PFAS and Residuals

MASSDEP STAKEHOLDER MEETING #1

SEPTEMBER 29, 2020

Zoom Meeting Logistics

- This meeting is being recorded.
- To minimize background noise, attendees are on mute.
- Please enter your full name and affiliation in the participants panel.

How to Participate via Phone and Zoom

★ Stakeholders will be able to ask questions first

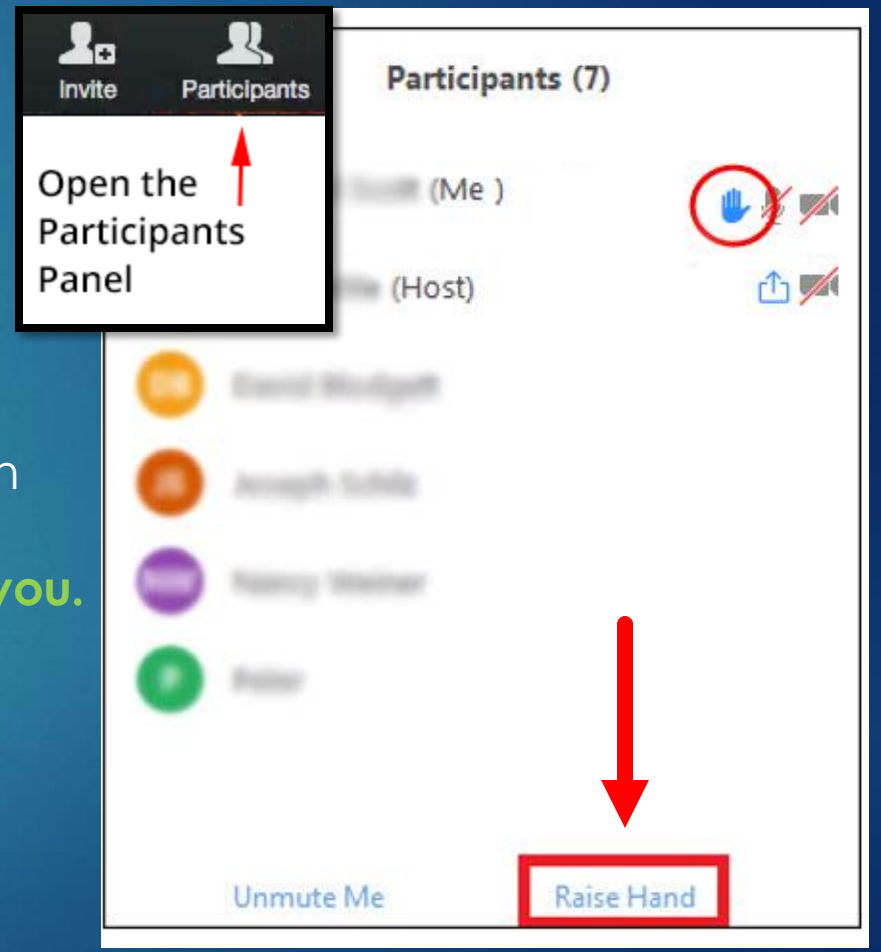
To ask a question on **Zoom**:

- Raise your virtual hand.
- When it's your turn we will:
  1) Unmute you.
  2) Announce your name for you to ask your question

If you are having difficulties, send a chat message and we will help you.

To ask a question on the **Phone**:

- During Q&A we will allow time for questions from phone participants



Welcome

Stephanie Cooper, MassDEP Deputy Commissioner, Policy & Planning

- MassDEP Overall PFAS Strategy
  - PFAS – Groundwater & Soil
  - PFAS - Drinking Water
  - PFAS – Wastewater & Residuals

Stakeholders

- BU School of Public Health
- Clean Water Action
- Community Action Works
- Conservation Law Foundation (CLF)
- Greater Lawrence Sanitary District (GLSD)
- Harvard Chan School of Public Health
- MA Association of Dairy Farmers
- MA Breast Cancer Coalition
- MA Coalition for Water Resources Stewardship (MCWRS)
- MA Dept. of Agricultural Resources (MDAR)
- MA Dept. of Fish and Game (DFW)
- MA Dept. of Public health (DPH)
- MA Farm Bureau
- MA Health Officers Association (MHOA)
- MA Rivers Alliance/Merrimack River Watershed Council
- MA Water Environment Association (MAWEA)
- MA Water Resources Authority (MWRA)
- MA Water Works Association (MWWA)
- New England Water Environment Association (NEWEA)
- North East Biosolids & Residuals Association (NEBRA)
- Silent Spring Institute
- Texas Tech University
- University of MA (UMass)
- UMass Extension Agricultural Program
- University of Rhode Island (URI) Superfund Research Center, STEEP
- U.S. Geological Survey (USGS)

Agenda, Part 1

1. **Purpose of Stakeholder Group**
   Stakeholder and Technical Meetings, Schedule
   Kathy Baskin, Assistant Commissioner Bureau of Water Resources

2. **Why are PFAS of Concern?**
   PFAS in Wastewater
   MassDEP's Residuals Program
   Lealdon Langley, Director Division of Watershed Management

3. **Waste Site Clean Up Regulations, MCP**
   Paul Locke, Assistant Commissioner, Bureau of Waste Site Cleanup

4. **PFAS in Residuals**
   Jennifer Wood, MassDEP Residuals Program

5. **Clarification Questions and Answers + 10 Minute Break**

Agenda, Part 2

6. **PFAS Screening Values in Soil due to Application of Residuals**
   Approaches for deriving PFAS Screening Values for Residuals
   Current Priorities and Continuing Efforts
   C. Mark Smith, Director Office of Research and Standards

7. **Accumulation of PFAS in Soils from Residuals (Loading)**
   Example: Accumulation of PFAS in Soil (Applied to NHDES Data)
   Jennifer Wood, MassDEP Residuals Program

8. **Summary**
   Key Points for Meeting #1
   Stakeholder Meetings #2 and 3

9. **Break, followed by Discussion**
10. **Wrap-Up**

Purpose of Stakeholder Group

Kathy Baskin, Assistant Commissioner Bureau of Water Resources

- Share available information and approaches
- Obtain additional information (studies, data, methodologies)
- Gain insight from organizations and people who will be most affected by the outcomes
- Gain advice on the development of a MassDEP PFAS strategy for residuals

Continued Engagement: Stakeholder and Technical Meetings

- Stakeholder Meeting #1

  September 29, 2020

- Stakeholder Meeting #2

  December 4 from 9am-12pm *or*

  December 15 from 1-4pm

- Stakeholder Meeting #3

  January 26, 2021 from 9-12pm *or*

  January 27 from 1-4pm

Per- and Polyfluoroalkyl Substances (PFAS)

Lealdon Langley, Director Division of Watershed Management

Why Are PFAS Of Concern?

