Status	• EPA health assessment available • Non-national finished and national ambient water occurrence data available
Persistence/Mobility/Fate/Transport	Biodegradation Half-Life ($t_{1/2}$) = 4.17 days Henry's Law Coefficient (K_H) = 4.07×10^{-9} atm-m^3/mol Octanol-Water Partitioning Coefficient (log K_{ow}) = 1.00 Organic Carbon Partitioning Coefficient (K_{oc}) = 56.3 L/kg Water Solubility = 0.117 mol/L
Use/Production/Release	NA
PubMed Article Count	1,106

Dichlorvos (DDVP): Health Effects

(slide 1 of 2)

EPA Health Assessment	OPP HHBP (2020)
Critical Effect	Plasma and red blood cell cholinesterase inhibition
Target Population	General Population
Reference Dose (RfD) or Equivalent	0.00006 mg/kg/day
Health Value	0.3 µg/L

Additional Health Information

EPA:

- OPP (2006): CCL-HRL = 2.96 µg/L; 0.0005 mg/kg/day
- OPP HHBP (2021):
  - Acute Benchmark = 0.0055 mg/L (5.5 µg/L); Acute Population-Adjusted Dose (RfD) = 0.00083 mg/kg/day
- ToxRefDB (accessed 2018): NOAEL = $5x10^{-2}$ mg/kg/day; LOAEL = 1 mg/kg/day; Subchronic NOAEL = 0.100 mg/kg/day; Subchronic LOAEL = 1.50 mg/kg/day

Dichlorvos (DDVP): Health Effects

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Additional Health Information (cont'd)

Other:

- CDC ATSDR (accessed 2018):
  - Chronic Minimal Risk Level = 0.0005 mg/kg/day
  - Intermediate Minimal Risk Level = 0.003 mg/kg/day
  - Acute Minimum Risk Level = 0.004 mg/kg/day
- CalEPA OEHHA (accessed 2019): CSF = 0.29 $(mg/kg/day)^{-1}$
- CPDB (accessed 2018): TD50 = 3.21 mg/kg/day
- NIH HSDB (accessed 2019): LD50 = 6.51 mg/kg

Cancer Classification:

- OPP (2006): S (Suggestive evidence of carcinogenic potential)
- WHO IARC (1990) = 2B (Possibly carcinogenic to humans)

Dichlorvos (DDVP): Occurrence

Best Available Occurrence Information	NA

Additional Occurrence Information

Finished Drinking Water

- USDA PDP (2001-2013): Detected in 1 of 15 (6.67%) sites; Concentration = 0.027 µg/L
- Drinking Water Monitoring Data - CA (2006-2020): Not detected in 1 (0%) site
- USGS, Sioux Falls Area, 2012 (2009-2010): Not detected in 1 (0%) site

Ambient Water

- USGS NAWQA (1991-2017): Detected in 60 of 4,978 (1.21%) sites; Concentration range = 0.0012 – 0.402 µg/L
- USGS NWIS (2008-2017): Detected in 53 of 3,859 (1.37%) sites; Concentration range = 0.0062 – 2.24 µg/L
- USDA PDP (2001-2013): Detected in 1 of 120 (0.83%) sites; Concentration range= 0.027 – 0.0595 µg/L
- Drinking Water Monitoring Data - CA (2006-2020): Not detected in 30 (0%) sites
- Arnold et al. 2016 (2012-2013): Not detected in 690 (0%) sites
- SURF (1990-2018): Detected in 20 of 9,029 (0.22%) sites; Concentration range = 0.007 – 0.634 µg/L
- USGS, Sioux Falls Area, 2012 (2009-2010): Not detected in 2 (0%) sites

Dicrotophos: Background

CASRN	141-66-2
DTXSID	DTXSID9023914
Contaminant Group/Use	Insecticide
PCCL 5/CCL 5 Status	CCL 5
Health and Occurrence Information Status	• EPA health assessment available • Non-national finished and national ambient water occurrence data available
Persistence/Mobility/Fate/Transport	Biodegradation Half-Life ($t_{1/2}$) = 4.17 days Henry's Law Coefficient (K_H) = 5.01×10^{-11} atm-m^3/mol Octanol-Water Partitioning Coefficient (log K_{ow}) = -0.424 Organic Carbon Partitioning Coefficient (K_{oc}) = 27.6 L/kg Water Solubility = 1.45 mol/L
Use/Production/Release	USGS (2016): 1,067,130 lbs
PubMed Article Count	28

Dicrotophos: Health Effects

EPA Health Assessment	OPP (2015)
Critical Effect	Inhibition of brain cholinesterase in adult rat
Target Population	Bottle-fed Infants
Reference Dose (RfD) or Equivalent	0.00003 mg/kg/day
Health Value	CCL-HRL = 0.0397 µg/L

Additional Health Information

EPA:

- OPP HHBP (2021):
  - Chronic Benchmark = 0.0002 mg/L (0.2 µg/L); Population-Adjusted Dose (RfD) = 0.00003 mg/kg/day
  - Acute Benchmark = 0.005 mg/L (0.5 µg/L); Acute Population-Adjusted Dose (RfD) = 0.00007 mg/kg/day
- ToxRefDB (accessed 2018): NOAEL = 2.50×10^{-2} mg/kg/day; LOAEL = 2.00×10^{-2} mg/kg/day

Other:

- HSDB (accessed 2019): LD50 = 9 mg/kg

Cancer Classification:

- OPP (2015): S (Suggestive evidence of carcinogenicity, but not sufficient to assess human carcinogenic potential)

Dicrotophos: Occurrence

Best Available Occurrence Information	NA

Additional Occurrence Information

Finished Drinking Water

- USDA PDP (2001-2013): Detected in 2 of 17 (12%) sites; Concentration range = 0.0015 – 0.0034 µg/L
- Drinking Water Monitoring Data - CA (2006-2020): Not detected in 1 (0%) site
- USGS, Sioux Falls Area, 2012 (2009-2010): Not detected in 1 (0%) site

Ambient Water

- USGS NAWQA (1991-2017): Detected in 33 of 4,916 (0.67%) sites; Concentration range = 5.00×10^{-4} – 6.83 µg/L
- USDA PDP (2001-2013): Detected in 2 of 145 (1.38%) sites; Concentration range = 0.0015 – 0.0015 µg/L
- Drinking Water Monitoring Data - CA (2006-2020): Not detected in 1 (0%) site
- Arnold et al. 2016 (2012-2013): Not detected in 690 (0%) sites
- SURF (1990-2018): Not detected in 3 (0%) sites
- USGS, Sioux Falls Area, 2012 (2009-2010): Not detected in 2 (0%) sites

Diethyl phthalate: Background

CASRN	84-66-2
DTXSID	DTXSID7021780
Contaminant Group/Use	Solvent for nitrocellulose and cellulose acetate, plasticizer, wetting agent; in plastics, perfumery as fixative and solvent, alcohol denaturant, plasticizer in solid rocket propellants.
PCCL 5/CCL 5 Status	PCCL 5
Health and Occurrence Information Status	• EPA health assessment available • Non-national finished and national ambient water occurrence data available
Persistence/Mobility/Fate/Transport	Biodegradation Half-Life ($t_{1/2}$) = 5.13 days Henry's Law Coefficient (K_H) = 2.34×10^{-8} atm-m^3/mol Octanol-Water Partitioning Coefficient (log K_{ow}) = 2.63 Organic Carbon Partitioning Coefficient (K_{oc}) = 102 L/kg Water Solubility = 2.53×10^{-3} mol/L
Use/Production/Release	CDR (2015): 1,000,000 - <10,000,000 lbs
PubMed Article Count	219

Diethyl phthalate: Health Effects

(slide 1 of 2)

EPA Health Assessment	OW (1992)
Critical Effect	Decreased weight gain and kidney weight
Target Population	General Population
Reference Dose (RfD) or Equivalent	0.75 mg/kg/day
Health Value	CCL-HRL = 4,440 µg/L

Additional Health Information

EPA:

- IRIS (1987): CCL-HRL = 4,730 µg/L; RfD = 0.8 mg/kg/day
- HHC (2015): Human Health Ambient Water Quality Criteria = 0.6 mg/L (600 µg/L)
- ToxRefDB (accessed 2018): NOAEL = 56.0 mg/kg/day; LOAEL = 197 mg/kg/day

Diethyl phthalate: Health Effects

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Additional Health Information (cont'd)

Other:

- MN DOH (accessed 2018):
  - Chronic Health Risk Limit = 6 mg/L (6,000 µg/L)
- CDC ATSDR (1995):
  - Intermediate Minimal Risk Level = 6 mg/kg/day
  - Acute Minimal Risk Level = 7 mg/kg/day
- NIH HSDB (accessed 2019): LD50 = 1,000 mg/kg

Cancer Classification:

- OW (1992): D (Not classifiable as to human carcinogenicity)
- IRIS (1988): D (Not classifiable as to human carcinogenicity)

Diethyl phthalate: Occurrence

Best Available Occurrence Information	NA

Additional Occurrence Information

Finished Drinking Water

- Drinking Water Monitoring Data - CA (2006-2020): Detected in 1 of 17 (5.88%) sites; Concentration range = 0.007 – 6.2 µg/L
- Drinking Water Monitoring Data - WA (2006-2011): Detected in 1 of 483 (0.21%) sites; Concentration = 4.9 µg/L
- USGS, Sioux Falls Area, 2012 (2009-2010): Detected in 1 of 1 (100%) site; Concentration = 0.1 µg/L

Ambient Water

- USGS NAWQA (1991-2017): Detected in 3 of 46 (6.52%) sites; Concentration range = 0.1 – 0.8 µg/L
- USGS NWIS (2008-2017): Detected in 189 of 1,236 (15%) sites; Concentration range = 0.06 – 60.4 µg/L
- Drinking Water Monitoring Data - CA (2006-2020): Detected in 2 of 113 (1.77%) sites; Concentration range = 0.005 – 13.6 µg/L
- Drinking Water Monitoring Data - WA (2006-2011): Detected in 2 of 638 (0.31%) sites; Concentration range = 0.421 – 1.1 µg/L
- Bradley et al. 2017 (2012-2014): Detected in 2 of 38 (5.26%) sites; Concentration range = 0.128 – 0.142 µg/L
- USGS, Sioux Falls Area, 2012 (2009-2010): Detected in 1 of 2 (50%) sites; Concentration = 0.1 µg/L

Dimethenamid Oxanilic Acid (OA): Background

CASRN	380412-59-9
DTXSID	DTXSID4037530
Contaminant Group/Use	Pesticide metabolite
PCCL 5/CCL 5 Status	PCCL 5
Health and Occurrence Information Status	• No EPA Health Assessment Available • Non-national finished and national ambient water occurrence data available
Persistence/Mobility/Fate/Transport	Biodegradation Half-Life ($t_{1/2}$) = 3.55 days Henry's Law Coefficient (K_H) = 8.91×10^{-10} atm-m^3/mol Octanol-Water Partitioning Coefficient (log K_{ow}) = 1.43 Organic Carbon Partitioning Coefficient (K_{oc}) = 33.1 L/kg Water Solubility = 1.11×10^{-2} mol/L
Use/Production/Release	NA
PubMed Article Count	NA

Dimethenamid Oxanilic Acid (OA): Health Effects

EPA Health Assessment	NA
Critical Effect	NA
Target Population	NA
Reference Dose (RfD) or Equivalent	NA
Health Value	NA

Additional Health Information

Other:

- MN DOH (2013): CCL-SL = 355 µg/L; RfD = 0.06 mg/kg/day
- MN DOH (accessed 2018):
  - Chronic Risk Assessment Advice = 0.3 mg/L (300 µg/L)
  - Subchronic Risk Assessment Advice = 0.6 mg/L (600 µg/L)
  - Short-Term Risk Assessment Advice = 0.6 mg/L (600 µg/L)

Dimethenamid Oxanilic Acid (OA): Occurrence

Best Available Occurrence Information	NA

Additional Occurrence Information

Finished Drinking Water

- USDA PDP (2001-2013): Detected in 5 of 12 (42%) sites; Concentration range = 0.00105 – 0.03 µg/L

Ambient Water

- USGS NAWQA (1991-2017): Detected in 73 of 2,539 (2.88%) sites; Concentration range = 0.0126 – 0.596 µg/L
- USDA PDP (2001-2013): Detected in 25 of 229 (11%) sites; Concentration range = 0.001049 – 0.061 µg/L
- Arnold et al. 2016 (2012-2013): Not detected in 584 (0%) sites
- Bradley et al. 2017 (2012-2014): Detected in 2 of 38 (5.26%) sites; Concentration = 0.02 µg/L

Di-n-butyl phthalate: Background

CASRN	84-74-2
DTXSID	DTXSID2021781
Contaminant Group/Use	Plasticizer in nitrocellulose lacquers, elastomers, explosives, nail polish and solid rocket propellants; in perfumes; in textiles; in safety glass; insecticides; in printing inks; resin solvent; paper coatings; and adhesives
PCCL 5/CCL 5 Status	PCCL 5
Health and Occurrence Information Status	• EPA health assessment available • Non-national finished and national ambient water occurrence data available
Persistence/Mobility/Fate/Transport	Biodegradation Half-Life ($t_{1/2}$) = 4.37 days Henry's Law Coefficient (K_H) = 1.82×10^{-6} atm-m^3/mol Octanol-Water Partitioning Coefficient (log K_{ow}) = 4.68 Organic Carbon Partitioning Coefficient (K_{oc}) = 1.65×10^3 L/kg Water Solubility = 4.45×10^{-5} mol/L
Use/Production/Release	CDR (2015): 1,000,000 - <10,000,000 lbs TRI (2016): 248,348 lbs
PubMed Article Count	831

Di-n-butyl phthalate: Health Effects

(slide 1 of 2)

Health Assessment	CDC ATSDR (2001)
Critical Effect	Absence of increased mortality and hematological effects
Target Population	Women of childbearing age
Reference Dose (RfD) or Equivalent	0.5 mg/kg/day
Health Value	CCL-HRL = 2,820 µg/L

Additional Health Information

EPA:

- OW (1991): CCL-HRL = 592 µg/L; RfD = 0.1 mg/kg/day
- IRIS (1987): CCL-HRL = 592 µg/L; RfD = 0.1 mg/kg/day
- HHC (2015): Human Health Ambient Water Quality Criteria = 0.02 mg/L (20 µg/L)

Di-n-butyl phthalate: Health Effects

(slide 1 of 2)

Additional Health Information (cont'd)

Other:

- MN DOH (accessed 2018):
  - Chronic Health Risk Limit = 0.02 mg/L (20 µg/L)
  - Subchronic Health Risk Limit = 0.02 mg/L (20 µg/L)
  - Short-Term Health Risk Limit = 0.02 mg/L (20 µg/L)
  - Acute Health Risk Limit = 0.02 mg/L (20 µg/L)
- NIH HSDB (accessed 2019): LD50 = 4,840 mg/kg

Cancer Classification:

- OW (1991): D (Not classifiable as to human carcinogenicity)
- IRIS (1987): D (Not classifiable as to human carcinogenicity)

Di-n-butyl phthalate: Occurrence

Best Available Occurrence Information	NA

Additional Occurrence Information

Finished Drinking Water

- Drinking Water Monitoring Data - CA (2006-2020): Detected in 1 of 26 (3.85%) sites; Concentration range = 0.002 – 0.137 µg/L
- Drinking Water Monitoring Data - WA (2006-2011): Detected in 2 of 483 (0.41%) sites; Concentration range = 0.637 – 26.4 µg/L

Ambient Water

- USGS NAWQA (1991-2017): Detected in 4 of 22 (18%) sites; Concentration range = 0.3 – 2 µg/L
- USGS NWIS (2008 -2017): Detected in 71 of 514 (14%) sites; Concentration range = 0.04 – 5 µg/L
- Drinking Water Monitoring Data - CA (2006-2020): Detected in 7 of 247 (2.83%) sites; Concentration range = 0.006 – 8.1 µg/L
- Drinking Water Monitoring Data - FL (2006-2011): Detected in 1 of 1 (100%) sites; Concentration range = 1.1 – 1.1 µg/L
- Drinking Water Monitoring Data - WA (2006-2011): Detected in 8 of 638 (1.25%) sites; Concentration range = 0.477 – 6 µg/L

Esfenvalerate: Background

CASRN	66230-04-4
DTXSID	DTXSID4032667
Contaminant Group/Use	Insecticide; medication
PCCL 5/CCL 5 Status	PCCL 5
Health and Occurrence Information Status	• EPA health assessment available • Non-national finished and national ambient water occurrence data available
Persistence/Mobility/Fate/Transport	Biodegradation Half-Life ($t_{1/2}$) = 3.55 days Henry's Law Coefficient (K_H) = 8.32×10^{-8} atm-m^3/mol Octanol-Water Partitioning Coefficient (log K_{ow}) = 6.48 Organic Carbon Partitioning Coefficient (K_{oc}) = 3.07×10^4 L/kg Water Solubility = 9.05×10^{-8} mol/L
Use/Production/Release	USGS (2016): 157,875 lbs
PubMed Article Count	483

Esfenvalerate: Health Effects

EPA Health Assessment	OPP (2017)
Critical Effect	Reduced locomotor activity
Target Population	Bottle-fed Infants
Reference Dose (RfD) or Equivalent	0.0037 mg/kg/day
Health Value	CCL-HRL = 4.90 µg/L

Additional Health Information

EPA:

- OPP (HHBP) (2021):
  - Acute Benchmark = 0.073 mg/L (73 µg/L); Acute Population-Adjusted Dose (RfD) = 0.011 mg/kg/day
- ToxRefDB (accessed 2018): LOAEL = 2.50 mg/kg/day; Subchronic NOAEL = 2.50 mg/kg/day; Subchronic LOAEL = 7.50 mg/kg/day

Other:

