



# FAMU-FSU Engineering

FAMU - FSU COLLEGE OF ENGINEERING  
DEPARTMENT OF CIVIL & ENVIRONMENTAL ENGINEERING

**Technical Awareness Group (TAG) Meeting No. 2**  
**Friday, September 29, 2023 1:00 – 1:50 pm Eastern Time**  
**Meeting location: Zoom**

**Project Title:** Fate of PFAS and Other Contaminants During Leachate Evaporation

**TAG Members:** Bruce Marvin (Geosyntec Consultants), Chao Zhou (Geosyntec Consultants), Claudia Mack (Geosyntec Consultants), Kevin Warner (Geosyntec Consultants), Terry Johnson (Waste Management Inc.), Sterling Carroll (Florida Rural Water Association), Joseph Dertien (Florida Department of Environmental Protection), Kerry Tate (Florida Department of Environmental Protection), Lauren J. Coleman (Florida Department of Environmental Protection), Owete S. Owete (WSP USA), Shanin Speas-Frost (Florida Department of Environmental Protection), Walsta Jean-Baptiste (Florida Department of Environmental Protection).

**In Attendance:** Mojtaba Nouri Goukeh, Youneng Tang, Chao Zhou, Joseph Dertien, Terry Johnson, Sterling Carroll, Owete S. Owete, Kerry Tate, Sarajeen Saima Hoque, Dennis Ssekimpi, Benhur Asefaw, Charles Amanze, Allison Cerlanek, Liz Foeller, Runwei Li, Alina Timshina, Ron Beladi, Joseph Ullo, Timothy G. Townsend, Shanin Speas-Frost, and a phone calling in.

**Presentation by Mojtaba Nouri Goukeh:**

Mojtaba Nouri Goukeh (a research assistant in this project) started the presentation at 1:00 PM. He introduced that leachate evaporation is one of the common leachate management methods, but the fate of various contaminants, particularly per- and polyfluoroalkyl substances (PFAS), during leachate evaporation is understudied. Based on three research questions, he introduced the three tasks in this project, including:

Task 1 – Determine the effects of leachate evaporation on the fate of PFAS and contaminants regulated by 40 CFR 445.11 during evaporation

Task 2 – Determine the distribution ratios of PFAS = PFAS in residual: PFAS in condensate: other PFAS

Task 3 – Determine the effects of reintroduction of the concentrated leachate residuals

He explained that three leachates sampled from three landfills in Florida were evaporated by a rotary evaporator. He explained that total dissolved solids (TDS), PFAS and contaminants regulated by 40 CFR 445.11 were measured in collected residuals and condensates. He explained that the concentrations of some parameters such as total suspended solids (TSS), TDS, total organic carbon (TOC), chemical oxygen demand (COD), biological oxygen demand (BOD), zinc, chromium, and less-volatile PFAS (measured by liquid Chromatography with tandem mass spectrometry (LC/MS/MS)) increased in residuals during evaporation. On the other hand, the concentrations of some chemicals, including, ammonia, naphthalene, p-cresol, and pyridine decreased in residuals during evaporation. Then, he mentioned they spiked synthetic leachates with fluorotelomer alcohol (FTOHs) and perfluorinated carboxylic acids (PFCAs) at 500 µg/L to further evaluate the fate of two groups of PFAS during leachate evaporation. He stated that more than 99.9 percent of FTOHs mass went to the air, and no FTOH remained in residual. On another

had, the concentrations of PFCAs increased in residual during evaporation, suggesting that PFCAs accumulated during evaporation. Then, he explained that they made a mixed leachate by mixing leachate #1 with leachate residual #1 at 90% evaporation to evaluate the effects of reintroduction of the concentrated leachate residuals. He stated that with adding only 10 percent concentrated leachate residual, the final values of TDS and TSS became 2 times bigger, showing these parameters are likely to accumulate. However, the reintroduction of concentrated leachate residual did not have a significant impact for volatile compounds such as naphthalene, pyridine, and p-cresol.

### **Group Discussion:**

Major questions, comments, suggestions, and discussion from the TAG:

- There were a couple of questions and discussion regarding the detection limits of metals and PFAS. Arsenic was below the detection limit of 100 µg/L. It might be detected if the detection limit were lowered to a typical detection limit of 10 µg/L. The detection limits for the other two metals were 10 µg/L.
- There was a question regarding the initial and final volumes of leachate. That research group explained that the initial leachate was 1.6 L and the final residual volume was 160 mL, corresponding to 90% of evaporation. This question was followed by a comment: While the concentrations of some chemicals increases, the leachate volume that landfill managers need to deal with decreased by many times.
- There was a question regarding the recovery of PFAS mass >100% for all PFCAs except one. The research group explained it could be due to conversion of PFAS precursors (likely) or measurement errors (possible).
- There was a question regarding contaminants in the condensate. The research group replied that phenol, aniline, p-cresol, and pyridine were transferred to and then stayed in the condensate.

The meeting was adjourned at 1:50 PM by Mojtaba Nouri Goukeh. Meeting minutes was taken and submitted by Youneng Tang.