- **Infants/children at risk**
  - Cross placenta
  - Expressed in breast milk
- **Toxic**
  - Developmental effects
  - Effects on the immune system
  - Endocrine disruption: thyroid hormone effects
  - Liver effects
  - Elevated cancer risks
- **Persistent**
- **Water soluble**

PFAS in Wastewater

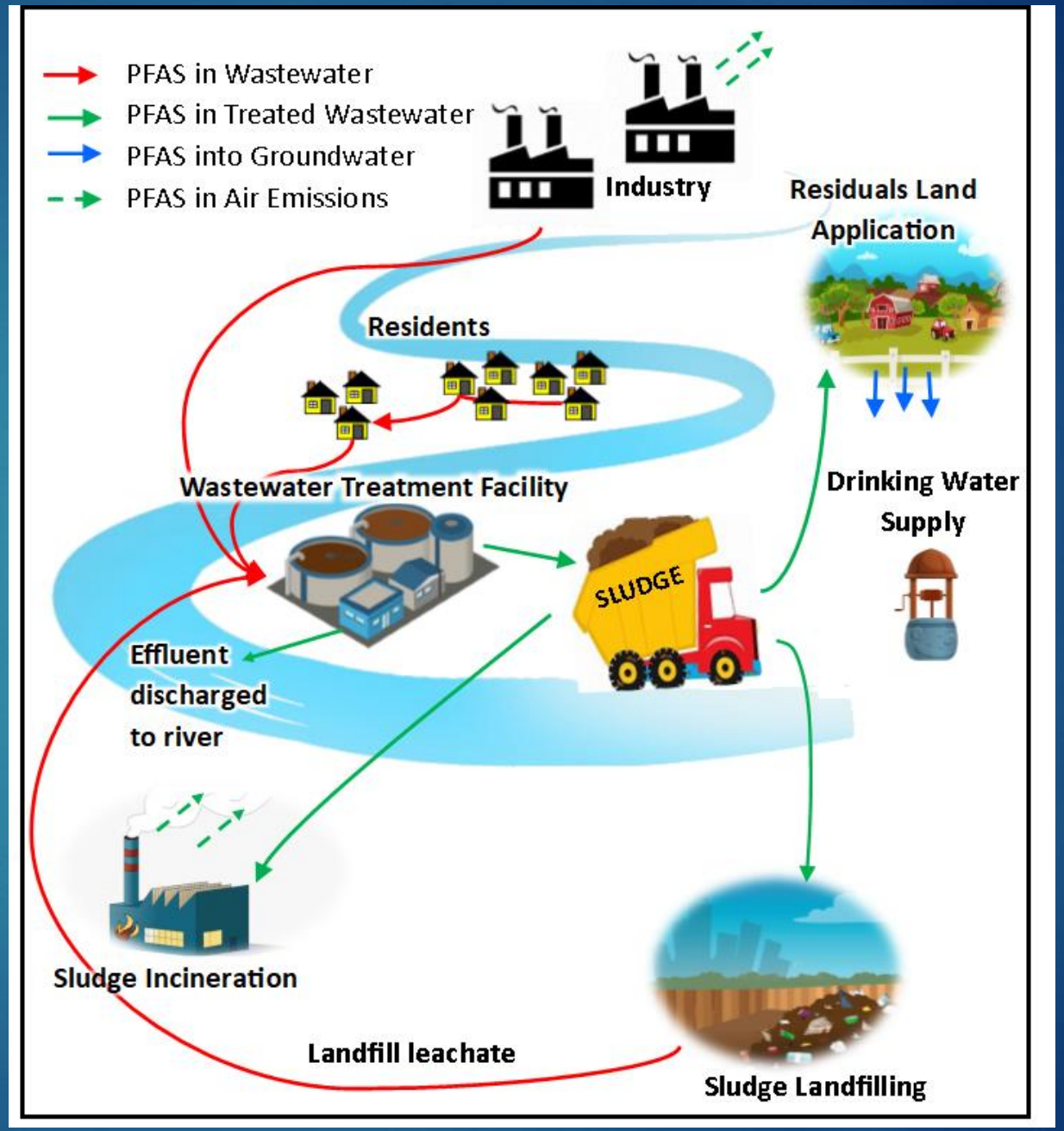


Image from the Northeast Biosolids Improvement Program Workgroup

MassDEP's Residuals Program

What are Residuals?

- Sludge - *Sludge means the solid, semi-solid, and liquid residue that results from a process of wastewater treatment or drinking water treatment. This residue does not include grit, screening, or grease and oil which are removed at the headworks of a facility*
  - Wastewater Treatment Plants (WWTP)
  - Drinking water treatment (DWTP)
  - Processing of paper (i.e. short paper fiber, SPF)
  - Industrial processing (manufacturing of gelatin and cotton; cultivation and processing of cranberries)

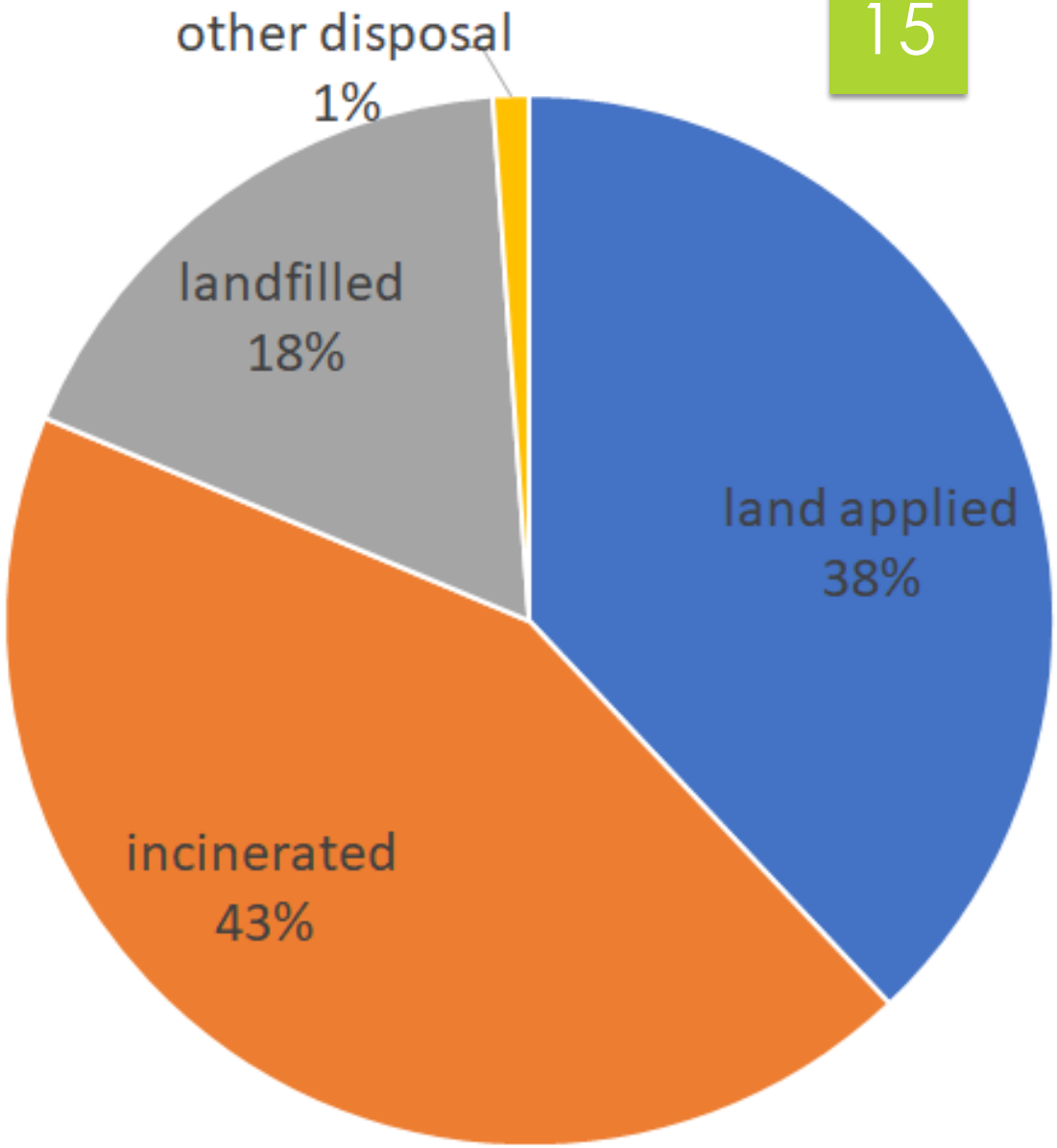
- Residuals
  - Meet pathogen standards

- Biosolids
  - WWTP residuals that meet pathogen standards and are reused

- Board of Health approval required unless product from out of state
- Used, sold, or distributed for reuse