- NIH HSDB (accessed 2019): LD50 = 88 mg/kg

Cancer Classification:

- OPP (2017): E (Equivocal evidence of carcinogenicity)

Esfenvalerate: Occurrence

Best Available Occurrence Information	NA

Additional Occurrence Information

Finished Drinking Water

- USDA PDP (2001-2013): Not detected in 15 (0%) sites

Ambient Water

- USGS NAWQA (1991-2017): Not detected in 2,965 (0%) sites
- USGS NWIS (2008-2017): Not detected in 143 (0%) sites
- USDA PDP (2001-2013): Not detected in 119 (0%) sites
- SURF (1990-2018): Detected in 152 of 4,983 (3.05%) sites; Concentration range = 0.000335 – 3.48 µg/L

Fipronil: Background

CASRN	120068-37-3
DTXSID	DTXSID4034609
Contaminant Group/Use	Insecticide, seed treatment/protectant
PCCL 5/CCL 5 Status	CCL 5
Health and Occurrence Information Status	• EPA health assessment available • Non-national finished and national ambient water occurrence data available
Persistence/Mobility/Fate/Transport	Biodegradation Half-Life ($t_{1/2}$) = 3.55 days Henry's Law Coefficient (K_H) = 9.12×10^{-9} atm-m^3/mol Octanol-Water Partitioning Coefficient (log K_{ow}) = 4.78 Organic Carbon Partitioning Coefficient (K_{oc}) = 5.23×10^3 L/kg Water Solubility = 1.86×10^{-5} mol/L
Use/Production/Release	USGS (2016): 7,124 lbs
PubMed Article Count	590

Fipronil: Health Effects

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EPA Health Assessment	OPP (2011)
Critical Effect	Increased incidence of seizures and death, alterations in clinical chemistry (protein), increased thyroid stimulating hormone, decreased thyroxine (T4)
Target Population	Women of childbearing age
Reference Dose (RfD) or Equivalent	0.0002 mg/kg/day
Health Value	CCL-HRL = 1.13 µg/L

Additional Health Information

EPA:

- OPP HHBP (2021):
  - Chronic Benchmark = 0.001 mg/L (1 µg/L); Population-Adjusted Dose (RfD) = 0.0002 mg/kg/day
  - Acute Benchmark = 0.17 mg/L (170 µg/L); Acute Population-Adjusted Dose (RfD) = 0.025 mg/kg/day
- ToxRefDB (accessed 2018): NOAEL = 2.50×10^{-2} mg/kg/day; LOAEL = 5.90×10^{-2} mg/kg/day; Subchronic LOAEL = 0.320 mg/kg/day

Fipronil: Health Effects

(slide 2 of 2)

Additional Health Information (cont'd)

Other:

- NIH HSDB (accessed 2019): LD50 = 91 mg/kg

Cancer Classification:

- OPP (2011): C (Possible human carcinogen)

Fipronil: Occurrence

Best Available Occurrence Information	NA

Additional Occurrence Information

Finished Drinking Water

- USDA PDP (2001-2013): Not detected in 8 (0%) sites
- USGS, Sioux Falls Area, 2012 (2009-2010): Not detected in 1 (0%) site

Ambient Water

- USGS NAWQA (1991-2017): Detected in 402 of 5,307 (7.57%) sites; Concentration range = 0.00014 – 6.41 µg/L
- USGS NWIS (2008-2017): Detected in 367 of 4,062 (9.03%) sites; Concentration range = 0.00022 – 0.181 µg/L
- USDA PDP (2001-2013): Detected in 15 of 121 (12%) sites; Concentration range = 0.00058 – 0.013 µg/L
- Arnold et al. 2016 (2012-2013): Detected in 4 of 690 (0.58%) sites; Concentration range = 0.001 – 0.003 µg/L
- Bradley et al. 2017 (2012-2014): Detected in 17 of 38 (45%) sites; Concentration range = 0.0066 – 0.153 µg/L
- SURF (1990-2018): Detected in 513 of 1,135 (45%) sites; Concentration range = 0.00031 – 2.11 µg/L
- USGS, McKenzie River, Oregon, 2012 (2002-2010): Detected in 5 of 119 (4.2%) samples; Maximum concentration = 0.041 µg/L
- USGS, Sioux Falls Area, 2012 (2009-2010): Detected in 1 of 2 (50%) sites; Concentration = 0.001 µg/L

Flufenacet: Background

CASRN	142459-58-3
DTXSID	DTXSID2032552
Contaminant Group/Use	Preemergent herbicide
PCCL 5/CCL 5 Status	CCL 5
Health and Occurrence Information Status	• EPA health assessment available • Non-national finished and national ambient water occurrence data available
Persistence/Mobility/Fate/Transport	Biodegradation Half-Life ($t_{1/2}$) = 3.55 days Henry's Law Coefficient (K_H) = 8.13×10^{-9} atm-m^3/mol Octanol-Water Partitioning Coefficient (log K_{ow}) = 3.15 Organic Carbon Partitioning Coefficient (K_{oc}) = 1.52×10^3 L/kg Water Solubility = 7.25×10^{-5} mol/L
Use/Production/Release	USGS (2016): 115,383 lbs
PubMed Article Count	13

Flufenacet: Health Effects

EPA Health Assessment	OPP (2015)
Critical Effect	Decreased pup body weight, delayed eye opening, delayed preputial separation, decreased caudate putamen size
Target Population	Bottle-fed Infants
Reference Dose (RfD) or Equivalent	0.0017 (mg/kg/day)
Health Value	CCL-HRL = 2.25 µg/L

Additional Health Information

EPA:

- OPP HHBP (2021):
  - Chronic Benchmark = 0.010 mg/L (10 µg/L); Population-Adjusted Dose (RfD) = 0.0017 mg/kg/day
  - Acute Benchmark = 0.011 mg/L (11 µg/L); Acute Population-Adjusted Dose (RfD) = 0.0017 mg/kg/day
- ToxRefDB (accessed 2018): NOAEL = 1.29 mg/kg/day; LOAEL = 1.20 mg/kg/day; Subchronic NOAEL = 1.70 mg/kg/day; Subchronic LOAEL = 6 mg/kg/day

Other:

- NIH HSDB (accessed 2019): LD50 = 371 mg/kg

Cancer Classification:

- OPP (2015): NL (Not likely to be a human carcinogen)

Flufenacet: Occurrence

Best Available Occurrence Information	NA

Additional Occurrence Information

Finished Drinking Water

- USDA PDP (2001-2013): Detected in 1 of 4 (25%) sites; Concentration = 0.075 µg/L

Ambient Water

- USGS NAWQA (1991-2017): Detected in 15 of 973 (1.54%) sites; Concentration range = 0.02 – 0.44 µg/L
- USDA PDP (2001-2013): Not detected in 4 (0%) sites
- USGS NWIS (2008-2017): Detected in 3 of 455 (0.66%) sites; Concentration range = 0.02 – 0.08 µg/L

Fluometuron: Background

CASRN	2164-17-2
DTXSID	DTXSID8020628
Contaminant Group/Use	Herbicide
PCCL 5/CCL 5 Status	CCL 5
Health and Occurrence Information Status	• EPA health assessment available • Non-national finished and national ambient water occurrence data available
Persistence/Mobility/Fate/Transport	Biodegradation Half-Life ($t_{1/2}$) = 4.47 days Henry's Law Coefficient (K_H) = $9.12x10^{-9}$ atm-m^3/mol Octanol-Water Partitioning Coefficient (log K_{ow}) = 2.37 Organic Carbon Partitioning Coefficient (K_{oc}) = 117 L/kg Water Solubility = $7.00x10^{-4}$ mol/L
Use/Production/Release	USGS (2016): 1,023,468 lbs
PubMed Article Count	34

Fluometuron: Health Effects

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EPA Health Assessment	OPP (2016)
Critical Effect	Combined adenomas/carcinomas in the lung of males and malignant lymphocytic lymphomas in females
Target Population	General Population
Cancer Slope Factor (CSF)	0.018 $(mg/kg/day)^{-1}$
Health Value	CCL-HRL = 1.64 µg/L

Additional Health Information

EPA:

- OPP (2016): CCL-HRL = 29.6 µg/L; RfD = 0.005 mg/kg/day
- DWSHA (accessed 2018):
  - Lifetime Health Advisory = 0.09 mg/L (90 µg/L)
  - 10-day Health Advisory = 2 mg/L (2,000 µg/L)
- ToxRefDB (2014): NOAEL = 10.0 mg/kg/day; LOAEL = 100 mg/kg/day

Fluometuron: Health Effects

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Additional Health Information (cont'd)

Other:

- NIH HSDB (accessed 2019): LD50 = 810 mg/kg
- NIH CPDB (accessed 2018): TD50 = 55.4 mg/kg/day

Cancer Classification:

- WHO IARC (1987): 3 (Possibly carcinogenic to humans)
- OPP (2016): C (Possible human carcinogen)

Fluometuron: Occurrence

Best Available Occurrence Information	NA

Additional Occurrence Information

Finished Drinking Water

- USDA PDP (2001-2013): Detected in 6 of 15 (40%) sites; Concentration range = 0.001998 – 0.042 µg/L
- Drinking Water Monitoring Data - CA (2006-2020): Not detected in 3 (0%) sites

Ambient Water

- USGS NAWQA (1991-2017): Detected in 242 of 7,813 (3.1%) sites; Concentration range = 0.0011 – 31.5 µg/L
- USGS NWIS (2008-2017): Detected in 40 of 1,744 (2.29%) sites; Concentration range = 0.00424 – 2.71 µg/L
- USDA PDP (2001-2013): Detected in 14 of 227 (6.17%) sites; 0.001998 – 0.229 µg/L
- Drinking Water Monitoring Data - CA (2006-2020): Not detected in 24 (0%) sites
- Arnold et al. 2016 (2012-2013): Detected in 7 of 690 (1.01%) sites; Concentration range = 0.0003 – 0.0514 µg/L
- Bradley et al. 2017 (2012-2014): Detected in 3 of 38 (7.89%) sites; Concentration range = 0.0086 – 0.0175 µg/L
- SURF (1990-2018): Detected in 1 of 393 (0.25%) sites; Concentration = 3 µg/L
- USGS McKenzie River, Oregon 2012 (2002-2010): Detected in 2 of 126 (1.6%) samples; Maximum concentration = 0.02 µg/L

Fluoranthene: Background

CASRN	206-44-0
DTXSID	DTXSID3024104
Contaminant Group/Use	Polycyclic aromatic hydrocarbon; occurs as a result of incomplete burning
PCCL 5/CCL 5 Status	PCCL 5
Health and Occurrence Information Status	• EPA health assessment available • Non-national finished and national ambient water occurrence data available
Persistence/Mobility/Fate/Transport	Biodegradation Half-Life ($t_{1/2}$) = 148 days Henry's Law Coefficient (K_H) = 8.91×10^{-6} atm-m^3/mol Octanol-Water Partitioning Coefficient (log K_{ow}) = 5.10 Organic Carbon Partitioning Coefficient (K_{oc}) = 4.66×10^4 L/kg Water Solubility = 6.78×10^{-7} mol/L
Use/Production/Release	CDR (2015): 775,055 lbs
PubMed Article Count	398

Fluoranthene: Health Effects

(slide 1 of 2)

EPA Health Assessment	IRIS (1990)
Critical Effect	Nephropathy, increased liver weights, hematological alterations, and clinical effects
Target Population	General Population
Reference Dose (RfD) or Equivalent	0.04 mg/kg/day
Health Value	CCL-HRL = 237 µg/L

Additional Health Information

EPA:

- PPRTV (2012): Subchronic RfD = 0.1 mg/kg/day
- HHC (2015): Human Health Ambient Water Quality Criteria = 0.02 mg/L (20 µg/L)

Fluoranthene: Health Effects

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Additional Health Information (cont'd)

Other:

- WHO (2003): CCL-HRL = 74.0 µg/L; Total Daily Intake (RfD) = 0.0125 mg/kg/day
- MN DOH (accessed 2018):
  - Chronic Health Risk Limit = 0.07 mg/L (70 µg/L)
  - Subchronic Health Risk Limit = 0.2 mg/L (200 µg/L)
- CDC ATSDR (1995):
  - Intermediate Minimal Risk Level = 0.4 mg/kg/day
- NIH HSDB (accessed 2019): LD50 = 2,000 mg/kg

Cancer Classification:

- PPRTV (2012): I (Inadequate information to assess carcinogenic potential)
- WHO IARC (2005): 3 (Possibly carcinogenic to humans)
- IRIS (1990): D (Not classifiable as to human carcinogenicity)

Fluoranthene: Occurrence

Best Available Occurrence Information	NA

Additional Occurrence Information

Finished Drinking Water

- Drinking Water Monitoring Data - CA (2006-2020): Detected in 1 of 20 (5%) sites; Concentration = 0.002 µg/L
- Drinking Water Monitoring Data - WA (2006-2011): Not detected in 481 (0%) sites
- Glassmeyer et al. 2017 (2007-2012): Not detected in 25 (0%) sites
- USGS, Sioux Falls Area, 2012 (2009-2010): Not detected in 1 (0%) site

Ambient Water

- USGS NAWQA (1991-2017): Detected in 42 of 589 (7.13%) sites; Concentration range = 0.003 – 0.15 µg/L
- USGS NWIS (2008-2017): Detected in 345 of 1,961 (18%) sites; Concentration range = 0.002 – 25.6 µg/L
- Drinking Water Monitoring Data - CA (2006-2020): Detected in 1 of 90 (1.11%) sites; Concentration = 0.034 µg/L
- Drinking Water Monitoring Data - WA (2006-2011): Not detected in 634 (0%) sites
- Bradley et al. 2017 (2012-2014): Detected in 15 of 38 (39%) sites; Concentration range = 0.0045 – 0.0564 µg/L
- Glassmeyer et al. 2017 (2007-2012): Not detected in 25 (0%) sites
- USGS, Sioux Falls Area, 2012 (2009-2010): Not detected in 2 (0%) sites

Fluoxetine: Background

CASRN	54910-89-3
DTXSID	DTXSID7023067
Contaminant Group/Use	Antidepressant
PCCL 5/CCL 5 Status	PCCL 5
Health and Occurrence Information Status	• EPA Health Assessment Available • Non-national finished and national ambient water occurrence data available
Persistence/Mobility/Fate/Transport	Biodegradation Half-Life ($t_{1/2}$) = 3.55 days Henry's Law Coefficient (K_H) = 3.09×10^{-8} atm-m^3/mol Octanol-Water Partitioning Coefficient (log K_{ow}) = 4.25 Organic Carbon Partitioning Coefficient (K_{oc}) = 4.27×10^3 L/kg Water Solubility = 1.81×10^{-4} mol/L
Use/Production/Release	NA
PubMed Article Count	8,127

Fluoxetine: Health Effects

EPA Health Assessment	OW (FDA/NIH (2018))
Critical Effect	Lowest therapeutic dose: treatment of major depressive disorder/bulimia; nervosa/obsessive compulsive disorder/Panic disorder
Target Population	Bottle-fed Infants
Reference Dose (RfD) or Equivalent	0.00008 mg/kg/day
Health Value	CCL-SL = 0.560 µg/L

Additional Health Information

EPA:

- OW FDA/NIH (2018): CCL-SL = 2.0 µg/L; RfD = 0.00008 mg/kg/day (General Population)

Other:

- FDA (2018): MRDD = 1.33 mg/kg/day

Fluoxetine: Occurrence

Best Available Occurrence Information	NA

Additional Occurrence Information

Finished Drinking Water

- Glassmeyer et al. 2017 (2007-2012): Not detected in 9 (0%) sites
- Padhye et al. 2013 (2009-2010): Detected in 1 of 8 (12.5%) samples; Concentration range = 0 – $1.92 \times 10^{-5} \pm 7 \times 10^{-7}$ µg/L

Ambient Water

- USGS NAWQA (1991-2017): Detected in 3 of 557 (0.54%) sites; Concentration range = 0.00585 – 0.0171 µg/L
- USGS NWIS (2008-2017): Detected in 4 of 607 (0.66%) sites; Concentration range = 0.002 – 0.169 µg/L
- Batt et al. 2016 (2008-2009): Detected in 10 of 182 (5.49%) sites; Concentration range = 9×10^{-4} – 0.0248 µg/L
- Bexfield et al. 2019 (2013-2015): Detected in 1 of 1,106 (0.09%) sites; Concentration = 0.0170815 µg/L
- Bradley et al. 2017 (2012-2014): Detected in 3 of 38 (7.89%) sites; Concentration range = 0.0065174 – 0.0246002 µg/L
- Glassmeyer et al. 2017 (2007-2012): Detected in 1 of 9 (11%) samples; Maximum concentration = 0.00053 µg/L
- Padhye et al. 2013 (2009-2010): Detected in 3 of 8 (38%) samples; Concentration range = 0 – $9 \times 10^{-7} \pm 1 \times 10^{-7}$ µg/L

Gemfibrozil: Background

CASRN	25812-30-0
DTXSID	DTXSID0020652
Contaminant Group/Use	Antihyperlipoproteinemic
PCCL 5/CCL 5 Status	PCCL 5
Health and Occurrence Information Status	• EPA Health Assessment Available • Non-national finished and ambient water occurrence data available
Persistence/Mobility/Fate/Transport	Biodegradation Half-Life ($t_{1/2}$) = 3.55 days Henry's Law Coefficient (K_H) = $5.75x10^{-9}$ atm-m^3/mol Octanol-Water Partitioning Coefficient (log K_{ow}) = 4.44 Organic Carbon Partitioning Coefficient (K_{oc}) = 214 L/kg Water Solubility = $1.73x10^{-4}$ mol/L
Use/Production/Release	NA
PubMed Article Count	1,287

