Environmental Research & Education Foundation™
Lighting a path to sustainable waste management practices

3301 Benson Drive Suite 101 Raleigh, NC 27609 Phone: 919.861.6876 Fax: 919.861.6878 www.erefdn.org

EREF Fellow Sponsored by The Antonacci Foundation

Komal Charania

Komal Charania joined EREF in March 2017. She graduated with honors in May 2018 with a degree from North Carolina State University in Environmental Engineering. At EREF, she worked on the State of Practice of Landfill Leachate Management and Treatment in the U.S. project (see description below) within the Data and Policy program. This involved gathering available leachate quality and quantity data in order to get a better understanding of the state of leachate generation, treatment, and management in the United States. In February 2018, she attended GWMS with EREF and presented a poster on per- and polyfluoroalkyl substances in landfills.

Since then, Komal has been promoted to Project Coordinator on a project in coordination with the EPA and Waste Management. This project is looking the mobile tracer correlation method of quantifying landfill gas emissions (see description below). She has also continued to support the Research and Scholarship program.

In addition to her work at EREF, Komal was an NC State Sustainability Steward and the Electrical Team Leader of SolarPack, North Carolina State University's solar car team. Currently, she is applying to attend graduate school in the fall to obtain her Master's. Her work with EREF has allowed her to gain a deeper understanding of real-world environmental conditions which has aided her in her pursuit of a greener future.

State of Practice of Landfill Leachate Management and Treatment in the U.S.

Management of leachate generated by municipal solid waste (MSW) landfills poses significant challenges to landfill operators. Leachate characteristics vary dramatically over time because of changing conditions within the landfill. Leachate is frequently discharged to local publically owned treatment works (POTWs) because of the cost and complexity of on-site treatment. Additionally, some POTWs have stopped accepting leachate due to nutrient loadings, interference with UV disinfection, or capacity challenges. Currently relevant descriptive data is scarce that connect leachate quality and treatment challenges with landfill characteristics, such as: waste age, types of waste accepted and composition, and climate.

The goal of this project is to collect data from landfills across the U.S. that includes leachate quantity and quality, management practices (e.g., on-site and off-site treatment). For example, some of the data to be collected as part of this effort include:

- Volume produced (e.g. total gallons, volume per acre)
- End point for disposal (e.g. POTW, evaporation, surface discharge, deep well injection)
- Treatment processes used (e.g. aerobic, anaerobic, denitrification, reverse osmosis)
- Parameter concentrations that impact treatment strategy (e.g. BOD, solids, nitrogen)

A comprehensive list of leachate treatment technologies offered by vendors and the frequency of what types of technologies are used under certain conditions will also be ascertained.

Results from this study will provide insight to the following types of questions:

- Does geographic location affect leachate volume or treatment strategies?
- What factors influence whether or not a landfill is allowed to discharge to a POTW?
- How accurate are empirical rules of thumb (e.g. leachate generation per acre) used for sizing treatment processes?
- What technology options are available on the market to address specific treatment goals?

Industry Air Testing Project: Evaluation of Indirect Measurement Techniques

In 2016, landfills were the third largest contributors to methane emissions in the United States following enteric fermentation and natural gas systems. As a greenhouse gas, methane is 25 times more potent than carbon dioxide. Thus, it is important to be able to quantify these emissions to calculate gas collection system efficiencies, find trends in gas production, and total quantify the actual contribution of landfills to global warming. Although models such as the Landfill Gas Emissions Model (LandGEM) are commonly used, they make generalized assumptions that cause results to be less accurate. Therefore, measurement techniques have been developed to aid in the quantification of methane emissions from landfills.

This study utilizes an indirect measurement technique known as mobile tracer correlation (TC). In comparison to TC, on-site test, such as Other Test Method 10 (OTM 10), results are much harder to interpret given the spatial variance in waste composition, and cover efficiencies. Thus, off-site tests provide whole-landfill measurements exclusive of spatial variance. In addition to TC, other methods of quantifying methane emissions are inverse dispersion modelling (IDM), Other Test Method 10 (OTM 10), and eddy covariance (EC). Although IDM can be done faster than TC, it is less accurate than TC. OTM 10 requires operation by skilled groups that are familiar with the technology. It is also much more time consuming and labor intensive than TC. In regards to EC, its results are comparable to those of TC, but it is a relatively new statistical method.