Residual reuse and disposal in Massachusetts[1]

- 122 Sources
- 180, 800 dry tons



[1]The Mass Sludge Survey 2018 Wastewater Solids Generation and Management in Massachusetts

Types of Residuals

- Type I: **does not require additional approval** to grow **any vegetation**
  - Equivalent to EPA Class A Biosolids
- Type II: **requires site-specific approval** to grow **any vegetation**
  - Equivalent to EPA Class B Biosolids
- Type III: **requires site-specific approval** to grow **limited vegetation** (not including direct food chain crops)
  - Land application must be recorded in registry of deeds
  - Currently no Type III in MA

more stringent

less stringent

Meets Type I Pathogen requirements

Meets Type I Metals* and PCBs requirements

Type I

Meets Type II Pathogen Requirements

Meets Type II Metals* and PCBs requirements

Land Application requirements

Type II

Metals*: Cadmium, Lead, Nickel, Zinc, Copper, Chromium (Total), Mercury, Boron (water soluble), Molybdenum

Currently none in MA

Type III

Availability of Residuals

- Type I: Pickup from treatment plants or purchase from retail stores, garden centers, and online

- Type I and II: Use in landscaping, dairy farms, animal feed farms, tree farms, produce farms, and golf courses

Residuals in Massachusetts: 2019*

- Type I: 33 AOS Holders
  - ~ 120,000 dry tons
- Type II: 3 AOS Holders
  - ~ 20,000 dry tons
- Type III: No product with this classification

*Data compiled from 2019 Residuals Annual Reports

Land Application Certificates

- In 2019, 6 properties in MA used products with Type II Approval
- Applications include site characteristics
  - Soil, slope, pH, seasonal high groundwater, protection of drinking water sources
- Land application certificates are valid for 1 year

MassDEP Residuals Regulations: 310 CMR 32.00

- Created in 1990s alongside EPA Biosolids Regulations (Title 40 Part 503)
- Last update in 2016: revised Molybdenum requirements, including labeling
- Residuals are subject to Approval of Suitability (AOS) for use, sale, or distribution in Massachusetts
- MassDEP makes AOS Type determination
- AOS term is 5 years with opportunity to renew

Waste Site Cleanup Regulations, MCP

Paul Locke, Assistant Commissioner,
MassDEP Bureau of Waste Site Cleanup

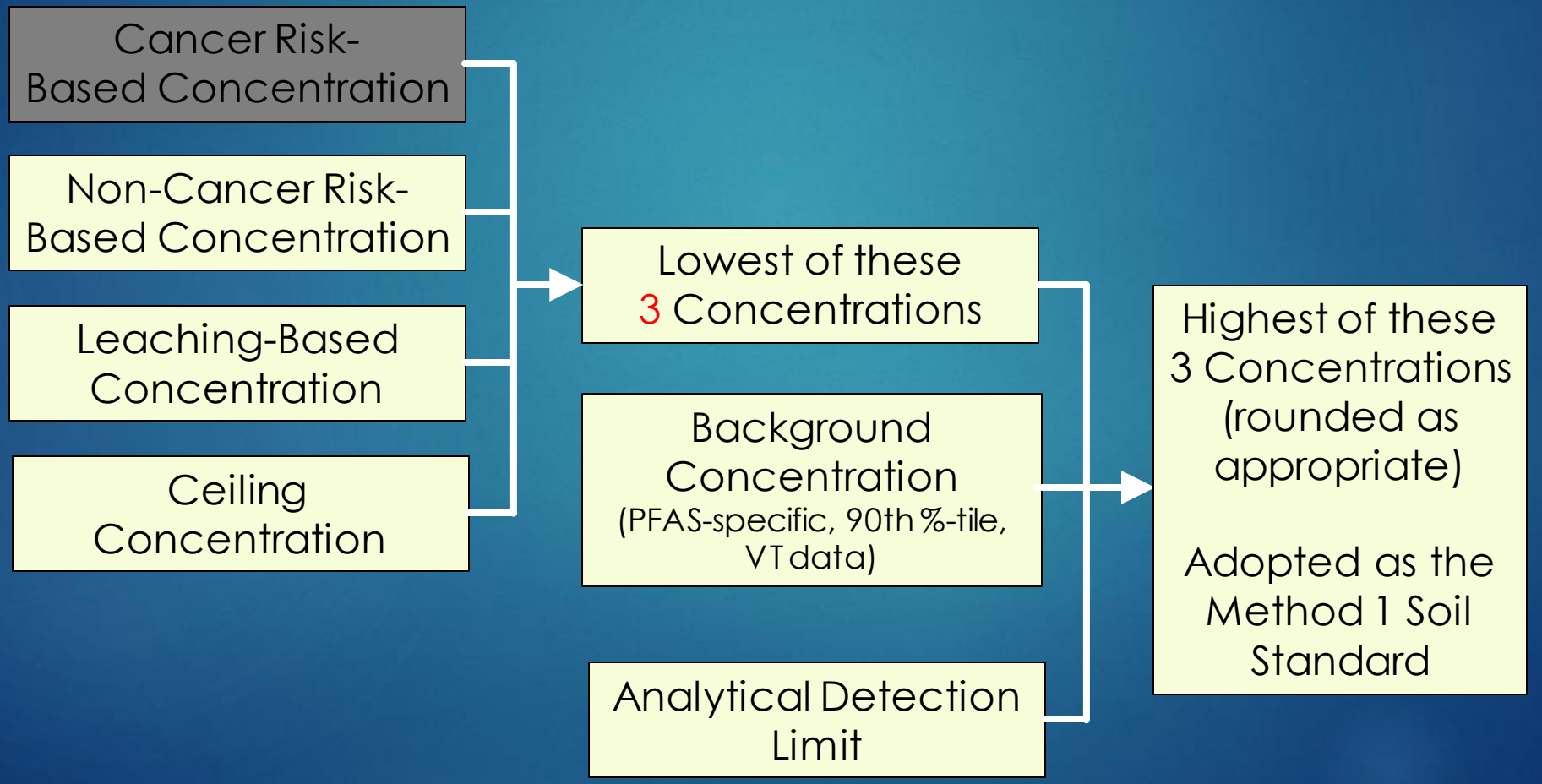
Why Talk About the Massachusetts Contingency Plan(MCP)?

- *The MCP contains standards for oil and hazardous material in soil, and*
- *Many things look like soil in some respects, such as sediment, compost, biosolids, so these values are often used as a benchmark…*
- *How MassDEP developed MCP PFAS Soil Standards may be informative!*

- Just remember, though…
  - The MCP soil standards are developed for a specific regulatory context and risk management paradigm.
  - An understanding of these standards, their derivation, their strengths and their weaknesses may be informative, if not directly applicable.

