

Minutes, Technical Awareness Group Meeting
January 26, 2018, 1 pm to 3 pm
University of Miami, 1251 Memorial Drive, McArthur Engineering Building,
Room 289, Coral Gables, FL

Project Title: Characterization of *Perfluoroalkyl and polyfluoroalkyl substances (PFAS)* in Landfill Leachate and Preliminary Evaluation of Leachate Treatment Processes

Meeting Participants:

In person:

Athena Jones, University of Miami

Helena Solo-Gabriele, University of Miami

Madeline Keep, University of Miami

Wes Henderson, Hinkley Center for Solid and Hazardous Waste Management

Weiland Uchdorf, Department of Solid Waste Management, Miami-Dade County, Resources Recovery

On-line:

Rula Deeb, Geosyntec Consultants

Johnsie Lang, Orise Fellow stationed at Research Triangle Park, EPA

Thabet Tolaymant, U.S. EPA Emerging Materials and Sustainability, Chemical Safety for Sustainability

Hilary Thornton, U.S. EPA Region 4, Superfund Division

Cory Dilmore, Florida Dept. of Environmental Protection, Permitting and Compliance, Tallahassee, FL

Elizabeth Foeller, Waste Management Inc., Environmental Protection

Joseph O'Neill, Hillsborough County, Solid Waste Management Division

Joe Dertian, Florida Department of Environmental Protection, Solid Waste, Tallahassee, FL

Eric Charest, Indian River County Utilities, Environmental Compliance

Himanshu Mehta, Indian River County Utilities, Environmental Compliance

Ramana Kari, Solid Waste Authority of Palm Beach County

Richard Meyers, Broward County Solid Waste and Recycling

The meeting started at 1:00 pm and ended at 2:45 pm

The meeting began with a welcome by Helena Solo-Gabriele. Every participant introduced themselves by stating their name a few sentences about their background and interest in PFAS research.

The introductions were followed by two presentations outlined as follows. These presentations have been recorded and are available at the links identified in the right hand column.

Presentation 1, Project Introduction.

- a. Research Motivation
- b. Background of PFCs (per- and poly-fluorinated compounds)
- c. Research Objectives
- d. Deliverables
- e. Budget and Timeline

(Jones, Solo-Gabriele)

Click here to [PPT](#) or [Audioslides](#)

Presentation 2, Results of Pilot Run.

- a. Sampling Trip
- b. Sample Characterization
- c. Filtration & Analysis
- d. Results
- e. Next Steps
- f. Acknowledgements

(Jones)

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Question and Answers:

Paraphrased from original conversation

Thabet Tolaymat: What is the relative contribution of PFAS from wastewater versus landfill leachate?

Johnsie Lang: A study by Busch quantified the contribution of PFAS through landfill leachates. From this study it appears as though landfill leachates correspond to a small fraction of the PFAS relative to what is observed through wastewater.

Rula Deeb: The contribution depends upon the type of landfill. In wastewater, the PFAS tend to accumulate in the wastewater biosolids. There is no universal answer.

Madeline Keep: Would it be possible to collect samples before and after treatment?

Athena Jones: From my current understanding: not all landfill leachates are sent through treatment processes before disposal. The landfill that we collected our recent samples from uses deep well injection on site so post-treatment sampling is not possible there. If the leachates are treated, the plan is to collect samples before and after treatment.

Weiland Uchdorf: Leachates may be treated through sedimentation and/or neutralization. Leachate may be treated in a single batch reactor and then sent to the wastewater treatment plant. It is interesting to hear that granular activated carbon (GAC) appears to extract PFAS. However, this is not typically used at landfills. There may be ways of getting leachates from individual cells which may differ but these leachates eventually come together.

Will there be work towards expanding the calibration curve for PFAS?

Athena Jones: Yes. In order to do this we will need to order standards with higher concentrations of PFAS. The other angle that we can take is diluting the samples more. In some cases this is the best route to work within the most accurate detection limits of the machinery.

Thabet Tolaymat: To process the samples it may be worthwhile to process before filtering. Are there plans to sample cells that have been closed for more than 30 years? It would be of interest to determine whether older cells release more contaminants than newer cells.

Athena Jones: One of the cells sampled was old and we can check this against the notes provided by the landfill operator. The oldest cells at the facility were started around 1990 while others are still being filled. Johnsie Lang's leachate survey showed some differences between landfills based on age.

Johnsie Lang: Differences were observed over time in landfills. However, these variations were patterned by different landfills in the same region indicating that environmental factors play an important role in variations. A landfill closed in the 90's was sampled at 5 time points and the differences appear to track weather and climate.

John Schert: Please explain the idea of pre-cursors going through wastewater treatment plants.

Helena Solo-Gabriele: Studies have shown that at WWTP PFAS levels have been observed to increase throughout the treatment process presumably due to the breakdown of precursors (e.g. fluorotelomers) into PFAS containing the carboxylic and sulfonatic acid groups.

