

**Minutes of the Technical Awareness Group Meeting**  
for the PFAS As It Relates to Solid Waste and the Environment  
Supported by the Hinkley Center for Solid and Hazardous Waste Management

**Meeting held, October 8, 2021, 10:00 am to 12:30 pm (eastern)**

Meeting Participation was through Virtual Connection

Registration is required to attend this meeting via Zoom

**Attendees:**

*Speakers:*

Ashely Lin, University of Florida  
Hekai Zhang, University of Miami  
Helena Solo-Gabriele, University of Miami  
Jake Thompson, University of Florida  
John Bowden, University of Florida  
Katherine Deliz, University of Florida  
Nicole Robey, University of Florida  
Oriana Zerillo, University of Miami  
Paola Mendoza-Perilla, University of Florida  
Timothy Townsend, University of Florida  
Yalan Liu, University of Florida  
Yutao Chen, University of Miami

*Attendees via computer webinar:*

Achaya Kelapanda, Miami-Dade County DSWM  
Alex Betts, ExxonMobil  
Alex Webster, FDEP Northwest District Office  
Alina Timshina, University of Florida  
Ally Berry, St. Lucie County Solid Waste  
Ana Wood, Polk County Waste and Recycling  
Arellys Roman, Miami Dade County DSWM  
Athena Jones, EPA Region 8  
Beau McCall, Polk County Waste and Recycling  
Bill Burns, FDEP Waste Site Cleanup Section  
Bob Curtis, SCS Engineers Tampa Office  
Brandie Stringer, FDEP Site Investigation Section  
Breck Dalton, FDEP Waste Site Cleanup Section  
Brian Dougherty, FDEP District and Business Program  
Brian Durden, FDEP Northeast District  
Brittany Sullivan, Southern Waste Information Exchange  
Carl Elder, Stearns Weaver Miller  
Catherine Eichner, Pinellas County Solid Waste  
Charlie Latham, Board of Clay County Commissioners  
Dan Meeroff, Florida Atlantic University  
David Dee, Gardner Bist Attorneys at Law  
David Eastman, Tallahassee Environmental Law Attorney  
David Gregory, Orange County Solid Waste and Hinkley Center Advisory Board  
David Meyers, FDEP Site Investigation Section  
Doug Podiak, Nassau County Public Works  
El Kromhout, FDEP Solid Waste Program and Permitting  
Eric Charest, Environmental Compliance Specialist, Indian River County Utilities

Fangmei Zhang, Miami-Dade County DSWM  
Fletcher Herrald, FDEP  
Florentino De La Cruz, North Carolina State University  
Frank Darabi, Gainesville Consulting Engineer  
Hillary Thornton, EPA region 4  
Jamie Sullivan, Palm Beach County Solid Waste  
Jeff Wagner, FDEP District and Business Program  
Jennifer Farrell, FDEP Waste Cleanup Section  
Jeremy O'Brien, SWANA Applied Research  
Jim Flynt, Orange County Solid Waste  
Joe Dertien, FDEP Solid Waste Program and Permitting  
Joe Ullo, Stearns Weaver Miller and Board of Hinkley Center  
Joel Woolsey, New River County Solid Waste  
John Schert, Executive Director of the Hinkley Center  
Johnsie Lang, Arcadis Consultants  
Karlee Fowler, FDEP Site Investigation Section  
Kim Walker, FDEP Permitting and Compliance Assistance Program  
Kyle Clavier, Sandia National Laboratories  
Lanita Walker, City of Tallahassee Environmental Engineer  
Larry Ruiz, Hillsborough County Solid Waste  
Leah Smith, FDEP Environmental Consultants  
Lee Casey, SCS Engineers Miami Office and Board of Hinkley Center  
Liz Foeller, Florida Waste Management and Board of Hinkley Center  
Maria Romero, Polk County Solid Waste  
Mario Porcelli, Miami-Dade County DSWM  
Mary Beth Morrison, Palm Beach Solid Waste  
Pam Davis, Columbia County Solid Waste  
Ramana Kari, Palm Beach County Solid Waste and Board of Hinkley Center  
Richard Potts, FDEP  
Richard Tedder, Geosyntec Consultants  
Rita Crouch, Pinellas County Solid Waste  
Robert Graessel, Miami-Dade County DSWM  
Robert Mackey, S2L Consultants  
Ron Beladi, Neil Schaffer and Hinkley Center Research Section Committee  
Rula Deeb, Geosyntec Consultants  
Sam Levin, S2L Consultants  
Scott Reynolds, Board of Indian River County Commissioners  
Seth Ramaley, Waste Management Groundwater and Technical Programs  
Suzanne Boroff, FDEP Waste Reduction Recycling Section  
Tanya Linzy  
Teresa Boeshaghi, FDEP Division Waste Management  
Terry Johnson, Waste Management  
Thomas Smallwood, University of Florida  
Tim Bahr, FDEP  
Tim Ruelke, FDOT Office of Materials and Board of Hinkley Center  
Tom Mulligan, Brevard County Solid Waste  
Vicky Pena, Brevard County Solid Waste  
Viraj de Silva, SCS Environmental Consultants and Contractors  
Virginia Walsh, Miami-Dade County Water and Sewage Department  
Walsta Jean-Baptiste, FDEP Waste Cleanup Section  
William Kilby, Lee County Solid Waste

**Agenda**  
**Hinkley Center TAG Meeting, PFAS As It Relates to Solid Waste and the Environment**

Date: October 8, 2021,  
Time: 10:00 am to 12:30 pm (eastern)  
Location: Virtual.