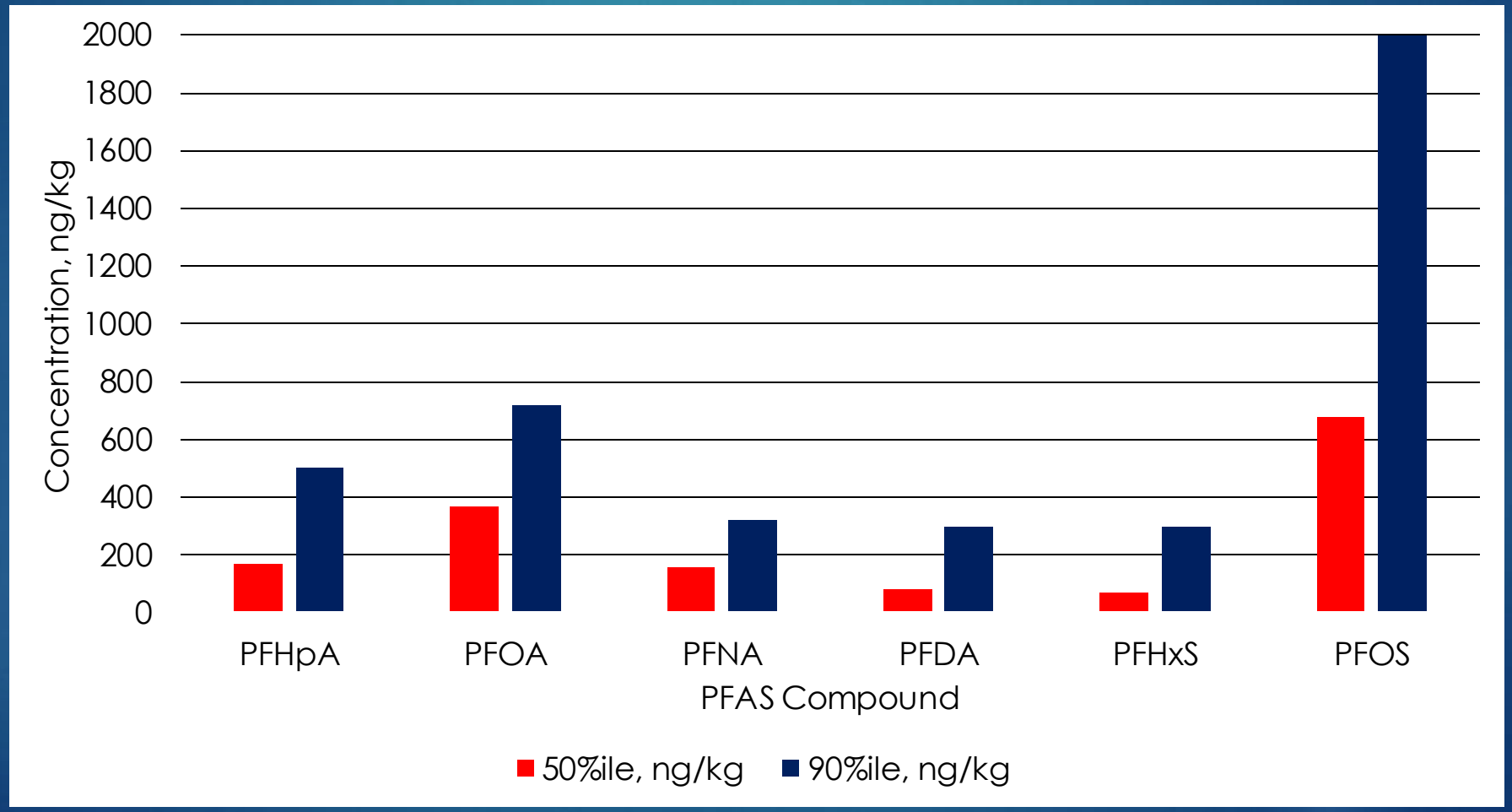
Derivation of Method 1 Soil Standards *for PFAS*

(See also https://youtu.be/CSsjcnGfKCg for more detail)



"VT Background" Soil Percentiles for Select PFAS

(See handout for more details)



PFAS in Residuals

Jennifer Wood, MassDEP Residuals Program

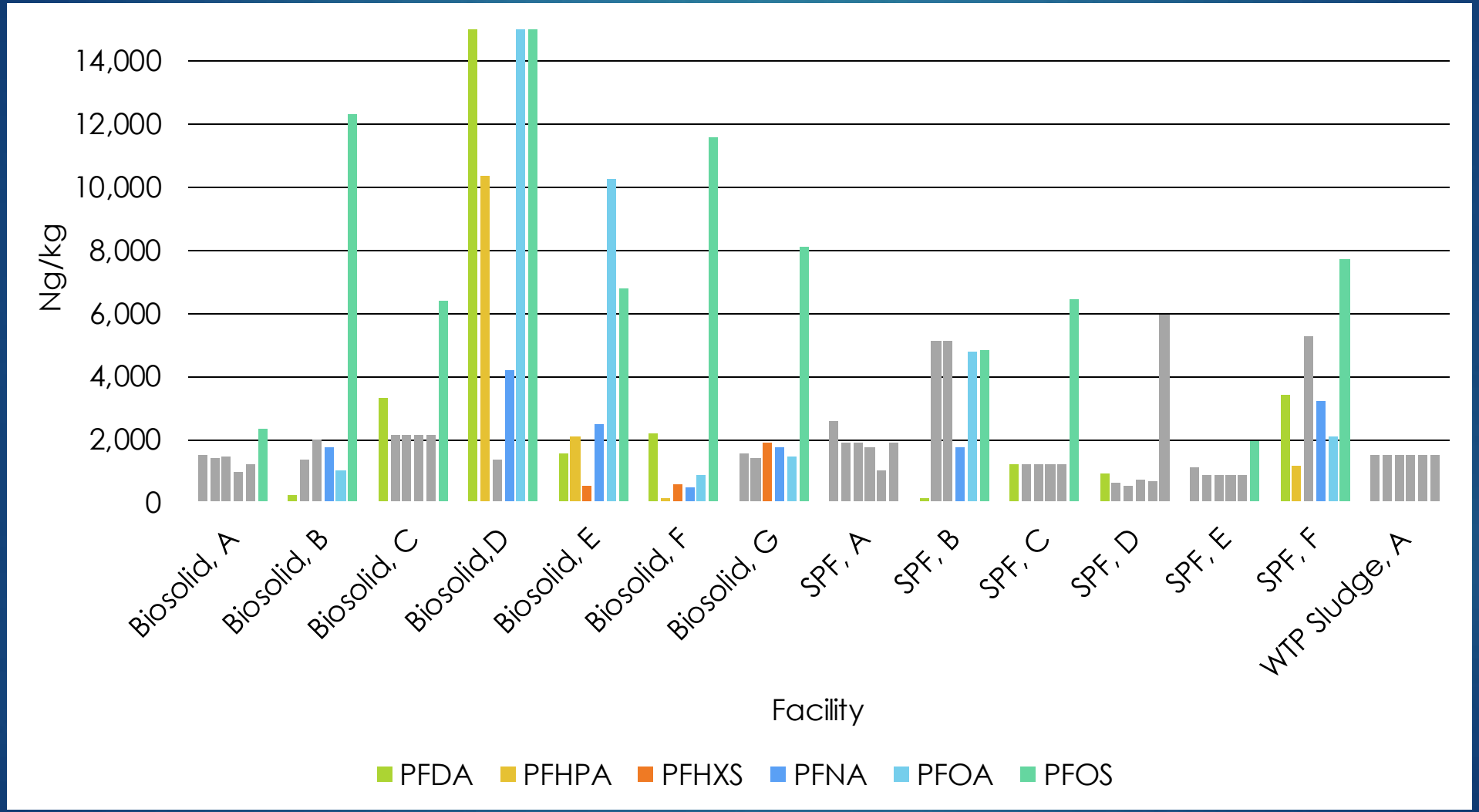
PFAS in Residuals in New Hampshire

NHDES PFAS in Residuals Data

- Collected by NHDES Personnel
- Analyzed by one laboratory
- Data from biosolids, paper production, and water treatment plant facilities

NHDES PFAS in Residuals

2017-2020 Average select data



* data reported below the Reporting Limit (<RL) is indicated at the RL in grey

Prepared by MassDEP using NHDES Data

MassDEP Analysis of NH Data Key Points

- No pattern in residuals data
- Of 6 MCP compounds, PFOS generally detected at highest concentrations
- Short Paper Fiber (SPF) has fewer compounds above reporting limits
- Range of reporting limits (RL)
  - Higher % solids residuals results in lower RL
  - RL can vary widely by laboratory, product, and compound

PFAS in Residuals in Massachusetts

AOS Monitoring Requirements for PFAS in Residuals

- January 2019 MassDEP focused on PFAS in residuals and added annual PFAS testing requirement to AOS renewals

- August 2020 MassDEP required all AOS holders to begin quarterly PFAS testing
  - Increase the available information on the PFAS concentrations in residuals
  - Better sense of variability
  - MassDEP is beginning to receive this data and perform QA/QC

PFAS- Laboratory Testing Methods

- Methods approved for testing drinking water samples
  - EPA Methods 533 and 537.1
  - https://www.epa.gov/pfas/epa-pfas-drinking-water-laboratory-methods
- Other samples (e.g., ambient water, soils, wastewater, and residuals)
  - "Modified" methods do not include regulatory standards
- MassDEP reviews and approves individual laboratory Standard Operating Procedures (SOPs)
  - 5 Laboratories currently approved

Clarification Questions and Answers

+ 10 Minute Break

PFAS Screening Values in Soil due to Application of Residuals

Dr. C. Mark Smith, Director Office of Research and Standards

How does MassDEP Propose to Regulate PFAS in residuals?

