QUARTERLY PROGRESS REPORT

March 1, 2017 to May 31, 2017

PROJECT TITLE: Use of Solid Wastes in Asphalt and Concrete

PRINCIPAL INVESTIGATOR(S): Timothy G. Townsend

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Department of Environmental Engineering Sciences

CO-PRINCIPAL INVESTIGATOR(S): Christopher C. Ferraro

AFFILIATION: Research Assistant Professor, University of Florida
Department of Civil and Coastal Engineering

COMPLETION DATE: August 31, 2017 **PHONE NUMBER: 352-392-0846**

PROJECT WEBSITE: https://www.essie.ufl.edu/home/townsend/research/bu/hc15/

Work accomplished during this reporting period:

During this time, environmental testing on ash-amended asphalt specimens continued using EPA Method 1315 ("monolith") and began using EPA Method 1312 (SPLP). EPA Method 1315 results showed that only two elements leached in any appreciable quantity: aluminum and antimony, and both were below EPA regional screening levels (RSL) for residential tap water. Meanwhile, EPA Method 1312 showed that antimony slightly exceeded this RSL when 15%, by mass, WTE bottom ash aggregate from two Florida facilities was utilized.

While EPA Methods 1312 and 1315 simulate different leaching regimes (i.e., rainwater on size-reduced material and mass flow of contaminants from a monolithic structure, respectively), they are not representative of how ash-amended asphalt concrete will exist as an in-service pavement material. In this application, water will infiltrate through the pavement (albeit, slowly) during which it may come in contact with ash particles and leach some contaminants of potential concern (COPC). To study this scenario, a new test method was developed by the UF research team: the Modified Permeability Test. This method combines the liquid-to-solid ratios prescribed by EPA Method 1314 ("column" testing) while using the concept and device (i.e., permeameter) from FM 5-565, Florida Method of Test for Measurement of Water Permeability of Compacted Asphalt Paving Mixture, for measuring the permeability of a compacted asphalt concrete specimen. To promote flow through an asphalt specimen, the apparatus was modified to allow for a constant head using reagent nanopure water. This testing procedure allows water to infiltrate through the voids of a compacted asphalt specimen.

Prior to performing this test, asphalt specimens were cut into 2-inch sections. Another factor that was examined was the air void content of asphalt specimens. In this case, asphalt specimens using 15% by mass of WTE bottom ash from two sources (including a control with no ash) were

prepared in duplicate at 6% and 8% air voids (12 specimens total). The rationale behind this variable is that it is believed that water will flow faster through asphalt pavement with a higher air void percentage. This effect may impact COPC leachability.

The water that infiltrates through the asphalt specimen is sampled at different liquid-to-solid ratios prescribed by EPA Method 1314 ("column" testing) to determine how leaching of COPC may change over time. The cumulative mass release of COPC from the Modified Permeability Test will be compared to EPA Method 1315 data to examine how they differ or are alike.

Work planned for the next reporting period:

In the next reporting period, the UF research team will continue developing the report associated with this project. This report will include the literature review conducted for the purposes of this work along with the experimental results gathered on WTE ash aggregate properties (e.g., gradation, specific gravity, absorption), and ash-amended concrete and asphalt by UF thus far.

In addition, further testing of cut asphalt specimens will be conducted using the Modified Permeability Test developed during this current reporting period.

Metrics:

Graduate Students

Name	Rank	Department	Professor	Institution
Kyle Clavier	Master's Student	Environmental Engineering	Timothy Townsend	University of Florida
Fernando Oliveira	Master's Student	Environmental Engineering	Timothy Townsend	University of Florida
Linda Monroy Sarmiento	PhD Student	Environmental Engineering	Timothy Townsend	University of Florida
Matthew Schafer	Master's Student	Environmental Engineering	Timothy Townsend	University of Florida
Chad Spreadbury	PhD Student	Environmental Engineering	Timothy Townsend	University of Florida
Stephen Townsend	Master's Student	Environmental Engineering	Timothy Townsend	University of Florida

Undergraduate Students

Name	Rank	Department	Professor	Institution

Sara Fox	Undergraduate Research Assistant	Environmental Engineering	Timothy Townsend	University of Florida
Edward Galvan	Undergraduate Research Assistant	Environmental Engineering	Timothy Townsend	University of Florida
Jarrod Petrohvich	Undergraduate Research Assistant	Environmental Engineering	Timothy Townsend	University of Florida

TAG Meetings:

No Technical Awareness Group (TAG) meetings were held during this period.