Johnsie Lang: Previous studies have shown that 5:3 FTCA that enters wastewater treatment plants appears to transform to PFHxA. Many prior studies did not track the precursors. The prior studies tended to focus on tracking PFCAs and PFSAs. The precursor 5:3 FTCA tends to be unique to landfills. It does not show up in other samples. This compound appears to be stable in anaerobic systems and does not transform in these environment. The conversion of 5:3 FTCA in air is not known.

Helena Solo-Gabriele: Does the committee have preferences with respect to which types of landfills to target?

Johnsie Lang: The work on C&D landfills is interesting. There has been no prior research to evaluate PFAS in C&D landfills. The assumption has been that PFAS from food wrappers would not be in C&D landfills. However, carpets can be a major contributor.

Cory Dilmore: There are few C&D landfills with a liner.

Helena Solo-Gabriele: One option would be to sample groundwater from monitoring wells near the C&D landfills. However, this would result in a lot of dilution.

Johnsie Lang: This was attempted and the dilution was too great.

Cory Dilmore: The best alternative may be to sample an MSW landfill that accepts large volumes of C&D. Another alternative would be Class III landfills.

Helena Solo-Gabriele: Do the private landfills have lined C&D landfills.

Elizabeth Foeller: Waste Management has Class III landfills and lined C&D landfills.

Himanshu Mehta: At Indian River County there is co-disposal of C&D, MSW and dewatered septic tank sludge.

Richard Meyers: Broward County Landfill is permitted as Class I but currently operates as Class III. In Broward MSW and C&D are commingled.

Thabet Tolaymat: It would be interesting to conduct an extraction on C&D components.

Johnsie Lang: As part of my PhD research I conducted anaerobic lab scale extraction experiments with carpet. The experiments were conducted over a period of 1.5 years. From carpet 5:3 FTCA was removed. The PFAS compounds were not observed until after peak methane production. No FTCA's were observed for methanol extractions nor for extractions conducted under non-biologically active conditions.

Richard Meyers: Is EPA or Florida moving closer towards an enforcement standard (for leachate) from the 70 ppt health advisory number?

No action is anticipated any time soon.

Rula Deeb: The 70ppt is guidance for drinking water.

Joe Dertien: There may be some legal work conducted on wastewater.

Weiland Uchdorf: It is interesting that the levels from MSW+gas and C&D are the same. The two types of landfills are very different.

Johnsie Lang: The 5:3 FTCA is semi-volatile and it may be moving into the gas condensate.

Weiland Uchdorf: Were the condensate systems tied to the leachate collection system?

Helena Solo-Gabriele: We believe so.

Johnsie Lang: Also interesting in this data set is that the PFBS is a lot higher than the national average. Industry switched to PFBS in 2013 and not much time has elapsed since then. Perhaps there is an industrial source entering the sampled landfill. Also interesting is that PFHxS is higher for the Class III.

Rula Deeb: Some landfills have been found at 13,000 for PFHxS. These landfills may have been impacted by PFAS waste. There are litigation issues. Values in the literature tend to be an order of magnitude lower. The levels are likely a function of the waste. There're parts of the country with a lot of chemical manufacturers. There's the carpet belt and then there's furniture manufacture.

John Schert: Dalton, Georgia is known for its carpet manufacture.

Rula Deeb: A Google Search on PFAS litigation will bring up the situation in Dalton, GA.

Cory Dilmore: In Florida, carpet goes to Class III landfills instead of C&D landfills. The policy was enacted in 1993 and clarified in 2001. The policy is that carpet remnants are OK in C&D landfills. Class III can

accept dedicated loads. Carpet manufacturers cannot send their waste to C&D landfills. Carpet is allowed in C&D landfills if attached to other C&D materials.

John Schert: Sharing web sites that provide background on PFAS. In Michigan there are issues with shoe manufacturers.

Madeline Keep: How do the results from the current study relate to the regulations?

Athena Jones: Only the results from PFOA and PFOS are part of the guidelines.

John Schert: Does the PFAS on food wrappers come off on the food?

Madeline Keep: Teflon pans have a tendency to tear and flake and it can release into food.

John Schert: There is anecdotal evidence that burning Teflon pans causes adverse health effects.

Johnsie Lang: One of the main sources of PFAS in landfill waste is paper. So PFAS do come off paper products.

Weiland Uchdorf: When cells are active, there must be a lot of variability on PFAS levels due to rain effects. For ash landfills, the pH is high due to the lime added as part of the air pollution control system. At South Dade, there is a Class I. Here treatment focuses on pH adjustment and some sedimentation and filtration. At North Dade, there is a Class III, which has no leachate treatment. In order for GAC to work, it would require pre-treatment because the GAC filter will plug up quickly if the water is not clear. The financial aspect of the GAC seems OK as it is not that expensive.

Johnsie Lang: GAC however is not very good for GenX and for 4C PFAS. The shorter chain PFAS are more mobile and go through the GAC.

Wes Henderson: For the change in the title (change PFC to PFAS), a modification will need to be submitted to the Hinkley Center. Make sure that a link is provided to the project web site.