- Good question!
- Various approaches require calculation of PFAS in soil

Concentration PFAS in Residual (from lab)

Concentration of PFAS in soil after residuals application (Loading)

Image from NEBRA website

Approaches for deriving PFAS Screening Values for Residuals

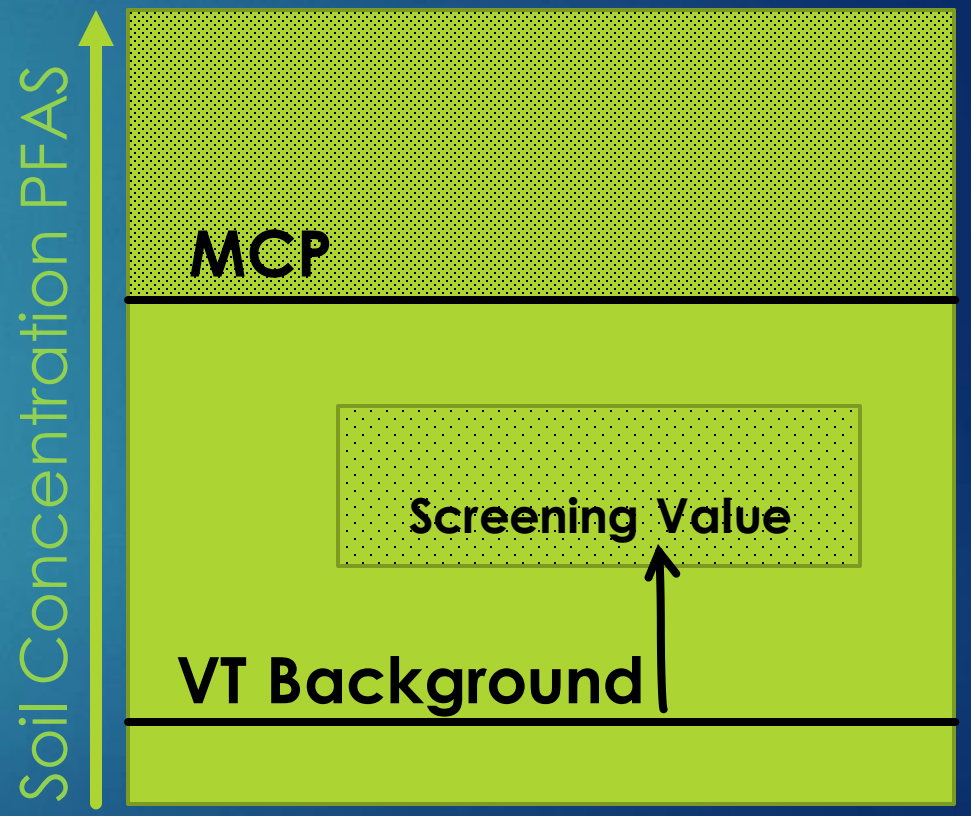
- Long-term goal = virtual elimination of 6 MCP (long chain) PFAS compounds in waste stream input
- Interim approaches
  - Consideration of background levels
  - Leaching of PFAS from residuals and soil into groundwater
    - Worst case
    - Modeled – potentially useful models
    - Experimentally derived or based on field data – insufficient data?
  - Food chain
  - Other?

Loading of PFAS to Soil

- Approach A: Percent over Background PFAS Soil Concentration
- Approach B: Leaching of PFAS from Soils to Groundwater
- Approach C: ?

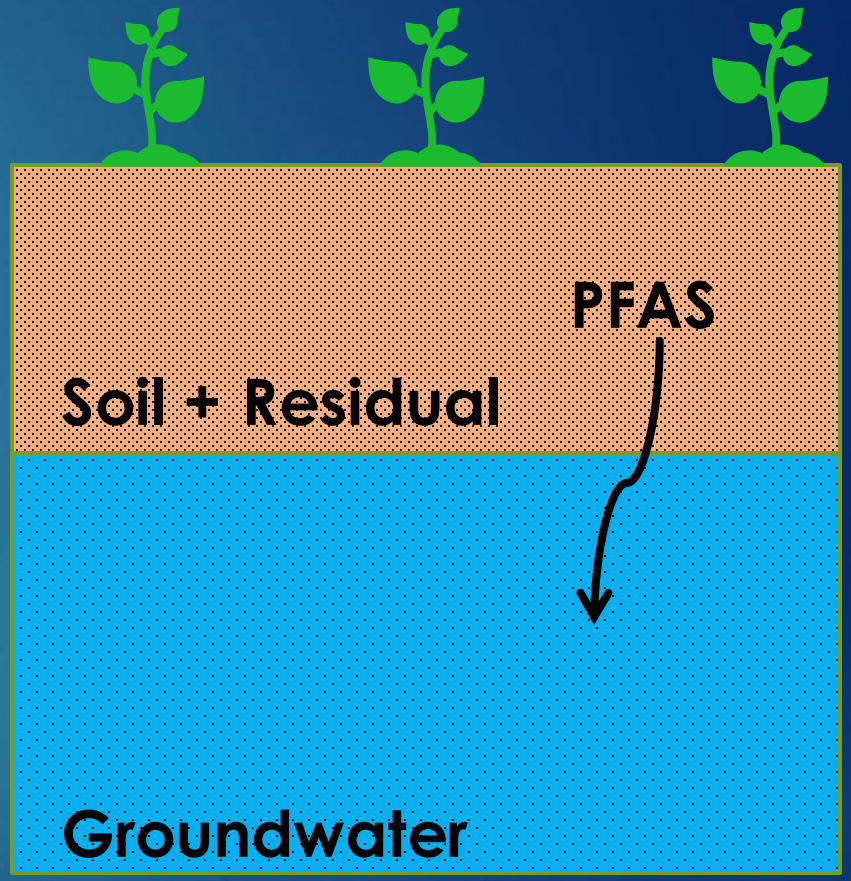
Approach A: Percentage PFAS above Background

- Screening values of PFAS in soil must not exceed specified percentage above background after residuals application
  - Background PFAS soil concentrations set equal to median Vermont background
- Primary strength - have data needed to set screening levels now
- Primary weaknesses - not risk based



Approach B: Leaching of PFAS into Groundwater

- Model leaching of PFAS from residuals applied to soil into groundwater
  - Set protective target in groundwater used as drinking water
  - Leaching model may include: *Typical area of application, depth to groundwater, frequency, loading rate, depth of application, and organic carbon/pH*
  - Used by Maine to set screening levels for PFAS in residuals
- Other possible testing-based leaching approaches



Maine PFAS Soil Screening Values

Chemical	Soil Concentration (ng/kg)
Perfluorobutane sulfonic acid (PFBS)	1,900,000
Perfluorooctane sulfonate (PFOS)	5,200
Perfluorooctanoic acid (PFOA)	2,500

- Maine became first state to regulate PFAS in residuals in 2019
- Values back-calculated from conservative leaching model
- Maine GW target: 205 ppt PFOS and PFOA in groundwater (10X higher than MA MCL; only two)

Maine Department of Environmental Protection, 06-096 Solid Waste Management Rules Chapter 418, Beneficial Use of Solid Wastes

Current Priorities

- MassDEP assessing leaching modeling options that expand on ME approach
- These include:
  - distributional approaches to variable data inputs;
  - data driven model parameters;
  - data driven groundwater flow and dilution factors;
  - groundwater targets that align with MassDEP more health-protective toxicity and drinking water values (i.e. 20 ppt vs 205 ppt)
- Will be forming Leaching Model Technical Subcommittee to provide input into these efforts

Continuing Efforts

- Approaches and Information collection/development to address:
  - Plant uptake
  - Potential runoff from land applied residuals
  - Continuing Pollution Prevention focusing on PFAS

With concentration PFAS in Residual (from lab)

How can you determine the concentration of PFAS in soil after residuals application (loading)?