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| 1. Welcome and introductions.  | SoloG/Townsend/Deliz/Bowden   |
| 2. Hinkley Funded Research Focused on Landfill Leachate. <ul style="list-style-type: none"><li>• Introduction</li><li>• PFAS in leachate on-site treatment systems</li><li>• PFAS in Florida landfills by waste and water type</li></ul> | Helena Solo-Gabriele<br>Yutao Chen/Hekai Zhang<br>Yutao Chen/Hekai Zhang                    |
| 3. Updates on EPA Funded Research. <ul style="list-style-type: none"><li>• Introduction and methods</li><li>• Results</li></ul>  | Tim Townsend, John Bowden,<br>Nicole Robey, Yalan Liu, Paola<br>Mendoza-Perilla, Ashley Lin |
| 4. Ongoing Hinkley Funded Research. <ul style="list-style-type: none"><li>• Introduction</li><li>• Remediation Waste</li><li>• Public Works (Street Sweepings/Biosolids)</li><li>• Additional Projects</li></ul>                         | Tim Townsend<br>Jake Thompson<br>Jake Thompson  |
| 5. Updates on PFAS Study in Brevard County.  | Katherine Deliz   |
| 6. Updates on Community Participatory Based PFAS Research.   | John Bowden   |
| 7. Next steps. <ul style="list-style-type: none"><li>• Complete final Hinkley report for Landfill Leachate</li><li>• Deliverables for Hinkley and EPA projects</li></ul>   | Helena Solo-Gabriele<br>Tim Townsend  |
| 8. Additional question and answers, wrap up.   |   |
| 9. Adjourn.  |   |

Questions about meeting: [hmsolo@miami.edu](mailto:hmsolo@miami.edu)

**Questions and Answer #1** (after section 2. Hinkley Project, Landfill Leachate):

1. Q: Have you conducted further studies about how unlined or lined systems impact the groundwater upstream and downstream of the landfills?

A: More work is still needed for this analysis. For unlined systems, the PFAS levels in the groundwater downstream were statistically higher than that in groundwater upstream. This difference was not statistically significant for the lined systems, but we still need to look at it further.

Also, it is very difficult to find a good greenfield site where there has never been prior unlined disposal. The next step of this analysis is to go back and check whether these sites received anything which can impact groundwater. This can help to determine whether these sites can be considered as clearly having only liner systems without any old legacy landfills or unlined landfills. So, in summary, it is hard to find a sample that does not have PFAS anywhere in the environment. Similarly with the results of groundwater surrounding these wells it is difficult to not detect PFAS. At this point we should not over interpret the results in terms of the performance of the liner systems.

2. Q: What about aeration and recirculation? Does the recirculation increase the PFAS?

A: The suggestion is that if the leachate were recirculated, the total of PFAS is not going to increase, but you should not expect that anything will be removed. It really depends on the route that water takes through the landfill ultimately. PFAS is relatively mobile in the landfill environment. So, if you recirculate the leachate containing PFAS, there might be some transformation of species. It will likely remain as part of the moisture within the landfill.

3. Q: It was mentioned that RO = 99% removal in permeate and concentrate is "cycled back to the landfill." Was it similar if it was not cycled back into the landfill?

A: Facilities may cycle the concentrate back into the landfill, and at least one of the facilities in the data set also recirculates the concentrate. Again, it is really going to depend on how long it will take the recycle water to make its way back through the system. But you should not expect PFAS is removed or mitigated over the long term. RO systems concentrate PFAS and some other advanced treatment options can be used to destroy PFAS. Other researchers consider RO as a concentrating step. It can be used to create a highly concentrated effluent stream that is then sent to a follow up treatment process that destroys PFAS. The RO concentrate reduces the cost of treating a large water volume. For the bottom liner, if you were recirculating leachate back to the landfill after the membrane system, the PFAS may not be removed or attenuated.

4. Q: How many RO installations were reviewed?

A: There were two landfills having RO installations among these data, and they have different configurations. One of them is a two-stage RO system and the other one is a combined treatment system that also includes an RO system.

**Questions and Answer #2** (after section 4. Hinkley Project, Thermal Treatment):

1. Q: Did the ratio of PFCAs remain the same from younger to older waste?

A: I believe the ratio of the PFCAs increase in the older waste, because the precursors constantly transform to the terminal PFCAs and PFSAs. When you have an older leachate, you have more time for the precursors to transform to PFCAs. So, you would see an increase of PFCAs in the older waste.

I do not know whether new or different types of PFCAs are formed in the old waste. I will go back and check this, but again, those samples were not from the same sites. So, this will depend on what

kind of waste is disposed at the sites. The ratio may change, but that is something we will definitely go back and check.

2. Q: Are any of the species you have detected sensitive to temperature?

A: I am sure many of them are sensitive to temperature, but we haven't done that kind of work to test it. Also, we are in the middle of the PFAS stability study. We just finished looking at the stability of over 100 PFAS at room temperature and at negative 20. And we have done it over five months, so we will have that data soon. This work does not factor in high temperatures, but at least it gives some ideas about the stability.

3. Q: In the permeate, did you see any specific species stand out which tended to make it through the membrane? Total removal is promising

A: Data analysis for this project is still ongoing, generally long chain PFAS have a higher removal than short chain, but even still, it's above 99% removal. We expect the detailed results will be available for review by end of year. Feel free to reach out before then for a specific discussion on any species trends.

**Questions and Answer #3** (after section 5. PFAS Study, Brevard):

1. Q: I just wanted to see if you would share your methodology for determining the flood risk zones that you showed there on the slide.

A: We can share the model that we are presenting, that includes a lot of areas.