Gemfibrozil: Health Effects

EPA Health Assessment	OW (FDA/NIH (2018))
Critical Effect	Lowest therapeutic dose: lipid regulation (decreases very low-density lipoprotein (VLDL), increases high-density lipoprotein (HDL) cholesterol)
Target Population	Bottle-Fed Infants
Reference Dose (RfD) or Equivalent	0.005 mg/kg/day
Health Value	CCL-SL = 33.0 µg/L

Additional Health Information

EPA:

- OW FDA/NIH (2018): CCL-SL = 120 µg/L; RfD = 0.005 mg/kg/day (General Population)

Other:

- FDA (2018): MRDD = 20 mg/kg/day
- NIH HSDB (accessed 2019): LD50 = 316 mg/kg

Cancer Classification:

- WHO IARC (1996): 3 (Possibly carcinogenic to humans)

Gemfibrozil: Occurrence

Best Available Occurrence Information	NA

Additional Occurrence Information

Finished Drinking Water

- Drinking Water Monitoring - CA (2006-2020): Not detected in 1 (0%) site
- Glassmeyer et al. 2017 (2007-2012): Not detected in 25 (0%) sites

Ambient Water

- Drinking Water Monitoring - CA (2006-2020): Not detected in 2 (0%) sites
- Glassmeyer et al. 2017 (2007-2012): Not detected in 25 (0%) sites
- Batt et al. 2016 (2008-2009): Detected in 27 of 182 (15%) sites; Concentration range = 0.0051 – 0.1125 µg/L

Hexazinone: Background

CASRN	51235-04-2
DTXSID	DTXSID4024145
Contaminant Group/Use	Post emergence contact herbicide
PCCL 5/CCL 5 Status	PCCL 5
Health and Occurrence Information Status	• EPA health assessment available • Non-national finished and national ambient water occurrence data available
Persistence/Mobility/Fate/Transport	Biodegradation Half-Life ($t_{1/2}$) = 4.68 days Henry's Law Coefficient (K_H) = 1.07×10^{-6} atm-m^3/mol Octanol-Water Partitioning Coefficient (log K_{ow}) = 1.94 Organic Carbon Partitioning Coefficient (K_{oc}) = 41.7 L/kg Water Solubility = 4.63×10^{-2} mol/L
Use/Production/Release	TRI (2016): 1,574 lbs USGS (2016): 483,326 lbs
PubMed Article Count	56

Hexazinone: Health Effects

EPA Health Assessment	OPP (2015)
Critical Effect	Decreased body weight, hepatoxicity (clinical chemical changes and microscopic lesions)
Target Population	General Population
Reference Dose (RfD) or Equivalent	0.05 mg/kg/day
Health Value	CCL-HRL = 296 µg/L

Additional Health Information

EPA:

- DWSHA (accessed 2018):
  - Lifetime Health Advisory = 0.4 mg/L (400 µg/L)
  - 10-day Health Advisory = 2 mg/L (2,000 µg/L)
- ToxRefDB (2014): NOAEL = 5.00 mg/kg/day; LOAEL = 37.6 mg/kg/day; Subchronic NOAEL = 31.6 mg/kg/day; Subchronic LOAEL = 123 mg/kg/day

Other:

- NIH HSDB (accessed 2019): LD50 = 860 mg/kg

Cancer Classification:

- OPP (2015): D (Not classifiable as to human carcinogenicity)

Hexazinone: Occurrence

Best Available Occurrence Information	NA

Additional Occurrence Information

Finished Drinking Water

- USDA PDP (2001-2013): Detected in 3 of 10 (30%) sites; Concentration range = $8x10^{-4}$ – 0.087 µg/L
- Drinking Water Monitoring - CA (2006-2020): Not detected in 1 (0%) site
- Bradley et al. 2018 (2016): Detected in 2 of 26 (7.69%) sites; Concentration range = 0.0065 – 0.0087 µg/L
- USGS, Sioux Falls Area, 2012 (2009-2010): Not detected in 1 (0%) site

Ambient Water

- USGS NAWQA (1991-2017): Detected in 375 of 4,886 (7.67%) sites; Concentration range = $1.00x10^{-4}$ – 1.23 µg/L
- USDA PDP (2001-2013): Detected in 14 of 218 (6.42%) sites; Concentration range = $8x10^{-4}$ – 0.021 µg/L
- Drinking Water Monitoring - CA (2006-2020): Not detected in 1 (0%) site
- Arnold et al. 2012 (2009-2010): Detected in 39 of 690 (5.65%) sites; Concentration range = $3x10^{-4}$ – 0.0929 µg/L
- Bradley et al. 2017 (2012-2014): Detected in 7 of 38 (18%) sites; Concentration range = 0.0029 – 0.0466 µg/L
- SURF (1990-2018): Detected in 347 o2f 1,615 (21%) sites; Concentration range = 0.0036 – 35 µg/L
- USGS, McKenzie River, Oregon, 2012 (2002-2010): Detected in 19 of 71 (27%) samples; Maximum concentration = 0.097 µg/L
- USGS, Sioux Falls Area, 2012 (2002-2010): Not detected in 2 (0%) sites

Iprodione: Background

CASRN	36734-19-7
DTXSID	DTXSID3024154
Contaminant Group/Use	Fungicide
PCCL 5/CCL 5 Status	CCL 5
Health and Occurrence Information Status	• EPA health assessment available • Non-national finished and national ambient water occurrence data available
Persistence/Mobility/Fate/Transport	Biodegradation Half-Life ($t_{1/2}$) = 3.39 days Henry's Law Coefficient (K_H) = 3.09×10^{-9} atm-m^3/mol Octanol-Water Partitioning Coefficient (log K_{ow}) = 2.99 Organic Carbon Partitioning Coefficient (K_{oc}) = 510 L/kg Water Solubility = 5.85×10^{-5} mol/L
Use/Production/Release	USGS (2016): 376,298 lbs
PubMed Article Count	100

Iprodione: Health Effects

EPA Health Assessment	OPP (2012)
Critical Effect	Leydig cell tumor
Target Population	General Population
Cancer Slope Factor (CSF)	0.0439 $(mg/kg/day)^{-1}$
Health Value	CCL-HRL = 0.674 µg/L

Additional Health Information

EPA:

- OPP (2012): CCL-HRL = 296 µg/L; RfD = 0.05 mg/kg/day
- OPP HHBP (2021):
  - Chronic Benchmark = 0.36 mg/L (360 µg/L); Population-Adjusted Dose (RfD) = 0.061 mg/kg/day
- ToxRefDB (2014): LOAEL = 12.4 mg/kg/day; Subchronic NOAEL = 60.0 mg/kg/day; Subchronic LOAEL = 151 mg/kg/day

Other:

- NIH HSDB (accessed 2019): LD50 = 3,500 mg/kg

Cancer Classification

- OPP (2012): = L (Likely to be carcinogenic to humans)

Iprodione: Occurrence

Best Available Occurrence Information	NA

Additional Occurrence Information

Finished Drinking Water

- USDA PDP (2001-2013): Not detected in 11 (0%) sites
- Bradley et. al 2018 (2016): Detected in 2 of 26 (7.69%) sites; Concentration range = 0.0174 – 0.0174 µg/L
- USGS, Sioux Falls Area, 2012 (2009-2010): Not detected in 1 (0%) site

Ambient Water

- USGS NAWQA (1991-2017): Detected in 46 of 3,669 (1.25%) sites; Concentration range = 0.01 – 141 µg/L
- USGS NWIS (2008-2017): Detected in 33 of 2,582 (1.28%) sites; Concentration range = 0.006 – 1.24 µg/L
- USDA PDP (2001-2013): Not detected in 4 (0%) sites
- Arnold et. al 2016 (2012-2013): Not detected in 106 (0%) sites
- Bradley et. al 2017 (2012-2014): Detected in 3 of 38 (7.89%) sites; Concentration range = 0.0246 – 0.0855 µg/L
- SURF (1990-2018): Not detected in 15 (0%) sites
- USGS, Sioux Falls Area, 2012 (2009-2010): Not detected in 2 (0%) sites

Isophorone: Background

CASRN	78-59-1
DTXSID	DTXSID8020759
Contaminant Group/Use	Solvent mixtures for finishes, for polyvinyl and nitrocellulose resins, stoving lacquers
PCCL 5/CCL 5 Status	PCCL 5
Health and Occurrence Information Status	• EPA health assessment available • Non-national finished and national ambient water occurrence data available
Persistence/Mobility/Fate/Transport	Biodegradation Half-Life ($t_{1/2}$) = 3.72 days Henry's Law Coefficient (K_H) = 3.72×10^{-5} atm-m^3/mol Octanol-Water Partitioning Coefficient (log K_{ow}) = 2.10 Organic Carbon Partitioning Coefficient (K_{oc}) = 70.1 L/kg Water Solubility = 3.91×10^{-2} mol/L
Use/Production/Release	CDR (2015): 10,000,000 – <50,000,000 lbs
PubMed Article Count	35

Isophorone: Health Effects

(slide 1 of 2)

EPA Health Assessment	OPP (1999)
Critical Effect	Preputial gland carcinoma
Target Population	General Population
Cancer Slope Factor (CSF)	0.000608 $(mg/kg/day)^{-1}$
Health Value	CCL-HRL = 48.7 µg/L

Additional Health Information

EPA:

- OW (1992):
  - CCL-HRL = 7.40 µg/L; CSF = 0.004 $(mg/kg/day)^{-1}$
  - CCL-HRL = 888 µg/L; RfD = 0.2 mg/kg/day
- OPP (1999): CCL-HRL = 888 µg/L; RfD = 0.15 mg/kg/day
- IRIS (1992):
  - CCL-HRL = 31.1 µg/L; CSF = 0.00095 $(mg/kg/day)^{-1}$
  - CCL-HRL = 1,180 µg/L; RfD = 0.2 mg/kg/day

Isophorone: Health Effects

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Additional Health Information (cont'd)

EPA:

- DWSHA (accessed 2018):
  - Lifetime Health Advisory = 0.1 mg/L (100 µg/L)
  - 10-day Health Advisory = 15 mg/L (15,000 µg/L)
- HHC (2015): Human Health Ambient Water Quality Criteria = 0.034 mg/L (34 µg/L)

Other:

- MN DOH (accessed 2018):
  - Chronic Health Risk Limit = 0.1 mg/L (100 µg/L)
- CDC ATSDR (2018):
  - CCL-HRL = 1,180 µg/L; RfD = 0.2 mg/kg/day
  - Intermediate Minimal Risk level = 3 mg/kg/day
- NIH HSDB (accessed 2019): LD50 = 1,000 mg/kg
- CPDB (accessed 2018): TD50 = 203 mg/kg/day

Cancer Classification:

- OPP (1999): C (Possible human carcinogen)
- IRIS (1992): C (Possible human carcinogen)
- OW (1992): C (Possible human carcinogen)

Isophorone: Occurrence

Best Available Occurrence Information	NA

Additional Occurrence Information

Finished Drinking Water

- Drinking Water Monitoring - CA (2006-2020): Detected in 1 of 12 (8.33%) sites; Concentration = 0.149 µg/L
- Glassmeyer et al. 2017 (2007-2012): Detected in 1 of 25 (4%) sites; Maximum concentration = 0.032 µg/L
- USGS, Sioux Falls Area, 2012 (2009-2010): Not detected in 1 (0%) sites

Ambient Water

- USGS NAWQA (1991-2017): Detected in 52 of 1,920 (2.71%) sites; Concentration range = 0.003 – 3.9 µg/L
- USGS NWIS (2008-2017): Detected in 513 of 2,701 (19%) sites; Concentration range = 0.002 – 18.2 µg/L
- Drinking Water Monitoring - CA (2006-2020): Not detected in 47 (0%) sites
- Arnold et al. 2016 (2012-2013): Not detected in 527 (0%) sites
- Bradley et al. 2017 (2012-2014): Detected in 24 of 38 (63%) sites; Concentration range = 0.0038 – 0.0991 µg/L
- Glassmeyer et al. 2017 (2007-2012): Not detected in 25 (0%) sites
- USGS, Sioux Falls Area, 2012 (2009-2010): Detected in 1 of 2 (50%) sites

Isopropylbenzene (Cumene): Background

CASRN	98-82-8
DTXSID	DTXSID1021827
Contaminant Group/Use	NA
PCCL 5/CCL 5 Status	PCCL 5
Health and Occurrence Information Status	• EPA health assessment available • Non-national finished and national ambient water occurrence data available
Persistence/Mobility/Fate/Transport	Biodegradation Half-Life ($t_{1/2}$) = 14.8 days Henry's Law Coefficient (K_H) = $1.52x10^{-2}$ atm-m^3/mol Octanol-Water Partitioning Coefficient (log K_{ow}) = 3.58 Organic Carbon Partitioning Coefficient (K_{oc}) = $1.01x10^3$ L/kg Water Solubility = $6.24x10^{-4}$ mol/L
Use/Production/Release	CDR (2015): 5,000,000,000 - <10,000,000,000 lbs TRI (2016): 994,604 lbs
PubMed Article Count	93

Isopropylbenzene (Cumene): Health Effects

EPA Health Assessment	IRIS (1997)
Critical Effect	Increased average kidney weight
Target Population	General Population
Reference Dose (RfD) or Equivalent	0.1 mg/kg/day
Health Value	CCL-HRL = 592 µg/L

Additional Health Information

EPA:

- DWSHA (accessed 2018):
  - 10-day Health Advisory = 11 mg/L (11,000 µg/L)

Other:

- WHO (1999): CCL-HRL = 592 µg/L; Total Daily Intake (RfD) = 0.1 mg/kg/day
- MN DOH (accessed 2018): Chronic Health Risk Limit = 0.3 mg/L (300 µg/L)
- NIH HSDB (accessed 2019): LD50 = 1,400 mg/kg

Cancer Classification:

- WHO IARC (2011): 2B (Possibly carcinogenic to humans)
- IRIS (1997): D (Not classifiable as to human carcinogenicity)

Isopropylbenzene (Cumene): Occurrence

Best Available Occurrence Information	NA

Additional Occurrence Information

Finished Drinking Water

- UCM-State Round 1 (1988-1992): Detected in 35 of 12,771 sites (0.27%); Concentration range = 0.01 – 10 µg/L
- UCM-State Round 2 (1993-1997): Detected in 56 of 22,995 sites (0.24%); Concentration range = 0.1 – 15 µg/L
- Glassmeyer et al. 2017 (2007-2012): Not detected in 9 (0%) sites
- USGS, Sioux Falls Area, 2012 (2009-2010): Not detected at 1 (0%) site

Ambient Water

- USGS NAWQA (1991-2017): Detected in 75 of 6,831 sites (1.1%); Concentration range = 0.005 – 27 µg/L
- USGS NWIS (2008-2017): Detected in 51 of 4,277 sites (1.19%); Concentration range = 0.01 – 39.6 µg/L
- Arnold et al. 2016 (2012-2013): Detected in 1 of 158 (0.63%) sites; Concentration = 0.064 µg/L
- Glassmeyer et al. 2017 (2007-2012): Not detected in 9 (0%) sites
- SESQA (2014): Not detected in 3 (0%) sites
- USGS, Sioux Falls Area, 2012 (2009-2010): Detected in 1 of 2 (50%) sites

Lactofen: Background

CASRN	77501-63-4
DTXSID	DTXSID7024160
Contaminant Group/Use	Herbicide
PCCL 5/CCL 5 Status	PCCL 5
Health and Occurrence Information Status	• EPA health assessment available • Non-national finished and national ambient water occurrence data available
Persistence/Mobility/Fate/Transport	Biodegradation Half-Life ($t_{1/2}$) = 3.55 days Henry's Law Coefficient (K_H) = 4.90×10^{-9} atm-m^3/mol Octanol-Water Partitioning Coefficient (log K_{ow}) = 4.78 Organic Carbon Partitioning Coefficient (K_{oc}) = 1.00×10^4 L/kg Water Solubility = 3.76×10^{-7} mol/L
Use/Production/Release	USGS (2016): 785,344 lbs
PubMed Article Count	11

Lactofen: Health Effects

(slide 1 of 2)

EPA Health Assessment	OPP (2007)
Critical Effect	Increased incidence of proteinaceous casts in kidneys and decreases in thyroid and adrenal gland weights
Target Population	General Population
Reference Dose (RfD) or Equivalent	0.008 mg/kg/day
Health Value	CCL-HRL = 47.3 µg/L

Additional Health Information

EPA:

- OPP HHBP (2021):
  - Chronic Benchmark = 0.05 mg/L (50 µg/L); Population-Adjusted Dose (RfD) = 0.008 mg/kg/day
  - Acute Benchmark = 0.48 mg/L (480 µg/L); Acute Population-Adjusted Dose (RfD) = 0.017 mg/kg/day
- ToxRefDB (accessed 2018): NOAEL = 0.790 mg/kg/day; LOAEL = 1.40 mg/kg/day; Subchronic NOAEL = 17.0 mg/kg/day; Subchronic LOAEL = 73.7 mg/kg/day

Lactofen: Health Effects

(slide 2 of 2)

Additional Health Information (cont'd)

Other:

- HSDB (accessed 2019): LD50 = 5,000 mg/kg

Cancer Classification:

- OPP (2007): NL (Not likely to be carcinogenic to humans)

Lactofen: Occurrence

Best Available Occurrence Information	NA

Additional Occurrence Information

Finished Drinking Water

- USDA PDP (2001-2013): Not detected in 2 (0%) sites

Ambient Water

- USGS NAWQA (1991-2017): Detected in 2 of 1,737 sites (0.12%); Concentration range = 0.101 – 0.265 µg/L
- USGS NWIS (2008-2017): Detected in 2 of 832 sites (0.24%); Concentration range = 0.154 – 0.172 µg/L
- Arnold et al. 2016 (2012-2013): Not detected in 584 (0%) sites