Image from NEBRA website

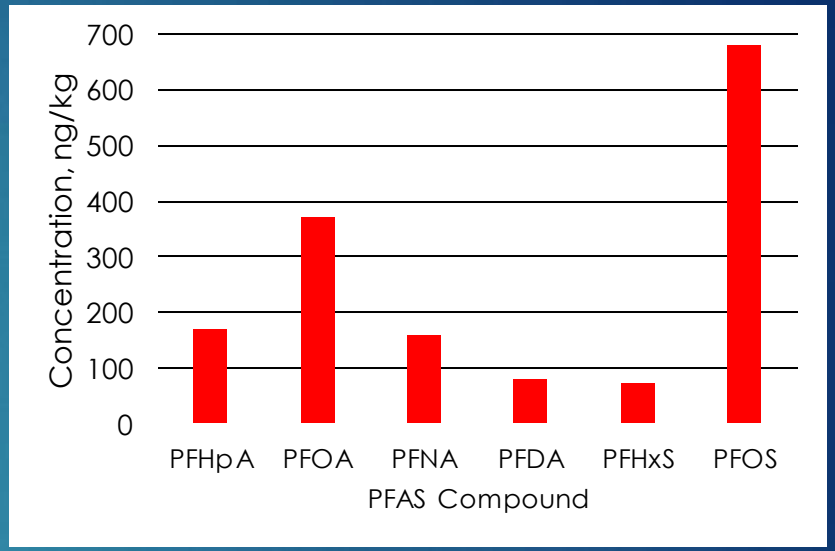
Accumulation of PFAS in Soils from Residuals (Loading)

(Method from Maine's Solid Waste Management Rules: Agronomic Utilization of Residuals, Chapter 419 Regulations)

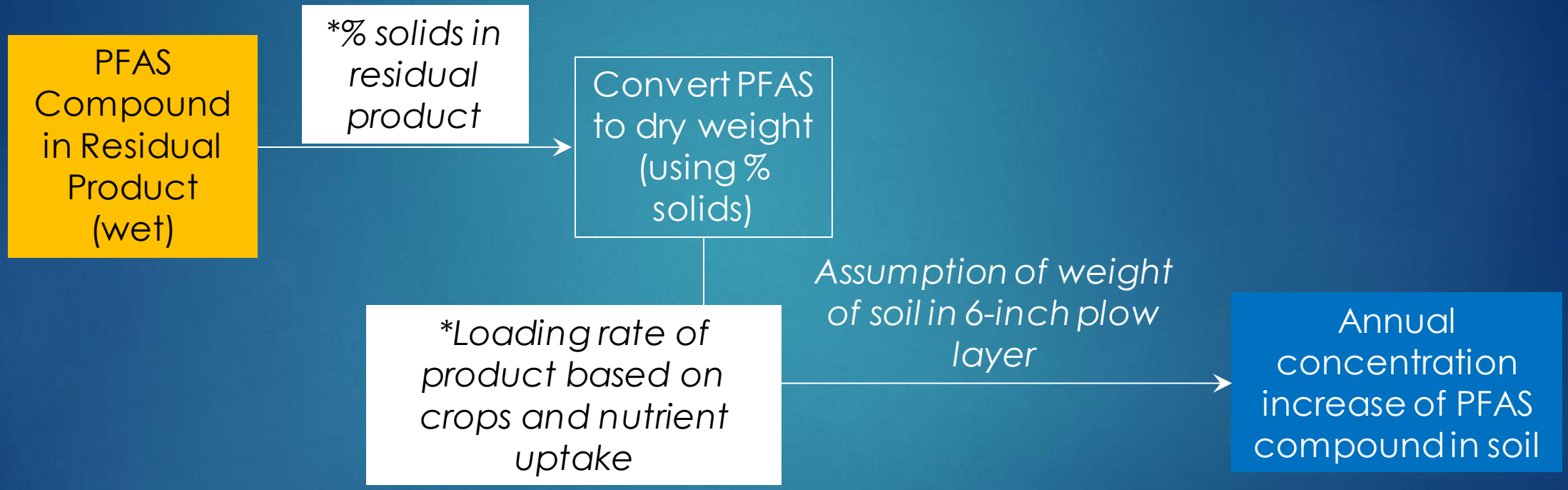
Jennifer Wood, MassDEP Residuals Program

Calculation Step 1: Determine Background

- Type I: Assume median background soil concentrations (50%ile in VT)
- Type II: Actual PFAS from site soil used as background



Calculation Step 2: Soil PFAS from Annual Residuals Application



* Information provided by residuals facility

Calculation Step 3: Soil PFAS from Multiple Year Residuals Application

Calculation Synopsis and Assumptions

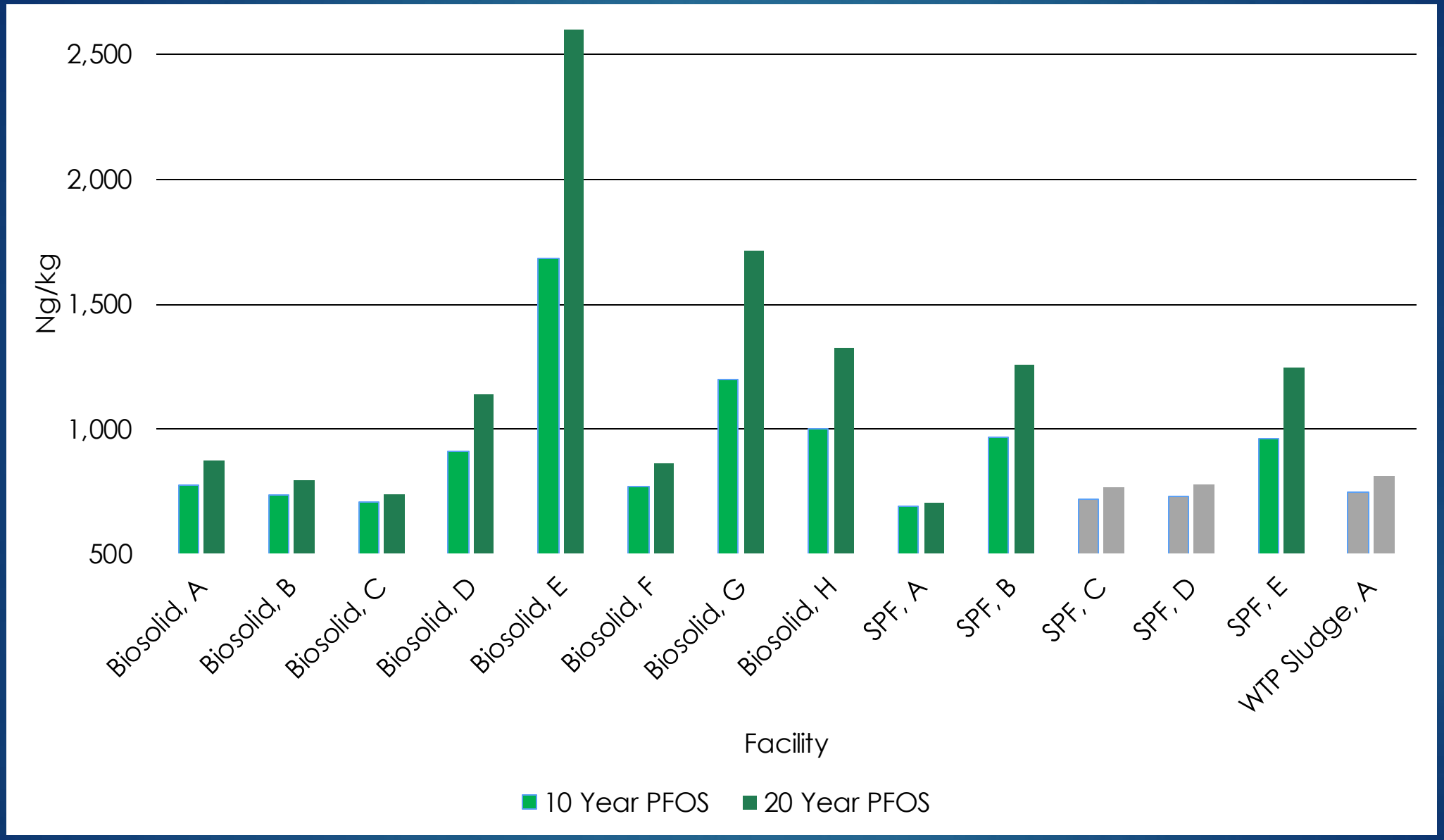
- PFAS continues to accumulate in soil, conservative approach
- Constant loading rate of residuals stated by the residuals facility/distributor
- Long-term application of residuals product over a certain time frame, i.e.,10 or 20 years

