# **Understanding Biosolids: The Complex Journey of PFAS to Soils**

# White Paper References

#### 1. What are PFAS?

a. Any of the papers in 3 will have a brief summary of PFAS compounds.

#### 2. What are biosolids?

- I. WEAT Biosolids Factsheet <u>Biosolids Fact Sheet</u>.
- II. WEF Biosolids Land application Factsheet "Land Application of Biosolids: Human Health Risk Assessment Related to Microconstituents" Water Environment Federation, Water Science and Engineering Center, Jan 2017. <u>Access Water | Land Application of Biosolids:</u> <u>Human Health Risk Assessment Related to...</u>
- III. EPA Biosolids Introduction <u>Basic Information about Biosolids | US EPA</u>.

#### 3A & 3B. How do PFAS and biosolids interact?

- IV. "Land Application of Biosolids Containing PFAS" Michigan Department of Environment, Great Lakes, and Energy. April 2022 <u>Land Application of Biosolids</u> <u>Containing PFAS Interim Strategy Updated 2022</u>.
- V. "PFAS in Biosolids What You Need To Know" Maryland Department of the Environment. August 2024 <u>MDE Fact Sheet PFAS in Biosolids.docx</u>.
- VI. California Water Board. GeoTracker PFAS Map [WWW Document]. Calif. Water Boards. URL https://geotracker.waterboards.ca.gov/map/pfas\_map.
- VII. DeLuca, Nicole M., et al. "Per- and Polyfluoroalkyl Substances (PFAS) in Paired Tap Water and House Dust from United States Homes." Indoor Environments, vol. 1, no. 3, 2024, p. 00033, doi:10.1016/j.indenv.2024.100033.
- VIII. Wu, Yan, et al. "Per- and Polyfluoroalkyl Substances in Paired Dust and Carpets from Childcare Centers." Chemosphere, vol. 251, no. 126771, 2020, p. 126771, doi:10.1016/j.chemosphere.2020.126771.
- IX. Ma, Jing, et al. "Fecal Excretion of Perfluoroalkyl and Polyfluoroalkyl Substances in Pets from New York State, United States." Environmental Science & Technology Letters, vol. 7, no. 3, 2020, pp. 135–142, doi:10.1021/acs.estlett.9b00786.
- X. Pepper, Ian L., et al. "Incidence of Pfas in Soil Following Long-Term Application of Class B Biosolids." The Science of the Total Environment, vol. 793, no. 148449, 2021, p. 148449, doi:10.1016/j.scitotenv.2021.148449
- XI. Gallocchio, Federica, et al. "Fast and Sensitive Analysis of Short- and Long-Chain Perfluoroalkyl Substances in Foods of Animal Origin." Molecules (Basel, Switzerland), vol. 27, no. 22, 2022, p. 7899, doi:10.3390/molecules27227899.
- XII. Lasee, Steven, et al. "Targeted Analysis and Total Oxidizable Precursor Assay of Several Insecticides for PFAS." Journal of Hazardous Materials Letters, vol. 3, no. 100067, 2022, p. 100067, doi:10.1016/j.hazl.2022.100067.



Water Environment Association of Texas 4908 Menchaca Road • Austin, Texas 78745 • 512.693.0060

A member-driven, collaborative organization leading Clean Water in Texas.

- XIII. Choi, Youn Jeong, et al. "Occurrence and Implications of per and Polyfluoroalkyl Substances in Animal Feeds Used in Laboratory Toxicity Testing." The Science of the Total Environment, vol. 867, no. 161583, 2023, p. 161583, doi:10.1016/j.scitotenv.2023.161583.
- XIV. "PFAS Strategic Roadmap: EPA's Commitments to Action 2021-2024" Environmental Protection Agency, October 2021. <u>PFAS Strategic Roadmap: EPA's</u> <u>Commitments to Action 2021–2024.</u>

### 4. How much biosolids are produced and where do they go?

I. National Biosolids Data Project, State Summary for Texas. <u>Texas – National Biosolids</u> <u>Data Project</u>.

## 5. How much will it cost rate payers to ban biosolids?

- a. Tipping fees for landfills were determined by biosolids committee members reaching out to utilities and landfills to request current fees, most were provided via phone calls or emails. Calculations, performed by a Professional Engineer licensed in the State of Texas, using biosolids data from the National Biosolids Data Project, were used to calculate statewide costs.
- b. A cost model developed by a licensed Professional Engineer was used to estimate the increase in cost a ban would cause using data regarding distances between landfills and landfill capacity, as well as population growth projections. The calculated data was compared to the rate of increase in biosolids disposal costs in Maine, after they banned land application of biosolids as a 'check', with the understanding that the effects in Texas would be greater to the increased size and population of this state compared to Main.

### 6. A Texas Farmer's story

 Raw data on field costs and production was provided to the biosolids committee from a North/Central Texas Farmer and calculations were done by Professional Engineers licensed in the State of Texas to determine the difference in profitability.



Water Environment Association of Texas 4908 Menchaca Road • Austin, Texas 78745 • 512.693.0060

A member-driven, collaborative organization leading Clean Water in Texas.