Malathion: Background

CASRN	121-75-5
DTXSID	DTXSID4020791
Contaminant Group/Use	Insecticide; veterinary medicine
PCCL 5/CCL 5 Status	CCL 5
Health and Occurrence Information Status	• EPA health assessment available • Non-national finished and national ambient water occurrence data available
Persistence/Mobility/Fate/Transport	Biodegradation Half-Life ($t_{1/2}$) = 126 days Henry's Law Coefficient (K_H) = 4.90×10^{-9} atm-m^3/mol Octanol-Water Partitioning Coefficient (log K_{ow}) = 2.58 Organic Carbon Partitioning Coefficient (K_{oc}) = 165 L/kg Water Solubility = 4.99×10^{-4} mol/L
Use/Production/Release	TRI (2016): 123,611 lbs USGS (2016): 1,346,697 lbs
PubMed Article Count	2,028

Malathion: Health Effects

(slide 1 of 2)

EPA Health Assessment	OPP (2016)
Critical Effect	Inhibition of red blood cell acetylcholinesterase in pups
Target Population	Bottle-fed Infants
Reference Dose (RfD) or Equivalent	0.01 mg/kg/day
Health Value	CCL-HRL = 13.2 µg/L

Additional Health Information

EPA:

- DWSHA (accessed 2018):
  - Lifetime Health Advisory = 0.5 mg/L (500 µg/L)
  - 10-day Health Advisory = 0.2 mg/L (200 µg/L)
- ToxRefDB (accessed 2018): NOAEL = 5.00 mg/kg/day; LOAEL = 29.0 mg/kg/day

Malathion: Health Effects

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Additional Health Information (cont'd)

Other:

- CDWG (2023): Maximum Allowable Concentration = 0.29 mg/L (290 µg/L)
- CDC ATSDR (2003):
  - Chronic Minimal Risk Level = 0.02 mg/kg/day
  - Intermediate Minimal Risk Level = 0.02 mg/kg/day
- NIH HSDB (accessed 2019): LD50 = 190 mg/kg
- NIH CPDB (accessed 2018): TD50 = 66.6 mg/kg/day

Cancer Classification:

- OPP (2016): S (Suggestive evidence of carcinogenicity, but not sufficient to assess human carcinogenic potential)
- WHO IARC (2015): 2A (Probably carcinogenic to humans)

Malathion: Occurrence

Best Available Occurrence Information	NA

Additional Occurrence Information

Finished Drinking Water

- USDA PDP (2001-2013): Detected in 2 of 17 (12%) sites; Concentration range = 0.01 – 0.331 µg/L
- Drinking Water Monitoring Data - CA (2006-2020): Not detected in 3 (0%) sites
- Drinking Water Monitoring Data - WA (2006-2011): Not detected in 481 (0%) sites
- USGS, Sioux Falls Area, 2012 (2009-2010): Not detected in 1 (0%) site

Ambient Water

- USGS NAWQA (1991-2017): Detected in 416 of 11,237 (3.7%) sites; Concentration range = 0.00041 – 9.58 µg/L
- USGS NWIS (2008-2017): Detected in 53 of 4,062 (1.3%) sites; Concentration range = 6.00×10^{-4} – 5.46 µg/L
- USDA PDP (2001-2013): Detected in 4 of 229 (1.75%) sites; Concentration range = 0.00999 – 0.312 µg/L
- Drinking Water Monitoring Data - CA (2006-2020): Not detected in 37 (0%) sites
- Drinking Water Monitoring Data - WA (2006-2011): Not detected in 634 (0%) sites
- Arnold et al. 2016 (2012-2013): Detected in 3 of 690 (0.43%) sites; Concentration range = 0.0011 – 0.111 µg/L
- Bradley et al. 2017 (2012-2014): Detected in 3 of 38 (7.89%) sites; Concentration range = 0.0166 – 0.0554 µg/L
- SURF (1990-2018): Detected in 712 of 15,764 (4.52%) sites; Concentration range = 0.006 – 46 µg/L
- USGS, McKenzie River, Oregon, 2012 (2002-2010): Detected in 3 of 133 (2.3%) samples; Maximum concentration = 0.04 µg/L
- USGS, Sioux Falls Area, 2012 (2009-2010): Not detected in 2 (0%) sites

Methomyl: Background

CASRN	16752-77-5
DTXSID	DTXSID1022267
Contaminant Group/Use	Insecticide
PCCL 5/CCL 5 Status	CCL 5
Health and Occurrence Information Status	• EPA health assessment available • Non-national finished and national ambient water occurrence data available
Persistence/Mobility/Fate/Transport	Biodegradation Half-Life ($t_{1/2}$) = 3.55 days Henry's Law Coefficient (K_H) = 2.00×10^{-8} atm-m^3/mol Octanol-Water Partitioning Coefficient (log K_{ow}) = 0.584 Organic Carbon Partitioning Coefficient (K_{oc}) = 20.0 L/kg Water Solubility = 0.220 mol/L
Use/Production/Release	USGS (2016): 902,435 lbs
PubMed Article Count	240

Methomyl: Health Effects

EPA Health Assessment	OPP (2018)
Critical Effect	Increases in peak red blood cell acetylcholinesterase inhibition in humans
Target Population	Bottle-fed Infants
Reference Dose (RfD) or Equivalent	0.0015 mg/kg/day
Health Value	CCL-HRL = 1.99 µg/L

Additional Health Information

EPA:

- DWHSA (accessed 2018):
  - Lifetime Health Advisory = 0.2 mg/L (200 µg/L)
  - 10-day Health Advisory = 0.3 mg/L (300 µg/L)
- ToxRefDB (accessed 2018): NOAEL = 2.50 mg/kg/day; LOAEL = 10.0 mg/kg/day; Subchronic NOAEL = 2.50 mg/kg/day; Subchronic LOAEL = 12.5 mg/kg/day

Other:

- NIH HSDB (accessed 2019): LD50 = 10 mg/kg

Cancer Classification:

- OPP (2018): NL (Not likely to be carcinogenic to humans)

Methomyl: Occurrence

Best Available Occurrence Information	NA

Additional Occurrence Information

Finished Drinking Water

- UCM-State Round 2 (1993-1997): Detected in 9 of 12,604 sites (0.07%); Concentration range = 0.1 – 3 µg/L
- USDA PDP (2001-2013): Not detected in 17 sites
- Drinking Water Monitoring Data - CA (2006-2020): Not detected in 169 (0%) sites
- Drinking Water Monitoring Data - MA (2006-2020): Not detected in 820 (0%) sites
- Drinking Water Monitoring Data - WA (2006-2011): Not detected in 255 (0%) sites

Ambient Water

- USGS NAWQA (1991-2017): Detected in 83 of 7,697 (1.08%) sites; Concentration range = 0.00018 – 3 µg/L
- USGS NWIS (2008-2017): Detected in 21 of 1,526 (1.38%) sites; Concentration range = 0.00024 – 0.295 µg/L
- USDA PDP (2001-2013): Detected in 1 of 229 (0.44%) sites; Concentration = 0.0122 µg/L
- Drinking Water Monitoring Data - CA (2006-2020): Not detected in 1,740 (0%) sites
- Drinking Water Monitoring Data - MA (2006-2020): Not detected in 77 (0%) sites
- Drinking Water Monitoring Data - PA (2006-2011): Not detected in 1 (0%) site
- Drinking Water Monitoring Data - WA (2006-2011): Not detected in 422 (0%) sites
- Drinking Water Monitoring Data - WI (2012-2019): Not detected in 92 (0%) sites
- Arnold et al. (2012-2013): Detected in 4 of 690 (0.58%); Concentration range = $3x10^{-4}$ – 0.01 µg/L
- Bradley et al. (2012-2014): Detected in 1 of 38 sites (2.63%); Concentration = 0.0282 µg/L
- SURF (1990-2018): Detected in 539 of 6,790 sites (7.94%); Concentration range = 0.021 – 55.3 µg/L

Metribuzin: Background

CASRN	21087-64-9
DTXSID	DTXSID6024204
Contaminant Group/Use	Herbicide
PCCL 5/CCL 5 Status	PCCL 5
Health and Occurrence Information Status	• EPA health assessment available • Non-national finished and national ambient water occurrence data available
Persistence/Mobility/Fate/Transport	Biodegradation Half-Life ($t_{1/2}$) = 3.80 days Henry's Law Coefficient (K_H) = 1.23×10^{-8} atm-m^3/mol Octanol-Water Partitioning Coefficient (log K_{ow}) = 1.50 Organic Carbon Partitioning Coefficient (K_{oc}) = 101 L/kg Water Solubility = 6.16×10^{-3} mol/L
Use/Production/Release	TRI (2016): 15,728 lbs USGS (2016): 5,804,692 lbs
PubMed Article Count	126

Metribuzin: Health Effects

(slide 1 of 2)

EPA Health Assessment	OPP (2017)
Critical Effect	Increased thyroid and liver weights, thyroid follicular cell hyperplasia, decreased body weight and body weight gains
Target Population	General Population
Reference Dose (RfD) or Equivalent	0.0013 mg/kg/day
Health Value	CCL-HRL = 7.69 µg/L

Additional Health Information

EPA:

- DWSHA (accessed 2018):
  - Lifetime Health Advisory = 0.07 mg/L (70 µg/L)
  - 10-day Health Advisory = 5 mg/L (5,000 µg/L)
- ToxRefDB (accessed 2018): NOAEL = 1.50 mg/kg/day; LOAEL = 7.50 mg/kg/day; Subchronic NOAEL = 1.25 mg/kg/day; Subchronic LOAEL = 3.00 mg/kg/day

Metribuzin: Health Effects

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Additional Health Information

Other:

- MN DOH (accessed 2018):
  - Chronic Health Risk Limit = 0.01 mg/L (10 µg/L)
  - Subchronic Health Risk Limit = 0.01 mg/L (10 µg/L)
  - Short-Term Health Risk Limit = 0.01 mg/L (10 µg/L)
  - Acute Health Risk Limit = 0.03 mg/L (30 µg/L)
- CDWG (accessed 2019): Maximum Allowable Concentration = 0.08 mg/L (80 µg/L)
- NIH HSDB (accessed 2019): LD50 = 250 mg/kg

Cancer Classification

- OPP (2017): D (Not classifiable as to human carcinogenicity)

Metribuzin: Occurrence

(slide 1 of 2)

Best Available Occurrence Information	NA

Additional Occurrence Information

Finished Drinking Water

- UCM-State Round 2 (1993-1997): Detected in 1 of 13,512 (0.01%) sites; Concentration = 0.1 µg/L
- USDA PDP (2001-2013): Detected in 3 of 15 (20%) sites; Concentration range = 0.0107 – 3.76 µg/L
- Drinking Water Monitoring Data - CA (2006-2020): Not detected in 182 (0%) sites
- Drinking Water Monitoring Data - MA (2006-2020): Detected in 1 of 822 (0.12%) sites; Concentration = 0.1 µg/L
- Drinking Water Monitoring Data - WA (2006-2011): Detected in 1 of 822 (0.12%) sites; Concentration range = 0.05 – 0.28 µg/L
- USGS, Sioux Falls Area, 2012 (2009-2010): Not detected in 1 (0%) site

Metribuzin: Occurrence

(slide 2 of 2)

Additional Occurrence Information (cont'd)

Ambient Water

- USGS NAWQA (1991-2017): Detected in 606 of 11,379 (5.33%) sites; Concentration range = 0.001 – 15.6 µg/L
- USGS NWIS (2008-2017): Detected in 194 of 4,090 (4.74%) sites; Concentration range = 0.0018 – 6.7 µg/L
- USDA PDP (2001-2013): Detected in 3 of 226 (1.33%) sites; Concentration range = 0.0107 –29.742 µg/L
- Drinking Water Monitoring Data - CA (2006 – 2020): Not detected in 2,171 (0%) sites
- Drinking Water Monitoring Data - MA (2006 – 2020): Not detected in 78 (0%) sites
- Drinking Water Monitoring Data - WA (2006 – 2011): Not detected in 997 (0%) sites
- Drinking Water Monitoring Data - WI (2012-2019): Not detected in 92 (0%) sites
- Arnold et al. 2016 (2012-2013): Detected in 4 of 690 (0.58%) sites; Concentration range = 0.0038 – 0.651 µg/L
- Bradley et al. 2017 (2012-2014): Detected in 3 of 38 (7.89%) sites; Concentration range = 0.0159 – 0.541 µg/L
- SURF (1990-2018): Detected in 27 of 1,320 (2.05%) sites; Concentration range = 0.006 – 0.182 µg/L
- USGS, Sioux Falls Area, 2012 (2009-2010): Not detected in 2 (0%) sites

N,N-Diethyl-m-toluamide (DEET): Background

CASRN	134-62-3
DTXSID	DTXSID2021995
Contaminant Group	Broad-spectrum insect repellant
PCCL 5/CCL 5 Status	PCCL 5
Health and Occurrence Information Status	• No EPA health assessment available • Non-national finished and national ambient water occurrence data available
Persistence/Mobility/Fate/Transport	Biodegradation Half-Life ($t_{1/2}$) = 3.39 days Henry's Law Coefficient (K_H) = 1.45×10^{-7} atm-m^3/mol Octanol-Water Partitioning Coefficient (log K_{ow}) = 2.16 Organic Carbon Partitioning Coefficient (K_{oc}) = 191 L/kg Water Solubility = 1.73×10^{-2} mol/L
Use/Production/Release	NA
PubMed Article Count	753

N,N-Diethyl-m-toluamide (DEET): Health Effects

EPA Health Assessment	NA
Critical Effect	NA
Target Population	NA
Health Data Element	NA
Health Value	NA

Additional Health Information

EPA:

- ToxRefDB (accessed 2018): NOAEL = 100 mg/kg/day; LOAEL = 25.0 mg/kg/day; Subchronic NOAEL = 61.0 mg/kg/day; Subchronic LOAEL = 304 mg/kg/day

Other:

- CDC ATSDR (2017): CCL-HRL = 4260 µg/L; RfD = 1 mg/kg/day
- MN DOH (accessed 2018):
  - Chronic Health Risk Limit = 0.2 mg/L (200 µg/L)
  - Subchronic Health Risk Limit = 0.2 mg/L (200 µg/L)
  - Short-Term Health Risk Limit = 0.2 mg/L (200 µg/L)
- NIH HSDB (accessed 2019): LD50 = 1,584 mg/kg

N,N-Diethyl-m-toluamide (DEET): Occurrence

Best Available Occurrence Information	NA

Additional Occurrence Information

Finished Drinking Water

- Glassmeyer et al. 2017 (2007-2012): Not detected in 25 (0%) sites
- Padhye et al. 2013 (2009-2010): Detected in 8 of 8 (100%), sites; Concentration range = $5x10^{-7} \pm 1x10^{-7}$ – $2.4x10^{-5} \pm 8.2x10^{-6}$ µg/L
- USGS, Sioux Falls Area, 2012 (2009-2010): Detected in 1 of 1 (100%) site; Concentration = 0.1 µg/L

Ambient Water

- USGS NAWQA (1991-2017): Detected in 114 of 538 (21%) sites; Concentration range = 0.01 – 2.2 µg/L
- USGS NWIS (2008-2017): Detected in 766 of 1,393 (55%) sites; Concentration range = 0.01 – 7.9 µg/L
- Bradley et al. 2017 (2012-2014): Detected in 22 of 38 (58%) sites; Concentration range = 0.0035 – 0.119 µg/L
- Glassmeyer et al. 2017 (2007-2012): Detected in 1 of 25 (4%) sites
- Padhye et al. 2013 (2009-2010): Detected in 8 of 8 (100%) sites; Concentration range = $2.33x10^{-5} \pm 3x10^{-6}$ – $2.56x10^{-4} \pm 6.25x10^{-5}$ µg/L
- SURF (1990-2018): Detected in 12 of 26 (46%) sites; Concentration range = 0.0106 – 0.912 µg/L
- USGS, Sioux Falls Area, 2012 (2009-2010): Detected in 2 of 2 (100%) sites

Naphthalene: Background

CASRN	91-20-3
DTXSID	DTXSID8020913
Contaminant Group/Use	Former pesticide; chemical intermediate; moth repellant
PCCL 5/CCL 5 Status	PCCL 5
Health and Occurrence Information Status	• EPA health assessment available • Non-national finished and national ambient water occurrence data available
Persistence/Mobility/Fate/Transport	Biodegradation Half-Life ($t_{1/2}$) = 3.02 days Henry's Law Coefficient (K_H) = $4.37x10^{-4}$ atm-m^3/mol Octanol-Water Partitioning Coefficient (log K_{ow}) = 3.32 Organic Carbon Partitioning Coefficient (K_{oc}) = 822 L/kg Water Solubility = $6.51x10^{-4}$ mol/L
Use/Production/Release	CDR (2015): 100,000,000 - <250,000,000 lbs TRI (2016): 2,631,597 lbs
PubMed Article Count	2280

Naphthalene: Health Effects

(slide 1 of 2)

EPA Health Assessment	OPP (2018)
Critical Effect	Decreases in body weight and renal effects
Target Population	General Population
Reference Dose (RfD) or Equivalent	0.100 mg/kg/day
Health Value	CCL-HRL = 592 µg/L

Additional Health Information

EPA:

- DWSHA (accessed 2018):
  - Lifetime Health Advisory = 0.1 mg/L (100 µg/L)
  - 10-day Health Advisory = 0.5 mg/L (500 µg/L)
- ToxRefDB (2014): LOAEL = 50.0 mg/kg/day

Naphthalene: Health Effects

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Additional Health Information (cont'd)

Other:

- CDC ATSDR (2005):
  - Intermediate Minimal Risk Level = 0.6 mg/kg/day
  - Acute Minimal Risk Level = 0.6 mg/kg/day
- MN DOH (accessed 2018):
  - Chronic Health Risk Limit = 0.07 mg/L (70 µg/L)
  - Subchronic Health Risk Limit = 0.07 mg/L (70 µg/L)
  - Short-Term Health Risk Limit = 0.07 mg/L (70 µg/L)
- NIH HSDB (accessed 2019): LD50 = 490 mg/kg
- CalEPA OEHHA (accessed 2019):
  - Benchmark = 0.17 mg/L (170 µg/L)
  - Cancer Slope Factor (CSF) = 0.12 $(mg/kg/day)^{-1}$

Cancer Classification:

- WHO IARC (2002) = 2B (Possibly carcinogenic to humans)

Naphthalene: Occurrence

Best Available Occurrence Information

Additional Occurrence Information

Finished Drinking Water

- UCM-State Round 1 (1988-1992): Detected in 159 of 13,452 (1.18%) sites; Concentration range = 0.03 – 906 µg/L
- UCM-State Round 2 (1993-1997): Detected in 173 of 22,923 (0.75%) sites; Concentration range = 0.07 – 90 µg/L
- Drinking Water Monitoring Data - CA (2006-2020): Detected in 3 of 366 (0.82%) sites; Concentration range = 0.003 – 7 µg/L
- Drinking Water Monitoring Data - MA (2006-2020): Detected in 14 of 887 (1.58%) sites; Concentration range = 0.5 – 3.1 µg/L
- Drinking Water Monitoring Data - WA (2006-2011): Not detected in 1,188 (0%) sites
- USGS, Sioux Falls Area, 2012 (2009-2010): Not detected in 1 (0%) site

Ambient Water

- USGS NAWQA (1991-2017): Detected in 68 of 7,850 (0.87%) sites; Concentration range = 0.008 – 70 µg/L
- USGS NWIS (2008-2017): Detected in 246 of 5,186 (4.74%) sites; Concentration range = 0.007 – 16000 µg/L
- Drinking Water Monitoring Data - CA (2006-2020): Detected in 21 of 3,888 (0.54%) sites; Concentration range = 0.001 – 5.8 µg/L
- Drinking Water Monitoring Data - MA (2006-2020): Detected in 5 of 131 (3.82%) sites; Concentration range = 0.5 – 4.5 µg/L
- Drinking Water Monitoring Data - PA (2006-2011): Detected in 1 of 15 (6.67%) sites; Concentration range = 1.08 – 1.25 µg/L
- Drinking Water Monitoring Data - WA (2006-2011): Detected in 2 of 1,665 (0.12%) sites; Concentration range = 0.66 – 36 µg/L
- Drinking Water Monitoring Data - WI (2012-2019): Not detected in 101 (0%) sites
- Arnold et al. 2016 (2012-2013): Detected in 1 of 685 (0.15%) sites; Concentration = 0.78 µg/L
- Bradley et al. 2017 (2012-2014): Detected in 3 of 38 (7.89%) sites; Concentration range = 0.0162 – 0.0284 µg/L
- USGS, Sioux Falls Area, 2012 (2009-2010): Not detected in 2 (0%) sites

Nonylphenol: Background

CASRN	25154-52-3
DTXSID	DTXSID3021857
Contaminant Group/Use	In the preparation of lubricating oil additives, resins, plasticizers, surface active agents; antioxidants for plastics and rubber
PCCL 5/CCL 5 Status	CCL 5
Health and Occurrence Information Status	• No EPA Health Assessment Available • Non-national finished and national ambient water occurrence data available
Persistence/Mobility/Fate/Transport	Biodegradation Half-Life ($t_{1/2}$) = 4.17 days Henry's Law Coefficient (K_H) = 2.09×10^{-3} atm-m^3/mol Octanol-Water Partitioning Coefficient (log K_{ow}) = 1.30 Organic Carbon Partitioning Coefficient (K_{oc}) = 2.95×10^3 L/kg Water Solubility = 1.62×10^{-7} mol/L
Use/Production/Release	CDR (2015): <1,000,000 lbs
PubMed Article Count	1,017

Nonylphenol: Health Effects

EPA Health Assessment	NA
Critical Effect	NA
Target Population	NA
Health Data Element	NA
Health Value	NA

Additional Health Information

Other:

- MN DOH (2015): CCL-SL = 29.0 µg/L; RfD = 0.0049 mg/kg/day
- MN DOH (accessed 2018):
  - Chronic Health Risk Limit = 0.02 mg/L (20 µg/L)
  - Subchronic Health Risk Limit = 0.04 mg/L (40 µg/L)
  - Short-Term Health Risk Limit = 0.1 mg/L (100 µg/L)
- NIH HSDB (accessed 2019): LD50 = 1,600 mg/kg

Nonylphenol: Occurrence

Best Available Occurrence Information	NA

Additional Occurrence Information

Finished Drinking Water

- Glassmeyer et al. 2017 (2007-2012): Not detected in 25 (0%) sites
- Padhye et al. 2013 (2009-2010): Detected in 8 of 8 (100%) samples; Concentration range = $1.24x10^{-5} \pm 5.3x10^{-6}$ – $6.06x10^{-5} \pm 1.92x10^{-5}$ µg/L
- USGS, Sioux Falls Area, 2012 (2009-2010): Not detected in 1 (0%) sites

Ambient Water

- USGS NAWQA (1991-2017): Detected in 45 of 567 (7.94%) sites; Concentration range = 0.3 – 13 µg/L
- Bradley et al. 2017 (2012-2014): Detected in 10 of 38 (26%) sites; Concentration range = 0.105 – 0.461 µg/L
- Glassmeyer et al. 2017 (2007-2012): Not detected in 25 (0%) sites
- Padhye et al. 2013 (2009-2010): Detected in 8 of 8 (100%) samples; Concentration range = $5.34x10^{-5} \pm 5.8x10^{-6}$ – $0.0001856 \pm 2x10^{-5}$ µg/L
- USGS, Sioux Falls Area, 2012 (2009-2010): Not detected in 2 (0%) sites

Norflurazon: Background

CASRN	27314-13-2
DTXSID	DTXSID8024234
Contaminant Group/Use	Herbicide
PCCL 5/CCL 5 Status	CCL 5
Health and Occurrence Information Status	• EPA health assessment available • Non-national finished and national ambient water occurrence data available
Persistence/Mobility/Fate/Transport	Biodegradation Half-Life ($t_{1/2}$) = 3.55 days Henry's Law Coefficient (K_H) = 1.10×10^{-9} atm-m^3/mol Octanol-Water Partitioning Coefficient (log K_{ow}) = 2.32 Organic Carbon Partitioning Coefficient (K_{oc}) = 1.02×10^3 L/kg Water Solubility = 2.02×10^{-4} mol/L
Use/Production/Release	USGS (2016): 202,807 lbs
PubMed Article Count	139

Norflurazon: Health Effects

EPA Health Assessment	OPP (2017)
Critical Effect	Increased incidence of thyroid colloid/vacuoles and epithelial desquamation, increased liver weight, alkaline phosphatase, and cholesterol in males
Target Population	General Population
Reference Dose (RfD) or Equivalent	0.0015 mg/kg/day
Health Value	CCL-HRL = 8.88 µg/L

Additional Health Information

EPA:

- OPP HHBP (2021):
  - Chronic Benchmark = 0.0089 mg/L (8.9 µg/L); Population-Adjusted Dose (RfD) = 0.0015 mg/kg/day
- ToxRefDB (accessed 2018): NOAEL = 1.58 mg/kg/day; LOAEL = 4.77 mg/kg/day

Other:

- NIH HSDB (accessed 2019): LD50 = 8,000 mg/kg

Cancer Classification:

- OPP (2017): C (Possible human carcinogen)

Norflurazon: Occurrence

Best Available Occurrence Information	NA

Additional Occurrence Information

Finished Drinking Water

- USDA PDP (2001-2013): Detected in 2 of 17 (12%) sites; Concentration range = 0.0313 – 0.096 µg/L
- Drinking Water Monitoring - WA (2006-2011): Not detected in 1 (0%) site

Ambient Water

- USGS NAWQA (1991-2017): Detected in 217 of 7,803 (2.78%) sites; Concentration range = 0.00025 – 26.5 µg/L
- USGS NWIS (2008-2017): Detected in 40 of 1,531 (2.61%) sites; Concentration range = 3.00×10^{-4} – 1.49 µg/L
- USDA PDP (2001-2013): Detected in 9 of 229 (3.93%) sites; Concentration range = 0.007992 – 0.352 µg/L
- Drinking Water Monitoring - WA (2006-2011): Not detected in 4 (0%) sites
- Arnold et al. 2016 (2012-2013): Detected in 12 of 690 (1.74%) sites; Concentration range = 3×10^{-4} – 0.0563 µg/L
- Bradley et al. 2017 (2012-2014): Detected in 2 of 38 (5.26%) sites; Concentration range = 0.0137 – 0.0274 µg/L
- SURF (1990-2018): Detected in 125 of 1,090 (11%) sites; Concentration range = 0.05 – 1.49 µg/L

Phenanthrene: Background

CASRN	85-01-8
DTXSID	DTXSID6024254
Contaminant Group/Use	Dyestuffs, explosives, synthesis of drugs, biochemical research, manufacturing phenanthrenequinone
PCCL 5/CCL 5 Status	PCCL 5
Health and Occurrence Information Status	• No EPA Health Assessment Available • Non-national finished and national ambient water occurrence data available
Persistence/Mobility/Fate/Transport	Biodegradation Half-Life ($t_{1/2}$) = 42.7 days Henry's Law Coefficient (K_H) = 4.27×10^{-5} atm-m^3/mol Octanol-Water Partitioning Coefficient (log K_{ow}) = 4.55 Organic Carbon Partitioning Coefficient (K_{oc}) = 1.49×10^4 L/kg Water Solubility = 2.82×10^{-6} mol/L
Use/Production/Release	CDR (2015): 958,463 lbs TRI (2016): 288,155 lbs
PubMed Article Count	1,596

Phenanthrene: Health Effects

EPA Health Assessment	NA
Critical Effect	NA
Target Population	NA
Health Data Element	NA
Health Value	NA

Additional Health Information

Other:

- NIH HSDB (accessed 2019): LD50 = 700 mg/kg

Cancer Classification:

- PPRTV (2009): I (Inadequate information to assess carcinogenic potential)
- WHO IARC (2005): 3 (Possibly carcinogenic to humans)
- OW (1991): D (Not classifiable as to human carcinogenicity)
- IRIS (1990): D (Not classifiable as to human carcinogenicity)

Phenanthrene: Occurrence

Best Available Occurrence Information	NA

Additional Occurrence Information

Finished Drinking Water

- Drinking Water Monitoring - CA (2006-2020): Detected in 1 of 28 (3.57%) sites; Concentration range = 0.001 – 0.002 µg/L
- Drinking Water Monitoring - WA (2006-2011): Not detected in 481 (0%) sites
- Glassmeyer et al. 2017 (2007-2012): Not detected in 25 (0%) sites
- USGS, Sioux Falls Area, 2012 (2009-2010): Not detected in 1 (0%) site

Ambient Water

- USGS NAWQA (1991-2017): Detected in 39 of 593 (6.58%) sites; Concentration range = 0.003 – 0.13 µg/L
- USGS NWIS (2008-2017): Detected in 356 of 1,965 (18%) sites; Concentration range = 0.002 – 140 µg/L
- Drinking Water Monitoring - CA (2006-2020): Detected in 2 of 233 (0%) sites; Concentration range = 0.1 – 0.37 µg/L
- Drinking Water Monitoring - WA (2006-2011): Not detected in 634 (0%) sites
- Bradley et al. 2017 (2012-2014): Detected in 6 of 38 (16%) sites; Concentration range = 0.0074 – 0.0241 µg/L
- Glassmeyer et al. 2017 (2007-2012): Not detected in 25 (0%) sites
- USGS, Sioux Falls Area, 2012 (2009-2010): Not detected in 2 (0%) sites

Phenol: Background

CASRN	108-95-2
DTXSID	DTXSID5021124
Contaminant Group/Use	Pesticide; chemical intermediate
PCCL 5/CCL 5 Status	PCCL 5
Health and Occurrence Information Status	• EPA health assessment available • Non-national finished and national ambient water occurrence data available
Persistence/Mobility/Fate/Transport	Biodegradation Half-Life ($t_{1/2}$) = 4.57 days Henry's Law Coefficient (K_H) = $3.39x10^{-7}$ atm-m^3/mol Octanol-Water Partitioning Coefficient (log K_{ow}) = 1.52 Organic Carbon Partitioning Coefficient (K_{oc}) = 53.2 L/kg Water Solubility = 0.644 mol/L
Use/Production/Release	CDR (2015): 1,000,000,000 – <5,000,000,000 lbs TRI (2016): 6,052,029 lbs
PubMed Article Count	4,884

Phenol: Health Effects

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EPA Health Assessment	OPP (2019)
Critical Effect	Reductions in mean fetal body weight per litter
Target Population	Women of childbearing age
Reference Dose (RfD) or Equivalent	0.6 mg/kg/day
Health Value	CCL-HRL = 3,390 µg/L

Additional Health Information

EPA:

- DWSHA (accessed 2018):
  - Lifetime Health Advisory = 2 mg/L (2,000 µg/L)
  - 10-day Health Advisory = 6 mg/L (6,000 µg/L)
- HHC (2015): Human Health Ambient Water Quality Criteria = 4 mg/L (4,000 µg/L)

Phenol: Health Effects

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Additional Health Information (cont'd)

Other:

- MN DOH (accessed 2018):
  - Chronic Health Risk Limit = 4 mg/L (4,000 µg/L)
- CDC ATSDR (2008):
  - Acute Minimal Risk Level = 1 mg/kg/day
- NIH HSDB (accessed 2019): LD50 = 100 mg/kg
- NIH CPDB (accessed 2018): TD50 = 133 mg/kg/day

Cancer Classification:

- OPP (2019): I (Inadequate information to assess carcinogenic potential)
- WHO IARC (1998): 3 (Unclassifiable as to carcinogenicity in humans)

Phenol: Occurrence

Best Available Occurrence Information	NA

Additional Occurrence Information

Finished Drinking Water

- Drinking Water Monitoring Data - CA (2006 -2020): Not detected in 7 (0%) sites
- USGS, Sioux Falls Area, 2012 (2009-2010): Not detected in 1 (0%) site

Ambient Water

- USGS NAWQA (1991-2017): Detected in 98 of 462 (21%) sites; Concentration range = 0.08 – 12 µg/L
- USGS NWIS (2008-2017): Detected in 268 of 1,851 (14%) sites; Concentration range = 0.02 – 54.3 µg/L
- Drinking Water Monitoring Data - CA (2006-2020): Not detected in 34 (0%) sites
- Bradley et al. 2017 (2012-2014): Detected in 4 of 38 (11%) sites; Concentration range = 0.0548 – 0.151 µg/L
- USGS, Sioux Falls Area, 2012 (2009-2010): Detected in 2 of 2 (100%) sites; Concentration range = 0.1 – 0.8 µg/L

Phorate: Background

CASRN	298-02-2
DTXSID	DTXSID4032459
Contaminant Group/Use	NA
PCCL 5/CCL 5 Status	CCL 5
Health and Occurrence Information Status	• EPA health assessment available • Non-national finished and national ambient water occurrence data available
Persistence/Mobility/Fate/Transport	Biodegradation Half-Life ($t_{1/2}$) = 141 days Henry's Law Coefficient (K_H) = 1.58×10^{-6} atm-m^3/mol Octanol-Water Partitioning Coefficient (log K_{ow}) = 3.60 Organic Carbon Partitioning Coefficient (K_{oc}) = 568 L/kg Water Solubility = 1.47×10^{-4} mol/L
Use/Production/Release	USGS (2016): 945,534 lbs
PubMed Article Count	113

Phorate: Health Effects

EPA Health Assessment	OPP (2006)
Critical Effect	Red blood cell and brain cholinesterase inhibition
Target Population	Bottle-fed infants
Reference Dose (RfD) or Equivalent	0.00017 mg/kg/day
Health Value	CCL-HRL = 0.225 µg/L

Additional Health Information

EPA:

- OPP HHBP (2021):
  - Chronic Benchmark = 0.001 mg/L (1 µg/L); Population-Adjusted Dose (RfD) = 0.00017 mg/kg/day
  - Acute Benchmark = 0.0055 mg/L (5.5 µg/L); Acute Population-Adjusted Dose (RfD) = 0.00083 mg/kg/day
- ToxRefDB (accessed 2018): NOAEL = 1.00×10^{-2} mg/kg/day; LOAEL = 5.00×10^{-2} mg/kg/day

Other:

- CDWG (accessed 2019): Maximum Allowable Concentration = 0.002 mg/L (2 µg/L)
- HSDB (accessed 2019): LD50 = 1.1 mg/kg

Cancer Classification:

- OPP (2006): E (Equivocal evidence of carcinogenicity)

Phorate: Occurrence

Best Available Occurrence Information	NA

Additional Occurrence Information

Finished Drinking Water

- USDA PDP (2001-2013): Detected in 1 of 17 (5.88%) sites; Maximum concentration = 0.078 µg/L
- Drinking Water Monitoring Data - CA (2006-2020): Not detected in 1 (0%) site
- USGS, Sioux Falls Area, 2012 (2009-2010): Not detected in 1 (0%) site

Ambient Water

- USGS NAWQA (1991-2017): Detected in 24 of 11,241 (0.21%) sites; Concentration range = 0.002 – 0.6 µg/L
- USDA PDP (2001-2013): Detected in 1 of 229 (0.44%) sites; Maximum concentration = 0.062 µg/L
- Drinking Water Monitoring Data - CA (2006-2020): Not detected in 4 (0%) sites
- Arnold et al. 2016 (2012-2013): Detected in 1 of 690 (0.14%) sites; Concentration = 0.0032 µg/L
- SURF (1990-2018): Detected in 13 of 11,178 (0.12%) sites; Concentration range = 0.016 – 0.22 µg/L
- USGS, Sioux Falls Area, 2012 (2009-2010): Not detected in 2 (0%) sites