Example: Accumulation of PFAS in Soil
(Applied to NH Residuals Data)

Notes on Graphs

- MassDEP applied calculations to 2019 PFAS residuals data collected by NH DES
- Background PFAS is assumed to be VT 50%ile
- Loading rate and percent solids are assumed to be the same for all residuals products
  - Actual loading rate and percent solids from one biosolids product used for these purposes

PFOS in Soil Based on 10 and 20 Years of Residuals



Note Y Axis Range

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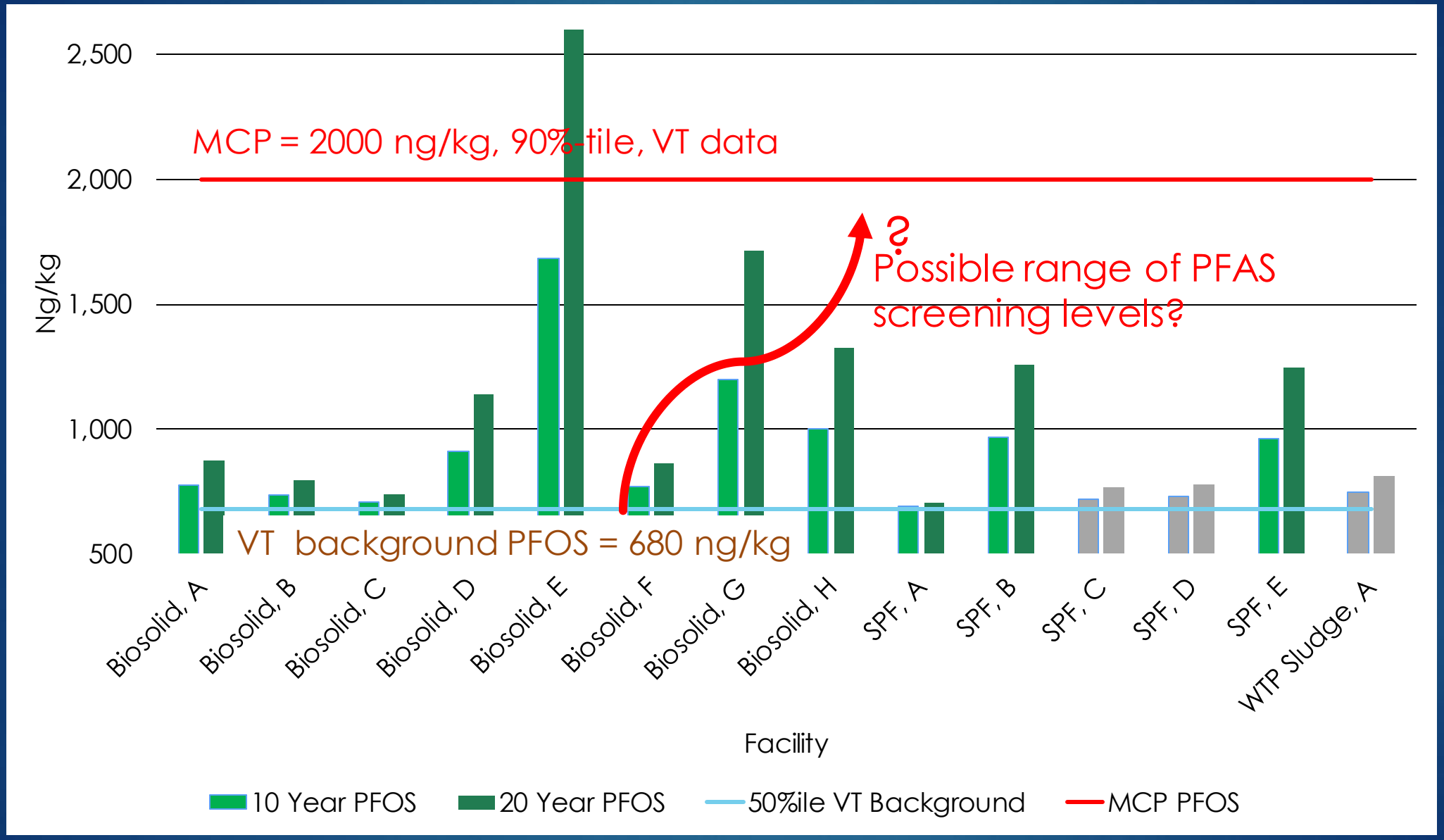
Prepared by MassDEP using NHDES Data