Prometryn: Background

CASRN	7287-19-6
DTXSID	DTXSID4024272
Contaminant Group/Use	Herbicide
PCCL 5/CCL 5 Status	PCCL 5
Health and Occurrence Information Status	• EPA health assessment available • Non-national finished and national ambient water occurrence data available
Persistence/Mobility/Fate/Transport	Biodegradation Half-Life ($t_{1/2}$) = 4.79 days Henry's Law Coefficient (K_H) = 2.29×10^{-8} atm-m^3/mol Octanol-Water Partitioning Coefficient (log K_{ow}) = 3.52 Organic Carbon Partitioning Coefficient (K_{oc}) = 580 L/kg Water Solubility = 1.81×10^{-4} mol/L
Use/Production/Release	TRI (2016): 863 lbs USGS (2016): 1,458,440 lbs
PubMed Article Count	103

Prometryn: Health Effects

EPA Health Assessment	OPP HHBP (2017)
Critical Effect	Renal and hepatic degenerative changes, bone marrow atrophy
Target Population	General Population
Reference Dose (RfD) or Equivalent	0.04 mg/kg/day
Health Value	200 µg/L

Additional Health Information

EPA:

- OPP (2013): CCL- HRL= 237 µg/L; RfD = 0.04 mg/kg/day
- ToxRefDB (accessed 2018): NOAEL = 0.70 mg/kg/day; LOAEL = 37.5 mg/kg/day

Other:

- NIH HSDB (accessed 2019): LD50 = 1,265 mg/kg

Cancer Classification:

- OPP (2013): E (Evidence of non-carcinogenicity for humans)

Prometryn: Occurrence

Best Available Occurrence Information	NA

Additional Occurrence Information

Finished Drinking Water

- USDA PDP (2001-2013): Detected in 5 of 17 (29%) sites; Concentration range = 0.00028 – 0.231 µg/L
- Drinking Water Monitoring Data - CA (2006-2020): Not detected in 99 (0%) sites
- USGS, Sioux Falls Area, 2012 (2009-2010): Not detected in 1 (0%) site

Ambient Water

- USGS NAWQA (1991-2017): Detected in 139 of 5,273 (2.64%) sites; Concentration range = 0.00017 – 3.73 µg/L
- USGS NWIS (2008-2017): Detected in 68 of 3,458 (1.97%) sites; Concentration range = 0.00015 – 0.658 µg/L
- USDA PDP (2001-2013): Detected in 8 of 228 (3.49%) sites; Concentration range = 0.00028 – 0.118 µg/L
- Drinking Water Monitoring Data - CA (2006-2020): Not detected in 1,207 (0%) sites
- Arnold et al. 2016 (2012-2013): Not detected in 690 (0%)
- Bradley et al. 2017 (2012-2014): Detected in 2 of 38 (5.26%) sites; Concentration range = 0.0032 – 0.0286 µg/L
- SURF (1990-2018): Detected in 92 of 3,433 (2.68%) sites; Concentration range = 0.0031 – 20 µg/L
- USGS, Sioux Fall Area, 2012 (2009-2010): Not detected in 2 (0%) sites

Pronamide: Background

CASRN	23950-58-5
DTXSID	DTXSID2020420
Contaminant Group/Use	Selective herbicide used on annual and perennial grasses
PCCL 5/CCL 5 Status	PCCL 5
Health and Occurrence Information Status	• EPA health assessment available • Non-national finished and national ambient water occurrence data available
Persistence/Mobility/Fate/Transport	Biodegradation Half-Life ($t_{1/2}$) = 3.31 days Henry's Law Coefficient (K_H) = $4.27x10^{-10}$ atm-m^3/mol Octanol-Water Partitioning Coefficient (log K_{ow}) = 3.52 Organic Carbon Partitioning Coefficient (K_{oc}) = 288 L/kg Water Solubility = $1.12x10^{-4}$ mol/L
Use/Production/Release	USGS (2016): 137,018 lbs
PubMed Article Count	54

Pronamide: Health Effects

(slide 1 of 2)

EPA Health Assessment	OPP HHBP (2019)
Critical Effect	Decreases in body weight, weight gain, and food consumption; increased liver weight; lesions in liver, thyroid, and ovaries
Target Population	Women of childbearing age
Reference Dose (RfD) or Equivalent	0.013 mg/kg/day
Health Value	77 µg/L

Additional Health Information

EPA:

- DWSHA (accessed 2018):
  - 10-day Health Advisory = 0.8 mg/L (800 µg/L)
- OPP (2015): CCL-HRL = 226 µg/L; RfD = 0.04 mg/kg/day
- OPP HHBP (2021):
  - Acute Benchmark = 0.3 mg/L (300 µg/L); Acute Population-Adjusted Dose (RfD) = 0.04 mg/kg/day
- ToxRefDB (accessed 2018): NOAEL = 5.00 mg/kg/day; LOAEL = 20.0 mg/kg/day; Subchronic NOAEL = 15.0 mg/kg/day; Subchronic LOAEL = 60.0 mg/kg/day

Pronamide: Health Effects

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Additional Health Information (cont'd)

Other:

- NIH HSDB (accessed 2019): LD50 = 5,600 mg/kg

Cancer Classification:

- OPP (2015): NL (Not likely to be carcinogenic to humans)

Pronamide: Occurrence

Best Available Occurrence Information	NA

Additional Occurrence Information

Finished Drinking Water

- USDA PDP (2001-2013): Not detected in 13 (0%) sites
- USGS, Sioux Falls Area, 2012 (2009-2010): Not detected in 1 (0%) site

Ambient Water

- USGS NAWQA (1991-2017): Detected in 143 of 11,233 (1.27%) sites; Concentration range = 0.00021 – 1.35 µg/L
- USGS NWIS (2008-2017): Detected in 24 of 4,084 (0.59%) sites; Concentration range = 7.00×10^{-4} – 5.75 µg/L
- USDA PDP (2001-2013): Not detected in 8 (0%) sites
- Arnold et al. 2016 (2012-2013): Not detected in 690 (0%) sites
- Bradley et al. 2017 (2012-2014): Detected in 1 of 38 (2.63%) sites; Concentration = 0.01134 µg/L
- SURF (1990-2018): Detected in 49 of 641 (7.64%) sites; Concentration range = 0.005 – 0.25 µg/L
- USGS, McKenzie River, Oregon, 2012 (2002-2010): Detected in 1 of 133 (0.8%) samples; Maximum concentration = 0.014 µg/L
- USGS, Sioux Falls Area, 2012 (2009-2010): Not detected in 2 (0%) sites

Propanil: Background

CASRN	709-98-8
DTXSID	DTXSID8022111
Contaminant Group/Use	Herbicide
PCCL 5/CCL 5 Status	CCL 5
Health and Occurrence Information Status	• EPA health assessment available • Non-national finished and ambient water occurrence data available
Persistence/Mobility/Fate/Transport	Biodegradation Half-Life ($t_{1/2}$) = 3.55 days Henry's Law Coefficient (K_H) = 1.86×10^{-9} atm-m^3/mol Octanol-Water Partitioning Coefficient (log K_{ow}) = 3.12 Organic Carbon Partitioning Coefficient (K_{oc}) = 272 L/kg Water Solubility = 4.90×10^{-4} mol/L
Use/Production/Release	TRI (2016): 81,157 lbs USGS (2016): 6,860,055 lbs
PubMed Article Count	130

Propanil: Health Effects

EPA Health Assessment	OPP (2006)
Critical Effect	Increased methemoglobin; increased spleen weight in females; and enlarged seminal vesicles/prostates in males
Target Population	General Population
Reference Dose (RfD) or Equivalent	0.009 mg/kg/day
Health Value	CCL-HRL = 53.3 µg/L

Additional Health Information

EPA:

- OPP HHBP (2021):
  - Chronic Benchmark = 0.2 mg/L (200 µg/L); Population-Adjusted Dose (RfD) = 0.03 mg/kg/day
- ToxRefDB (accessed 2018): NOAEL = 15.0 mg/kg/day; LOAEL = 5.00 mg/kg/day; Subchronic NOAEL = 9.60 mg/kg/day; Subchronic LOAEL = 49.0 mg/kg/day

Other:

- NIH HSDB (accessed 2019): LD50 = 360 mg/kg

Cancer Classification:

- OPP (2006): S (Suggestive evidence of carcinogenic potential)

Propanil: Occurrence

Best Available Occurrence Information	NA

Additional Occurrence Information

Finished Drinking Water

- USDA PDP (2001-2013): Detected in 6 of 16 (38%) sites; Concentration range = 0.0112 – 0.17 µg/L
- Drinking Water Monitoring Data - CA (2006-2020): Not detected in 1 (0%) sites

Ambient Water

- USGS NWIS (2008-2017): Detected in 23 of 2,980 (0.77%) sites; Concentration range = 0.00188 – 6.5 µg/L
- USDA PDP (2001-2013): Not detected in 228 (0%) sites
- Drinking Water Monitoring Data - CA (2006-2020): Not detected in 1 (0%) sites
- Arnold et. al 2016 (2012-2013): Not detected in 690 (0%) sites
- Bradley et. al 2017 (2012-2014): Detected in 1 of 38 (2.63%) sites; Concentration = 3.0096 µg/L
- SESQA (2014): Detected in 1 of 77 (1.3%) sites; Concentration = 0.0020539 µg/L
- SURF (1990-2018): Detected in 201 of 1,424 (14%) sites; Concentration range = 0.004 – 57.6 µg/L

Propazine: Background

CASRN	139-40-2
DTXSID	DTXSID3021196
Contaminant Group/Use	Herbicide
PCCL 5/CCL 5 Status	CCL 5
Health and Occurrence Information Status	• EPA health assessment available • Non-national finished and national ambient water occurrence data available
Persistence/Mobility/Fate/Transport	Biodegradation Half-Life ($t_{1/2}$) = 5.01 days Henry's Law Coefficient (K_H) = 1.23×10^{-8} atm-m^3/mol Octanol-Water Partitioning Coefficient (log K_{ow}) = 3.03 Organic Carbon Partitioning Coefficient (K_{oc}) = 234 L/kg Water Solubility = 2.70×10^{-4} mol/L
Use/Production/Release	USGS (2016): 637,397 lbs
PubMed Article Count	39

Propazine: Health Effects

EPA Health Assessment	OPP (2015)
Critical Effect	Attenuation of luteinizing hormone surge
Target Population	Women of childbearing age
Reference Dose (RfD) or Equivalent	0.0242 mg/kg/day
Health Value	CCL-HRL = 137 µg/L

Additional Health Information

EPA:

- DWSHA (accessed 2018):
  - Lifetime Health Advisory = 0.01 mg/L (10 µg/L)
- ToxRefDB (accessed 2018): NOAEL = 5.00 mg/kg/day; LOAEL = 50.0 mg/kg/day

Other Health Assessments

- CalEPA OEHHA (accessed 2019): MADL = 100 µg/day
- NIH HSDB (accessed 2019): LD50 = 1,200 mg/kg

Cancer Classification

- OPP (2015): NL (Not Likely to be Carcinogenic to Humans)

Propazine: Occurrence

Best Available Occurrence Information	NA

Additional Occurrence Information

Finished Drinking Water

- USDA PDP (2001-2013): Detected in 7 of 10 (70%) sites; Concentration Range = $7x10^{-4}$ – 0.032 µg/L
- Drinking Water Monitoring Data - CA (2006-2020): Not detected in 4 (0%) sites

Ambient Water

- USGS NAWQA (1991-2017): Detected in 260 of 2,165 (12%) sites; Concentration range = $2x10^{-4}$ – 1.79 µg/L
- USGS NWIS (2008-2017): Detected in 159 of 1,243 (13%) sites; Concentration range = 0.00021 – 0.39 µg/L
- USDA PDP (2001-2013): Detected in 14 of 227 (6.17%) sites; Concentration range = $7x10^{-4}$ – 0.071 µg/L
- Drinking Water Monitoring Data - CA (2006-2020): Not detected in 19 (0%) sites
- Arnold et al. 2016 (2012-2013): Detected in 9 of 584 (1.84%) sites; Concentration range = 0.0005 – 0.0029 µg/L
- Bradley et al. 2017 (2012-2017): Detected in 3 of 38 (7.89%) sites; Concentration range = 0.03 – 0.041 µg/L
- SURF (1990-2018): Detected in 2 of 68 (2.94%) sites; Concentration range = 1.1 – 2 µg/L

Propoxur: Background

CASRN	114-26-1
DTXSID	DTXSID7021948
Contaminant Group/Use	Insecticide
PCCL 5/CCL 5 Status	CCL 5
Health and Occurrence Information Status	• EPA health assessment available • Non-national finished and ambient water occurrence data available
Persistence/Mobility/Fate/Transport	Biodegradation Half-Life ($t_{1/2}$) = 4.68 days Henry's Law Coefficient (K_H) = 1.41×10^{-9} atm-m^3/mol Octanol-Water Partitioning Coefficient (log K_{ow}) = 1.64 Organic Carbon Partitioning Coefficient (K_{oc}) = 50.0 L/kg Water Solubility = 6.07×10^{-3} mol/L
Use/Production/Release	TRI (2016): 1 lb
PubMed Article Count	380

Propoxur: Health Effects

EPA Health Assessment	OPP (2015)
Critical Effect	Red blood cell acetylcholinesterase inhibition in pups
Target Population	Bottle-fed infants
Reference Dose (RfD) or Equivalent	0.00038 mg/kg/day
Health Value	CCL-HRL = 0.503 µg/L

Additional Health Information

EPA:

- OPP (2015): CCL-HRL = 8.41 µg/L; CSF = 0.00352 $(mg/kg/day)^{-1}$
- DWSHA (accessed 2018):
  - Lifetime Health Advisory = 0.003 mg/L (3 µg/L)
  - 10-day Health Advisory = 0.04 mg/L (40 µg/L)
- ToxRefDB (accessed 2018): NOAEL = 3.00 mg/kg/day; LOAEL = 9.00 mg/kg/day

Other:

- NIH HSDB (accessed 2019): LD50 = 23.5 mg/kg

Cancer Classification:

- OPP (2015): B2 (Probable Human Carcinogenic)

Propoxur: Occurrence

Best Available Occurrence Information	NA

Additional Occurrence Information

Finished Drinking Water

- USDA PDP (2001-2013): Not detected in 13 sites (0%)
- Drinking Water Monitoring Data - CA (2006-2020): Not detected in 105 (0%) sites
- Drinking Water Monitoring Data - WA (2006-2011): Not detected in 227 (0%) sites

Ambient Water

- USGS NWIS (2008-2017): Detected in 79 of 1,520 (5.2%) sites; Concentration range = 0.00038 – 0.367 µg/L
- USDA PDP (2001-2013): Detected in 1 of 223 (0.45%) sites; Concentration = 0.005 µg/L
- Drinking Water Monitoring Data - CA (2006-2020): Not detected in 868 (0%) sites
- Drinking Water Monitoring Data - WA (2006-2011): Not detected in 373 (0%) sites
- Arnold et al. 2016 (2012-2013): Detected in 3 of 690 (0.43%) sites; Concentration range = 0.0014 – 0.0034 µg/L
- Bradley et al. 2017 (2012-2014): Detected in 2 of 38 (5.26%) sites; Concentration range = 0.0093 – 0.0097 µg/L
- SESQA (2014): Detected in 29 of 77 (38%) sites; Concentration range = 0.0003306 – 0.0126086 µg/L
- SURF (1990-2018): Not detected in 1,584 (0%) sites
- USGS, McKenzie River, Oregon, 2012 (2002-2010): Detected in 1 of 126 (0.8%) samples; Concentration = 0.007 µg/L

Pyrene: Background

CASRN	129-00-0
DTXSID	DTXSID3024289
Contaminant Group/Use	Occurs as a result of incomplete burning
PCCL 5/CCL 5 Status	PCCL 5
Health and Occurrence Information Status	• EPA health assessment available • Non-national finished and national ambient water occurrence data available
Persistence/Mobility/Fate/Transport	Biodegradation Half-Life ($t_{1/2}$) = 240 days Henry's Law Coefficient (K_H) = 1.17×10^{-5} atm-m^3/mol Octanol-Water Partitioning Coefficient (log K_{ow}) = 4.98 Organic Carbon Partitioning Coefficient (K_{oc}) = 4.83×10^4 L/kg Water Solubility = 5.44×10^{-7} mol/L
Use/Production/Release	CDR (2015): 264,983 lbs
PubMed Article Count	1,695

Pyrene: Health Effects

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EPA Health Assessment	OW (1991)
Critical Effect	Nephropathy (renal tubular pathology, decreased kidney weights)
Target Population	General Population
Reference Dose (RfD) or Equivalent	0.03 mg/kg/day
Health Value	CCL-HRL = 148 µg/L

Additional Health Information

EPA:

- IRIS (1990): CCL-HRL = 178 µg/L; RfD = 0.03 mg/kg/day
- PPRTV (2007): Subchronic RfD = 0.25 mg/kg/day
- HHC (2015): Human Health Ambient Water Quality Criteria = 0.02 mg/L (20 µg/L)

Pyrene: Health Effects

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Additional Health Information (cont'd)

Other:

- MN DOH (accessed 2018):
  - Chronic Health Risk Limit = 0.05 mg/L (50 µg/L)
  - Subchronic Health Risk Limit = 0.09 mg/L (90 µg/L)
- NIH HSDB (accessed 2019): LD50 = 2,700 mg/kg

Cancer Classification:

- PPRTV (2007): NL (Not Likely to be Carcinogenic to Humans)
- WHO IARC (2005): 3 (Possibly carcinogenic to humans)
- IRIS (1990): D (Not classifiable as to human carcinogenicity)
- OW (1991): D (Not classifiable as to human carcinogenicity)

Pyrene: Occurrence

Best Available Occurrence Information	NA

Additional Occurrence Information

Finished Drinking Water

- Drinking Water Monitoring - CA (2006-2020): Detected in 1 of 28 (3.57%) sites; Concentration = 0.001 µg/L
- Drinking Water Monitoring - WA (2006-2011): Not detected in 481 (0%) sites
- USGS, Sioux Falls Area, 2012 (2009-2010): Not detected in 1 (0%) site
- Glassmeyer et al. 2017 (2007-2012): Not detected in 25 (0%) sites

Ambient Water

- USGS NAWQA (1991-2017): Detected in 38 of 588 (6.46%) sites; Concentration range = 0.003 – 0.14 µg/L
- USGS NWIS (2008-2017): Detected in 346 of 1,962 (18%) sites; Concentration range = 0.001 – 25.6 µg/L
- Drinking Water Monitoring - CA (2006-2020): Detected in 8 of 231 (3.46%) sites; Concentration range = 0.1 – 0.3 µg/L
- Drinking Water Monitoring - WA (2006-2011): Not detected in 634 (0%) sites
- Bradley et al. 2017 (2012-2014): Detected in 14 of 38 (37%) sites; Concentration range = 0.0034 – 0.0447 µg/L
- Glassmeyer et al. 2017 (2007-2012): Not detected in 25 (0%) sites
- USGS, Sioux Falls Area, 2012 (2009-2010): Not detected in 2 (0%) sites

Sulfamethoxazole: Background

CASRN	723-46-6
DTXSID	DTXSID8026064
Contaminant Group/Use	Antibacterial; antipneumocystic
PCCL 5/CCL 5 Status	PCCL 5
Health and Occurrence Information Status	• EPA Health Assessment Available • Non-national finished and national ambient water occurrence data available
Persistence/Mobility/Fate/Transport	Biodegradation Half-Life ($t_{1/2}$) = 3.31 days Henry's Law Coefficient (K_H) = $1.74x10^{-10}$ atm-m^3/mol Octanol-Water Partitioning Coefficient (log K_{ow}) = 0.726 Organic Carbon Partitioning Coefficient (K_{oc}) = 91.2 L/kg Water Solubility = $5.03x10^{-3}$ mol/L
Use/Production/Release	NA
PubMed Article Count	4,876

Sulfamethoxazole: Health Effects

(slide 1 of 2)

EPA Health Assessment	OW (FDA/NIH (2018))
Critical Effect	Lowest therapeutic dose: treat or prevent bacterial infections: urinary tract infections/acute otitis media/acute exacerbations of chronic bronchitis/ Shigellosis/Pneumocystis jiroveci Pneumonia/Traveler's Diarrhea in Adults
Target Population	Bottle-Fed Infants
Reference Dose (RfD) or Equivalent	0.003333333 mg/kg/day
Health Value	CCL-SL = 22.0 µg/L

Additional Health Information

EPA:

- OW FDA/NIH (2018): CCL-SL = 78.0 µg/L; RfD = 0.0034 mg/kg/day (General Population)

Sulfamethoxazole: Health Effects

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Additional Health Information (cont'd)

Other:

- MN DOH (accessed 2018):
  - Chronic Risk Assessment Advice = 0.1 mg/L (100 µg/L)
  - Subchronic Risk Assessment Advice = 0.1 mg/L (100 µg/L)
  - Short-Term Risk Assessment Advice = 0.1 mg/L (100 µg/L)
- NIH HSDB (accessed 2019): LD50 = 2,650 mg/kg

Cancer Classification:

- WHO IARC (2000): 3 (Possibly carcinogenic to humans)

Sulfamethoxazole: Occurrence

Best Available Occurrence Information	NA

Additional Occurrence Information

Finished Drinking Water

- Bradley et al. 2018 (2016): Detected in 1 of 26 (3.85%) sites; Concentration = 0.005 µg/L
- CWSS (2006): Not detected in 1 (0%) site
- Glassmeyer et al. 2017 (2007-2012): Detected in 1 of 25 (4%) sites; Concentration = 0.0082 µg/L
- Padhye et al. 2013 (2009-2010): Detected in 1 of 8 (12.5%) samples; Concentration range = 0 – $1.27 \times 10^{-5} \pm 3.6 \times 10^{-6}$ µg/L
- USGS, Sioux Falls Area, 2012 (2009-2010): Not detected in 1 (0%) site

Ambient Water

- USGS NAWQA (1991-2017): Detected in 30 of 619 (4.85%) sites; Concentration range = 0.0016 – 1.46 µg/L
- USGS NWIS (2008-2017): Detected in 252 of 1,441 (17%) sites; Concentration range = 0.00171 – 1.58 µg/L
- Batt et al. 2016 (2008-2009): Detected in 141 of 182 (77%) sites; Concentration range = 0.0016 – 0.5764 µg/L
- Bexfield et al. 2019 (2013-2015): Detected in 12 of 1,100 (1.09%) sites; Concentration range = 0.019022 – 0.1198271 µg/L
- Bradley et al. 2017 (2012-2014): Detected in 20 of 38 (53%) sites; Concentration range = 0.005 – 1.5 µg/L
- Glassmeyer et al. 2017 (2007-2012): Detected in 10 of 25 (40%) sites; Maximum concentration = 0.1611 µg/L
- Padhye et al. 2013 (2009-2010): Detected in 7 of 8 (87.5%) samples; Concentration range = 0 – $7.4 \times 10^{-6} \pm 8 \times 10^{-7}$µg/L
- USGS, Sioux Falls Area, 2012 (2009-2010): Detected in 2 of 2 (100%) sites; Concentration range = 0.006 – 0.052 µg/L

Tebuthiuron: Background

CASRN	34014-18-1
DTXSID	DTXSID3024316
Contaminant Group/Use	Herbicide
PCCL 5/CCL 5 Status	PCCL 5
Health and Occurrence Information Status	• EPA health assessment available • Non-national finished and national ambient water occurrence data available
Persistence/Mobility/Fate/Transport	Biodegradation Half-Life ($t_{1/2}$) = 4.68 days Henry's Law Coefficient (K_H) = 1.20×10^{-10} atm-m^3/mol Octanol-Water Partitioning Coefficient (log K_{ow}) = 1.77 Organic Carbon Partitioning Coefficient (K_{oc}) = 120 L/kg Water Solubility = 6.28×10^{-3} mol/L
Use/Production/Release	USGS (2015): 22,610 lbs
PubMed Article Count	12

Tebuthiuron: Health Effects

EPA Health Assessment	OPP (2014)
Critical Effect	Decreased body weights in F1 females; decreased pup body weights in F1 and F2 generations
Target Population	Bottle-fed Infants
Reference Dose (RfD) or Equivalent	0.14 mg/kg/day
Health Value	CCL-HRL = 185 µg/L

Additional Health Information

EPA:

- DWSHA (accessed 2018):
  - Lifetime Health Advisory = 0.5 mg/L (500 µg/L)
  - 10-day Health Advisory = 3 mg/L (3,000 µg/L)
- ToxRefDB (accessed 2018): NOAEL = 15.0 mg/kg/day; LOAEL = 31.0 mg/kg/day

Other:

- NIH HSDB (accessed 2019): LD50 = 200 mg/kg

Cancer Classification:

- OPP (2014): D (Not classifiable as to human carcinogenicity)

Tebuthiuron: Occurrence

Best Available Occurrence Information	NA

Additional Occurrence Information

Finished Drinking Water

- USDA PDP (2001-2013): Detected in 10 of 17 (59%) sites; Concentration range = 0.00035 – 0.055 µg/L
- Drinking Water Monitoring - CA (2006-2020): Not detected in 2 (0%) sites
- USGS Sioux Falls Area, 2012 (2009-2010): Not detected in 1 (0%) site

Ambient Water

- USGS NAWQA (1991-2017): Detected in 1,134 of 11,243 (10%) sites; Concentration range = 0 – 17.3 µg/L
- USGS NWIS (2008-2017): Detected in 315 of 4,001 (7.87%) sites; Concentration range = 3.00×10^{-4} – 1.4 µg/L
- USDA PDP (2001-2013): Detected in 47 of 229 (21%) sites; Concentration range = 0.00035 – 0.43 µg/L
- Drinking Water Monitoring - CA (2006-2020): Not detected in 1 (0%) site
- Arnold et al. 2016 (2012-2013): Detected in 24 of 690 (3.48%) sites; Concentration range = 5×10^{-4} – 0.0317 µg/L
- Bradley et al. 2017 (2012-2014): Detected in 3 of 38 (7.89%) sites; Concentration range = 0.0125 – 0.0358 µg/L
- SURF (1990-2018): Detected in 31 of 1,757 (1.76%) sites; Concentration range = 0.0127 – 3 µg/L
- USGS McKenzie River Oregon, 2010 (2002-2010): Detected in 6 of 134 (4.5%) samples; Maximum concentration = 3.47 µg/L
- USGS Sioux Falls Area, 2012 (2009-2010): Not detected in 2 (0%) sites

Thiamethoxam: Background

CASRN	153719-23-4
DTXSID	DTXSID2034962
Contaminant Group/Use	Insecticide
PCCL 5/CCL 5 Status	CCL 5 List
Health and Occurrence Information Status	• EPA health assessment available • Non-national finished and national ambient water occurrence data available
Persistence/Mobility/Fate/Transport	Biodegradation Half-Life ($t_{1/2}$) = 4.47 days Henry's Law Coefficient (K_H) = 2.34×10^{-8} atm-m^3/mol Octanol-Water Partitioning Coefficient (log K_{ow}) = -0.201 Organic Carbon Partitioning Coefficient (K_{oc}) = 71.7 L/kg Water Solubility = 9.99×10^{-3} mol/L
Use/Production/Release	USGS (2016): 353,487 lbs
PubMed Article Count	252

Thiamethoxam: Health Effects

(slide 1 of 2)

EPA Health Assessment	OPP (2016)
Critical Effect	Increased incidence and severity of tubular atrophy in testes of F1 males (pups)
Target Population	Bottle-fed Infants
Reference Dose (RfD) or Equivalent	0.012 mg/kg/day
Health Value	CCL-HRL = 15.9 µg/L

Additional Health Information

EPA:

- OPP HHBP (2021):
  - Chronic Benchmark = 0.071 mg/L (71 µg/L); Population-Adjusted Dose (RfD) = 0.012 mg/kg/day
  - Acute benchmark = 2.3 mg/L (2,300 µg/L); Acute Population-Adjusted Dose (RfD) = 0.35 mg/kg/day
- ToxRefDB (accessed 2018): LOAEL = 1.84 mg/kg/day; Subchronic LOAEL = 14.3 mg/kg/day

Thiamethoxam: Health Effects

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Additional Health Information (cont'd)

Other:

- MN DOH (accessed 2018):
  - Chronic Health Risk Limit = 0.2 mg/L (200 µg/L)
  - Subchronic Health Risk Limit = 0.2 mg/L (200 µg/L)
  - Short-Term Health Risk Limit = 0.4 mg/L (400 µg/L)
- NIH HSDB (accessed 2019): LD50 = 1,563 mg/kg

Cancer Classification:

- OPP (2016): NL (Not likely to be carcinogenic to humans)

Thiamethoxam: Occurrence

Best Available Occurrence Information	NA

Additional Occurrence Information

Finished Drinking Water

- USDA PDP (2001-2013): Detected in 3 of 10 (30%) sites; Concentration = 0.0102 µg/L
- Klarich et al. 2017 (2016): Detected in 19 of 20 (95%) sites; Concentration range = 0.00026 – 0.00415 µg/L

Ambient Water

- USGS NAWQA (1991-2017): Not detected in 5 (0%) sites
- USGS NWIS (2008-2017): Detected in 50 of 143 (35%) sites; Concentration range = 9.00×10^{-4} – 4.37 µg/L
- USDA PDP (2001-2013): Detected in 2 of 227 (0.88%) sites; Concentration range = 0.0102 – 0.025 µg/L
- Bradley et al. 2017 (2012-2014): Detected in 8 of 38 (21%) sites; Concentration range = 0.0019 – 0.1904 µg/L
- SURF (1990-2018): Detected in 43 of 281 (15%) sites; Concentration range = 0.0068 – 2.06 µg/L

Thiobencarb: Background

CASRN	28249-77-6
DTXSID	DTXSID6024337
Contaminant Group/Use	Herbicide
PCCL 5/CCL 5 Status	PCCL 5
Health and Occurrence Information Status	• EPA health assessment available • Non-national finished and national ambient water occurrence data available
Persistence/Mobility/Fate/Transport	Biodegradation Half-Life ($t_{1/2}$) = 2.95 days Henry's Law Coefficient (K_H) = 1.95×10^{-8} atm-m^3/mol Octanol-Water Partitioning Coefficient (log K_{ow}) = 3.53 Organic Carbon Partitioning Coefficient (K_{oc}) = 1.17×10^3 L/kg Water Solubility = 9.31×10^{-5} mol/L
Use/Production/Release	TRI (2016): 3,385 lbs USGS (2016): 2,372,729 lbs
PubMed Article Count	72

Thiobencarb: Health Effects

EPA Health Assessment	OPP (2018)
Critical Effect	Decreased body weights
Target Population	General Population
Reference Dose (RfD) or Equivalent	0.01 mg/kg/day
Health Value	CCL-HRL = 59.2 µg/L

Additional Health Information

EPA:

- OPP HHBP (2021):
  - Chronic Benchmark = 0.06 mg/L (60 µg/L); Population-Adjusted Dose (RfD) = 0.01 mg/kg/day
  - Acute Benchmark = 7 mg/L (7,000 µg/L); Acute Population-Adjusted Dose (RfD) = 1 mg/kg/day
- ToxRefDB (accessed 2018): NOAEL = 25.0 mg/kg/day; LOAEL = 2.00 mg/kg/day

Other:

- CalEPA OEHHA (accessed 2019): Public Health Goal = 0.042 mg/L (42 µg/L)
- NIH HSDB (accessed 2019): LD50 = 560 mg/kg

Cancer Classification:

- OPP (2018): D (Not classifiable as to human carcinogenicity)

Thiobencarb: Occurrence

Best Available Occurrence Information	NA

Additional Occurrence Information

Finished Drinking Water

- USDA PDP (2001-2013): Detected in 5 of 15 (33%) sites; Concentration range = 0.029 – 0.19 µg/L
- Drinking Water Monitoring Data - CA (2006-2020): Not detected in 256 (0%) sites

Ambient Water

- USGS NAWQA (1991-2017): Detected in 84 of 10,703 (0.78%) sites; Concentration range = 2.00×10^{-5} – 4.38 µg/L
- USGS NWIS (2008-2017): Detected in 35 of 2,980 (1.17%) sites; Concentration range = 0.00093 – 12.4 µg/L
- USDA PDP (2001-2013): Not detected in 227 (0%) sites
- Drinking Water Monitoring Data - CA (2006-2020): Detected in 2 of 2,975 (0.07%) sites; Concentration range = 0.097 – 1.6 µg/L
- Arnold et al. 2016 (2012-2013): Not detected in 690 (0%) sites
- Bradley et al. 2017 (2012-2014): Detected in 1 of 38 (2.63%) sites; Concentration = 0.3429 µg/L
- SURF (1990-2018): Detected in 635 of 7,197 (8.82%) sites; Concentration range = 0.004 – 150 µg/L

Triclosan: Background

CASRN	3380-34-5
DTXSID	DTXSID5032498
Contaminant Group/Use	Antiseptic/disinfectant/antimicrobial in personal care products and household goods; pesticide
PCCL 5/CCL 5 Status	PCCL 5
Health and Occurrence Information Status	• EPA health assessment available • Non-national finished and national ambient water occurrence data available
Persistence/Mobility/Fate/Transport	Biodegradation Half-Life ($t_{1/2}$) = 4.47 days Henry's Law Coefficient (K_H) = 6.46×10^{-10} atm-m^3/mol Octanol-Water Partitioning Coefficient (log K_{ow}) = 4.97 Organic Carbon Partitioning Coefficient (K_{oc}) = 2.24×10^4 L/kg Water Solubility = 1.50×10^{-5} mol/L
Use/Production/Release	NA
PubMed Article Count	2,221

Triclosan: Health Effects

EPA Health Assessment	OPP (2018)
Critical Effect	20% decrease in thyroxine (T4) and associations with neurodevelopmental and cognitive deficits
Target Population	Women of childbearing age
Reference Dose (RfD) or Equivalent	0.27 mg/kg/day
Health Value	CCL-HRL = 1,530 µg/L

Additional Health Information

EPA:

- OPP HHBP (2021):
  - Chronic Benchmark = 2 mg/L (2,000 µg/L); Population-Adjusted Dose (RfD) = 0.3 mg/kg/day
  - Acute Benchmark = 2 mg/L (2,000 µg/L); Acute Population-Adjusted Dose (RfD) = 0.3 mg/kg/day
- ToxRefDB (accessed 2018): NOAEL = 50.0 mg/kg/day; LOAEL = 15.0 mg/kg/day; Subchronic LOAEL = 25.0 mg/kg/day

Other:

- MN DOH (accessed 2018):
  - Chronic Health Risk Limit = 0.05 mg/L (500 µg/L)
  - Subchronic Health Risk Limit = 0.05 mg/L (500 µg/L)
  - Short-Term Health Risk Limit = 0.05 mg/L (500 µg/L)

Triclosan: Occurrence

Best Available Occurrence Information	NA

Additional Occurrence Information

Finished Drinking Water

- Drinking Water Monitoring - CA (2006-2020): Detected in 1 of 2 (50%) sites; Concentration = 3 µg/L
- Glassmeyer et al. 2017 (2007-2012): Not detected in 25 (0%) sites
- Padhye et al. 2013 (2009-2010): Detected in 5 of 8 (62.5%) samples; Concentration range = 0 – $5.96 \times 10^{-5} \pm 2.57 \times 10^{-5}$ µg/L
- USGS, Sioux Falls Area, 2012 (2009-2010): Not detected in 1 (0%) site