PFOS in Soil Based on 10 and 20 Years of Residuals



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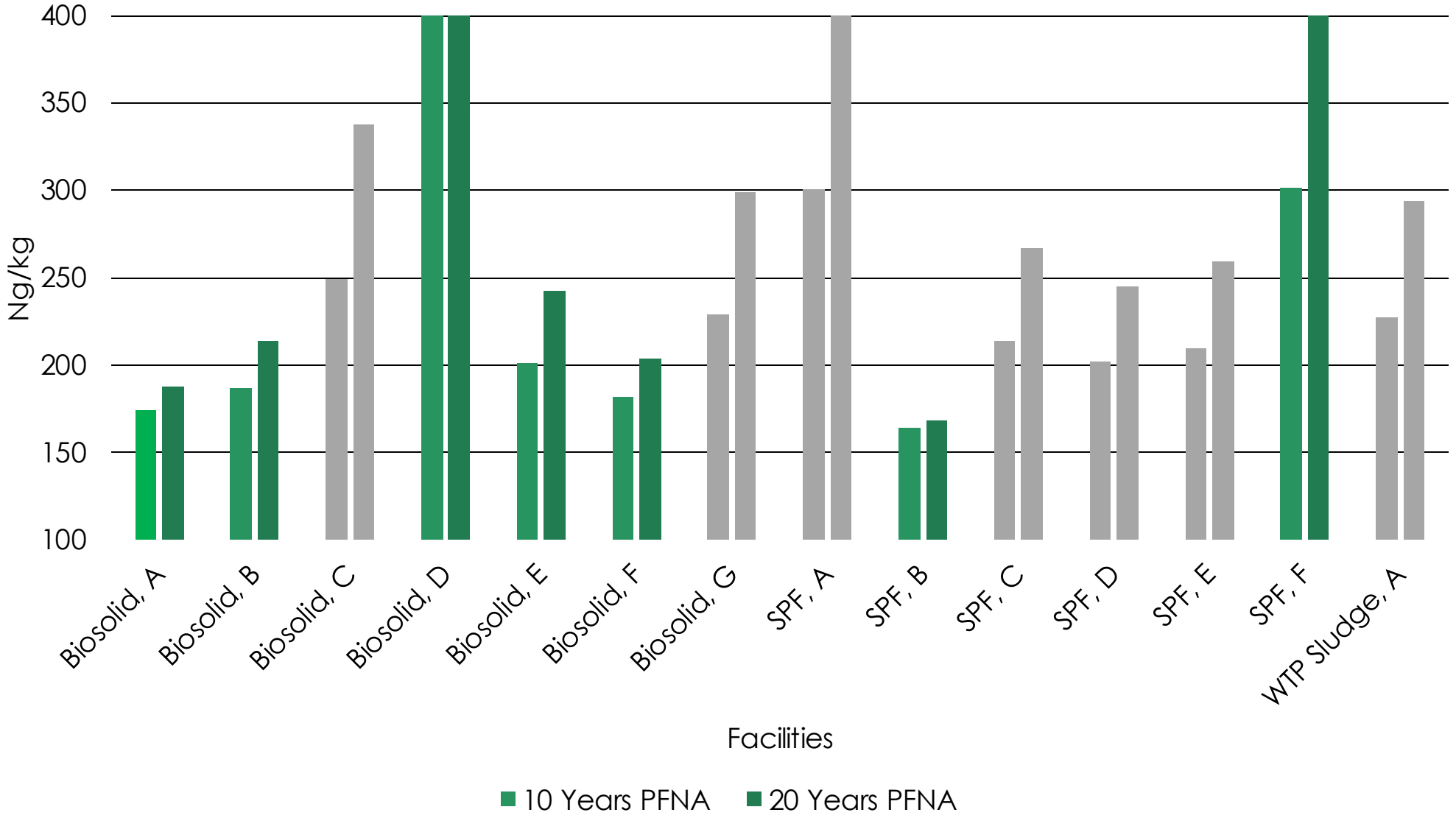
Prepared by MassDEP using NHDES Data

PFNA in Soil Based on 10 and 20 Years of Residuals Application



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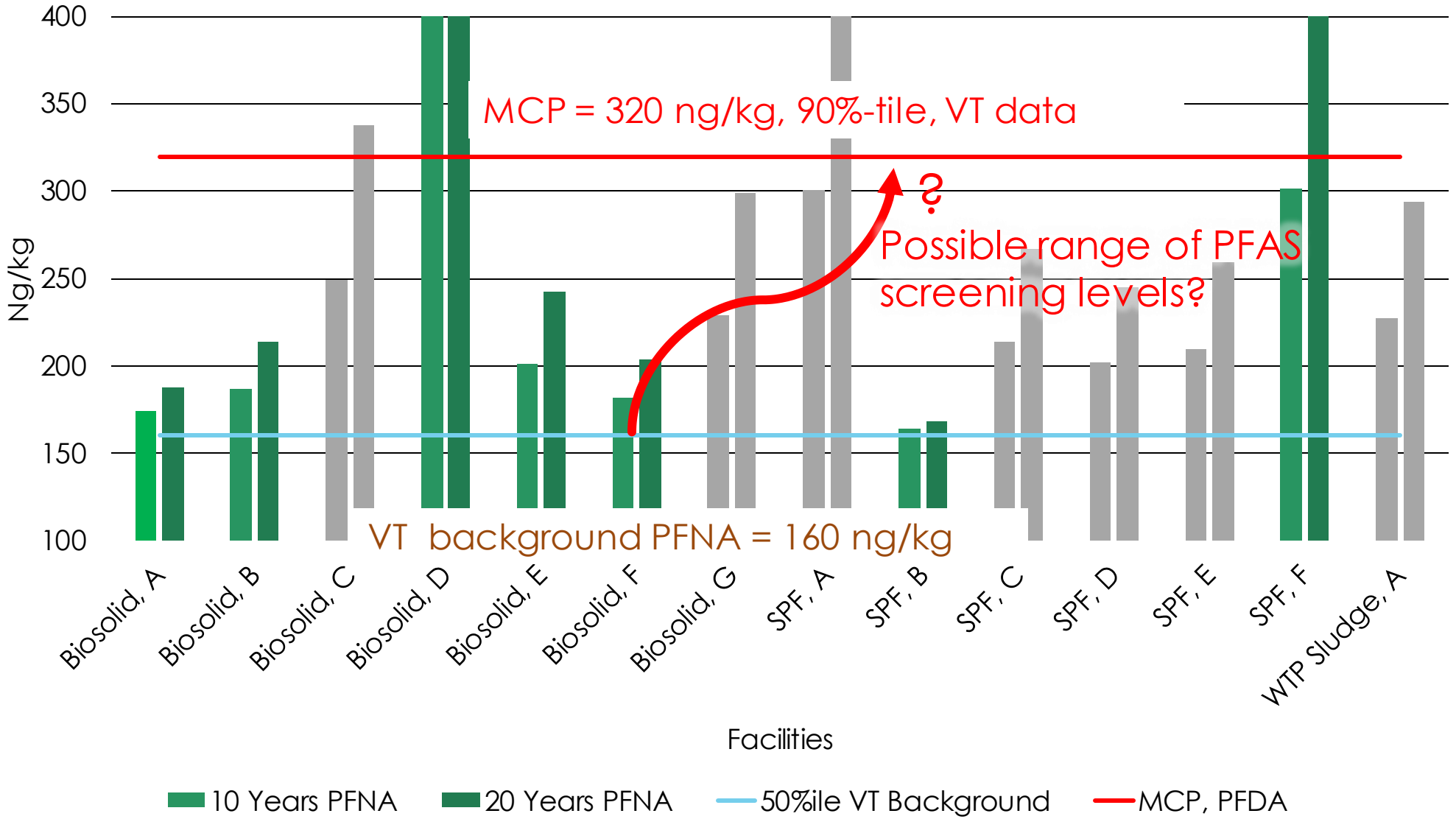
PFNA in Soil Based on 10 and 20 Years of Residuals Application



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Prepared by MassDEP using NHDES Data

MassDEP Analysis on PFAS Soils Accumulation using NHDES Residuals Data

- No pattern in calculated soil PFAS
- Of 6 MCP compounds, PFOS is calculated at the highest concentrations in soil
- Background and residuals concentrations vary between compounds, resulting in varying ranges for acceptable PFAS screening levels
- Reporting limits need to be considered
- Calculations differ depending on loading rate and % solids input

Summary

Key Points from Presentation

- Information on PFAS in residuals is continually evolving
- Determining the best solutions to addressing PFAS in residuals is a challenge
- Considering implications of policy options on current uses of residuals is important
- MassDEP is taking actions to address public health concerns
- MassDEP expects to implement interim screening concentrations

10 Minute Break+

Discussion

Stakeholder Meetings #2 and #3

- The next meetings will delve into the status of alternative approaches to establish screening values. Additional information will be shared.
- MassDEP is looking for input on the following categories:
  - What information is relevant but has not been discussed?
  - Thoughts on setting target PFAS screening levels
    - Leaching vs. percent over background approach vs. others
  - If you have additional information, i.e. data, please email: MassDEP.Residuals@mass.gov

Wrap Up

Contact: MassDEP.Residuals@mass.gov