Ambient Water

- USGS NAWQA (1991-2017): Detected in 31 of 567 (5.47%) sites; Concentration range = 0.01 – 0.56 µg/L
- USGS NWIS (2008-2017): Detected in 126 of 1,415 (8.9%) sites; Concentration range = 0.02 – 15.6 µg/L
- Drinking Water Monitoring - CA (2006-2020): Detected in 1 of 3 (33%) sites; Concentration = 3 µg/L
- Bradley et al. 2017 (2012-2014): Detected in 23 of 38 (61%) sites; Concentration range = 0.00152 – 0.534 µg/L
- Glassmeyer et al. 2017 (2007-2012): Detected in 3 of 25 (12%) sites; Maximum concentration = 0.0035 µg/L
- Padhye et al. 2013 (2009-2010): Detected in 5 of 8 (62%) samples; Concentration range = 0 – 0.0001058 ± 6.31×10^{-5} µg/L
- USGS, Sioux Falls Area, 2012 (2009-2010): Not detected in 2 (0%) sites

Trifluralin: Background

CASRN	1582-09-8
DTXSID	DTXSID4021395
Contaminant Group/Use	Herbicide
PCCL 5/CCL 5 Status	PCCL 5
Health and Occurrence Information Status	• EPA health assessment available • Non-national finished and national ambient water occurrence data available
Persistence/Mobility/Fate/Transport	Biodegradation Half-Life ($t_{1/2}$) = 3.55 days Henry's Law Coefficient (K_H) = 1.02×10^{-4} atm-m^3/mol Octanol-Water Partitioning Coefficient (log K_{ow}) = 5.31 Organic Carbon Partitioning Coefficient (K_{oc}) = 1.69×10^4 L/kg Water Solubility = 1.16×10^{-6} mol/L
Use/Production/Release	TRI (2016): 13,360 lbs USGS (2016): 8,578,613 lbs
PubMed Article Count	259

Trifluralin: Health Effects

(slide 1 of 2)

EPA Health Assessment	OPP (2018)
Critical Effect	Thyroid follicular cell combined adenoma, papillary adenoma, cystadenoma, and carcinoma in males
Target Population	General Population
Cancer Slope Factor (CSF)	0.00296 $(mg/kg/day)^{-1}$
Health Value	CCL-HRL = 10 µg/L

Additional Health Information

EPA:

- OPP (2018): CCL-HRL = 142 µg/L; RfD = 0.024 mg/kg/day
- DWSHA (accessed 2018):
  - Lifetime Health Advisory = 0.01 mg/L (10 µg/L)
  - 10-day Health Advisory = 0.08 mg/L (80 µg/L)
- ToxRefDB (accessed 2018): NOAEL = 0.800 mg/kg/day; LOAEL = 3.80 mg/kg/day

Trifluralin: Health Effects

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Additional Health Information (cont'd)

Other:

- WHO (2017): Drinking Water Guideline Value = 0.02 mg/L (20 µg/L)
- CDWG (accessed 2019): Maximum Allowable Concentration = 0.045 mg/L (45 µg/L)
- NIH HSDB (accessed 2019): LD50 = 500 mg/kg
- NIH CPDB (accessed 2018): TD50 = 263 mg/kg/day

Cancer Classification:

- OPP (2018): C (Possible human carcinogen)
- WHO IARC (1990): 3 (Unclassifiable as to carcinogenicity in humans)

Trifluralin: Occurrence

Best Available Occurrence Information	NA

Additional Occurrence Information

Finished Drinking Water

- USDA PDP (2001-2013): Detected in 1 of 15 (6.67%) sites; Concentration = 0.0025 µg/L
- Drinking Water Monitoring Data - CA (2006-2020): Not detected in 60 (0%) sites
- Drinking Water Monitoring Data - WA (2006-2011): Not detected in 481 (0%) sites
- USGS, Sioux Falls Area, 2012 (2009-2010): Not detected in 1 (0%) site

Ambient Water

- USGS NAWQA (1991-2017): Detected in 485 of 10,201 (4.75%) sites; Concentration range = 0.001 – 1.74 µg/L
- USGS NWIS (2008-2017): Detected in 149 of 3,480 (4.28%) sites; Concentration range = 6.00×10^{-5} – 0.323 µg/L
- USDA PDP (2001-2013): Not detected in 225 (0%) sites
- Drinking Water Monitoring Data - CA (2006-2020): Detected in 3 of 604 (0.5%) sites; Concentration range = 0.5 – 210 µg/L
- Drinking Water Monitoring Data - WA (2006-2011): Not detected in 635 (0%) sites;
- Arnold et al. 2016 (2012-2013): Not detected in 106 (0%) sites
- Bradley et al. 2017 (2012-2014): Detected in 15 of 38 (39%) sites; Concentration range = 2.75×10^{-5} – 0.0473 µg/L
- SURF (1990-2018): Detected in 254 of 2,711 (9.37%) sites; Concentration range = 0.003 – 3.3 µg/L
- USGS, McKenzie River, Oregon, 2012 (2002-2010): Detected in 3 of 133 (2.3%) sites; Maximum concentration = 0.002 µg/L
- USGS, Sioux Falls Area, 2012 (2009-2010): Not detected in 2 (0%) sites

Appendix C: Abbreviations and Acronyms

Abbreviations and Acronyms

- **µg** – Micrograms
- **%Rec** – Percent Recovery
- **%RSD** – Percent Relative Standard Deviation
- **11Cl-PF3OUdS** – 11-Chloroeicosafluoro-3-Oxaundecane-1-Sulfonic Acid
- **2,4-DB** – 2,4-Dichlorophenoxybutyric acid
- **4:2 FTS** – 1H, 1H, 2H, 2H-Perfluorohexane Sulfonic Acid
- **6:2 FTS** – 1H, 1H, 2H, 2H-Perfluorooctane Sulfonic Acid
- **8:2 FTS** – 1H, 1H, 2H, 2H-Perfluorodecane Sulfonic Acid
- **9Cl-PF3ONS** – 9-Chlorohexadecafluoro-3-Oxanone-1-Sulfonic Acid
- **AM** – Assessment Monitoring
- **ADONA** – 4,8-Dioxa-3H-Perfluorononanoic Acid
- **ASTM** – ASTM International

Abbreviations and Acronyms

- **atm** – Atmosphere Unit
- **ATSDR** – Agency for Toxic Substances and Disease Registry
- **AWIA** – America's Water Infrastructure Act
- **BCAA** – Bromochloroacetic Acid
- **BCIM –** Bromochloroiodomethane
- **BDCAA** – Bromodichloroacetic Acid
- **BDCNM** – Bromodichloronitromethane
- **BDIM** – Bromodiiodomethane
- **CalEPA** – California Environmental Protection Agency
- **CASRN** – Chemical Abstracts Service Registry Number
- **CCC** – Continuing Calibration Check
- **CCL** – Contaminant Candidate List

Abbreviations and Acronyms

- **CCL-HRL** – Contaminant Candidate List Health Reference Level
- **CCL-SL** – Contaminant Candidate List Screening Level
- **CDC** – Centers for Disease Control and Prevention
- **CDIM** - Chlorodiiodomethane
- **CDR** – Chemical Data Reporting
- **CDWG** – Guidelines for Canadian Drinking Water
- **CIC** – Combustion Ion Chromatography
- **CIS** – Contaminant Information Sheet
- **CPDB** – Carcinogenic Potency Database
- **CSF** – Cancer Slope Factor
- **CWS** – Community Water System
- **CWSS** – Community Water System Survey

Abbreviations and Acronyms

- **DAI-LC/MS/MS** – Direct Aqueous Injection- Liquid Chromatography/Tandem Mass Spectrometry
- **DBAN** – Dibromoacetonitrile
- **DBCAA** – Dibromochloroacetic Acid
- **DBCNM** - Dibromochloronitromethane
- **DBIM** - Dibromoiodomethane
- **DBP** – Disinfection Byproduct
- **DCAN** – Dichloroacetonitrile
- **DCIM –** Dichloroiodomethane
- **D/DBPR** – Disinfectants and Disinfection Byproducts Rules (including Stage 1 and Stage 2 D/DBPRs)
- **DEET** – N,N-Diethyl-m-toluamide

Abbreviations and Acronyms

- **DS** – Distribution System
- **DSMRT** – Distribution System Maximum Residence Time
- **DTXSID** – Distributed Structure Searchable Toxicity Substance Identifiers
- **DWSHA** – Drinking Water Standards and Health Advisories
- **DWTP** – Drinking Water Treatment Plant
- **EDC** – Endocrine Disrupting Chemical
- **EJ** – Environmental Justice
- **EO** – Executive Order
- **EOF** – Extractable Organic Fluorine
- **EPA** – Environmental Protection Agency
- **EPTC** – Ethyl dipropylthiocarbamate
- **EPTDS** – Entry Point to the Distribution System

Abbreviations and Acronyms

- **ESA** – Ethanesulfonic Acid
- **et al.** – And Others
- **F1** – First Filial Generation
- **F2** – Second Filial Generation
- **FDA** – United States Food and Drug Administration
- **FDAMDD** – FDA Maximum (Recommended) Daily Dose Database
- **FR** – *Federal Register*
- **FRB** – Field Reagent Blank
- **FRN** – *Federal Register* Notice
- **GC** – Gas Chromatography
- **GC/MS** – Gas Chromatography/Mass Spectrometry
- **GW** – Ground Water

Abbreviations and Acronyms

- **GWRMP** – Ground Water Representative Monitoring Plan
- **HA** – Office of Water Health Advisory
- **HCFC-22** – Chlorodifluoromethane
- **HDL** – High-Density Lipoprotein
- **HESD** – Office of Water's Health Effect Support Documents
- **HFPO-DA** – Hexafluoropropylene Oxide Dimer Acid
- **HHBP** – Human Health Benchmark for Pesticides
- **HHC** – Human Health Criteria
- **HPLC** – High Performance Liquid Chromatography
- **HRL** – Health Reference Level
- **HSDB** – Hazardous Substances Data Bank
- **IARC** – International Agency for Research on Cancer

Abbreviations and Acronyms

- **ICP-AES** – Inductively Coupled Plasma- Atomic Emission Spectrometry
- **IDC** – Initial Demonstration of Capability
- **IRIS** – Integrated Risk Information System
- **IS** – Internal Standard
- **ISO** – International Organization for Standardization
- **K_H** – Henry's Law Coefficient
- **K_{OC}** – Organic Carbon Partitioning Coefficient
- **K_{OW}** – Octanol-Water Partitioning Coefficient
- **kg** – Kilograms
- **L** – Liter
- **lbs** – Pounds
- **LC/ESI-MS/MS** – Liquid Chromatography/Electrospray Ionization/Tandem Mass Spectrometry

Abbreviations and Acronyms

- **LC/MS/MS** – Liquid Chromatography/Tandem Mass Spectrometry
- **LCMRL** – Lowest Concentration Minimum Reporting Level
- **LFB** – Laboratory Fortified Blank
- **LFSM** – Laboratory Fortified Sample Matrix
- **LFSMD** – Laboratory Fortified Sample Matrix Duplicate
- **LLE-GC/ECD** – Liquid-Liquid Extraction Gas Chromatography/Electron Capture Detection
- **LOAEL** – Lowest-Observed-Adverse-Effect Level
- **LRB –** Laboratory Reagent Blank
- **LSI** – Large System Inventory

Abbreviations and Acronyms

- **MAC** – Maximum Allowable Concentration
- **MADL** – Maximum Allowable Daily Level
- **MALDI-MS** - Matrix-Assisted Laser Desorption/Ionization Mass Spectrometry
- **MCLG** – Maximum Contaminant Level Goal
- **MCPA** – 2-Methyl-4-chlorophenoxyacetic Acid
- **MCPP** – 2-(2-Methyl-4-chlorophenoxy)propionic Acid
- **MDBP** – Microbial Disinfection Byproduct
- **MN DOH** – Minnesota Department of Health
- **mg** – Milligrams
- **MRDD** – Maximum Recommended Daily Dose
- **MRL** – Minimum Reporting Level
- **MTBE** – Methyl Tert-Butyl Ether

Abbreviations and Acronyms

- **NAWQA** – National Water-Quality Assessment
- **NCOD** – National Contaminant Occurrence Database
- **NDBA** – Nitrosodibutylamine
- **NDEA** – N-Nitrosodiethylamine
- **NDMA** – N-Nitrosodimethylamine
- **NDPA** – N-Nitrosodi-n-propylamine
- **NDPhA** – Nitrosodiphenylamine
- **NEtFOSAA** – N-Ethyl Perfluorooctanesulfonamidoacetic Acid
- **NFDHA** – Nonafluoro-3,6-Dioxaheptanoic Acid
- **NIH –** National Institutes of Health
- **NIRS** – National Inorganics and Radionuclides Survey
- **NMeFOSAA** – N-Methyl Perfluorooctanesulfonamidoacetic Acid

Abbreviations and Acronyms

- **NOAEL** – No-Observed-Adverse-Effect Level
- **NPDWRs** – National Primary Drinking Water Regulations
- **NPYR** - Nitrosopyrrolidine
- ***NTM*** – Nontuberculous Mycobacteria
- **NTNCWS** – Non-Transient Non-Community Water System
- **NWIS** – National Water Information System
- **NWQMC** – National Water Quality Monitoring Council
- **OA** – Oxanilic Acid
- **OEHHA** – California Office of Environmental Health Hazard Assessment
- **OGWDW** – Office of Ground Water and Drinking Water
- **OPP** – Office of Pesticide Programs
- **ORD** – Office of Research and Development

Abbreviations and Acronyms

- **OW** – Office of Water
- **PA** – Partnership Agreement
- **PDP** – Pesticide Data Program
- **PCCL** – Preliminary Contaminant Candidate List
- **PFAS** – Per- and Polyfluoroalkyl Substances
- **PFBA** – Perfluorobutanoic Acid
- **PFBS** – Perfluorobutanesulfonic Acid
- **PFDA** – Perfluorodecanoic Acid
- **PFDoA** – Perfluorododecanoic Acid
- **PFEESA** – Perfluoro (2-Ethoxyethane) Sulfonic Acid
- **PFHpA** – Perfluoroheptanoic Acid
- **PFHpS** – Perfluoroheptanesulfonic Acid

Abbreviations and Acronyms

- **PFHxA** – Perfluorohexanoic Acid
- **PFHxS** – Perfluorohexanesulfonic Acid
- **PFMBA** – Perfluoro-4-Methoxybutanoic Acid
- **PFMPA** – Perfluoro-3-Methoxypropanoic Acid
- **PFNA** – Perfluorononanoic Acid
- **PFOA** – Perfluorooctanoic Acid
- **PFOS** – Perfluorooctanesulfonic Acid
- **PFOSA** – Perfluorooctanesulfonamide
- **PFPeA** – Perfluoropentanoic Acid
- **PFPeS** – Perfluoropentanesulfonic Acid
- **PFTA** – Perfluorotetradecanoic Acid
- **PFTrDA** – Perfluorotridecanoic Acid

Abbreviations and Acronyms

- **PFUnA** – Perfluoroundecanoic Acid
- **PHG** – CalEPA's Public Health Goals
- **p,p'-DDE –** p,p'-Dichlorodiphenyldichloroethylene
- **PPCP** – Pharmaceutical and Personal Care Products
- **PPRTV** – Provisional Peer-Reviewed Toxicity Values
- **PST** – Pre-Screen Testing
- **PT** – Proficiency Testing
- **PWS** – Public Water System
- **QA** – Quality Assurance
- **QC** – Quality Control
- **QCS –** Quality Control Sample
- **qPCR –** Quantitative Polymerase Chain Reaction

Abbreviations and Acronyms

- **RAA** – Risk Assessment Advice
- **RfD** – Reference Dose
- **SAP** – Standard Analytical Protocol
- **SESQA** – Southeast Stream Quality Assessment
- **SDWA** – Safe Drinking Water Act
- **SDWARS** – Safe Drinking Water Accession and Review System
- **SDWIS** – Safe Drinking Water Information System
- **SM –** Standard Methods
- **SMP** – State Monitoring Plan
- **SS** – Screening Survey
- **SSI** – Small System Inventory
- **SUR** – Surrogate Samples

Abbreviations and Acronyms

- **SURF** - Surface Water Database
- **SW** – Surface Water
- **SYR** – Six-Year Review
- **$t_{1/2}$** – Half-Life
- **T4** - Thyroxine
- **TBAA –** Tribromoacetic Acid
- **TBEP –** Tris(2-butozylethyl) Phosphate
- **TCAN** – Trichloroacetonitrile
- **TCEP –** Tris(2-chloroethyl) Phosphate
- **TCNM** – Trichloronitromethane (Chloropicrin)
- **TCOTS** – Tribal Consultation Opportunities Tracking System
- **TDCP –** Tris(1,3-dichloro-2-propyl) Phosphate
- **TIM** – Triiodomethane (Iodoform)

Abbreviations and Acronyms

- **TNCWS** – Transient Non-Community Water System
- **ToxRefDB** – Toxicity Reference Database
- **TRI** – Toxic Release Inventory
- **TSCA** – Toxic Substance Control Act
- **UCM** – Unregulated Contaminant Monitoring
- **UCMR** – Unregulated Contaminant Monitoring Rule
- **URCIS** – Unregulated Contaminant Monitoring Information System
- **USDA** – United States Department of Agriculture
- **USGS** – United States Geological Survey
- **VCSB** – Voluntary Consensus Standards Body
- **VLDL** – Very Low-Density Lipoprotein
- **WHO** – World Health Organization