

## **QUARTERLY PROGRESS REPORT**

September 1, 2017 - November 30, 2017

**PROJECT TITLE:** Research Advances on the Use of Solid Wastes in Concrete and Asphalt

**PRINCIPAL INVESTIGATOR(S):** Timothy G. Townsend

**AFFILIATION:** Professor, University of Florida  
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:** November 30, 2017

**PHONE NUMBER:** 352-392-0846

**PROJECT WEBSITE:** <https://www.essie.ufl.edu/home/townsend/research/bu/research-advances-on-waste-in-asphalt--concrete/>

---

### **Work accomplished during this reporting period:**

During this time period, work has been started on the use of recycled glass powder and waste-to-energy (WTE) bottom ash in portland cement concrete mixes. A suite of mixes has been created that will be used to evaluate the potential of ground glass powder and WTE bottom ash for use in concrete. Specimens have been created in accordance with the standard laboratory procedure ASTM C192 for the determination of alkali-silica reactivity (ASR) as per test method ASTM C1293. A total of 16 concrete mixes have been cast and are currently being measured (in triplicate) which include control bars containing traditional aggregates and three experimental groups containing a 30% replacement of traditional coarse aggregate with WTE bottom ash from three different Florida facilities. Other experimental groups include cementitious materials replacements of 20% with ground glass and fly ash, which are pozzolans are known to control ASR. The concrete was amended with the pozzolan to evaluate benefits with respect to mitigation of expansion. Expansion is known to occur when concrete is amended with WTE bottom ash. To date these bars have shown no indication of deleterious alkali-silica reaction.

UF researchers are currently developing an experimental plan for utilizing processed/treated WTE bottom ash as an aggregate replacement in asphalt concrete. This plan involves conducting an extensive literature review on prior works that pretreat WTE ash and assessing improvements in physical performance (e.g., particle size distribution, organics content) and changes in chemical properties (e.g., heavy metal leachability, chloride content, pH).

### **Work planned for the next reporting period:**

UF researchers will continue the literature review of WTE ash pretreatment/processing techniques and finalize an experimental approach for utilizing this processed/treated WTE bottom ash aggregate in asphalt concrete. Representative WTE bottom ash samples will also be collected from various Florida WTE facilities for this purpose. UF researchers will also continue monitoring cast portland cement concrete specimens for indication of deleterious alkali-silica reactions and proceed with additional mixes with changing variables (e.g., additions of glass powder and WTE bottom ash subjected to various treatments/processing).

### **TAG Meetings:**

On October 6, 2017, a Technical Awareness Group (TAG) meeting was held at the Florida Department of Environmental Protection (FDEP) in Tallahassee, FL. The UF research team presented results and recommendations from a previous project supported by the Hinkley Center, *Use of Solid Waste in Asphalt and Concrete in Florida*. The results from that study reported data and findings from UF research regarding asphalt and concrete, a review of the literature, and some background behind the impact of this work. The presentation also introduced this current Hinkley Center project, *Research Advances on the Use of Solid Wastes in Concrete and Asphalt*, and discussed the potential this work has on improving the state of beneficial use of WTE ash. This meeting was attended by various members from industry, FDOT, consulting, and local governments. The meeting was well received and there was in-depth and substantive discussion that improved the understanding of both the UF team as well as the attendees. The PowerPoint presentation is available on this project's website.

#### *Invited TAG members include:*

- John Schert, Hinkley Center
- Cory Dilmore, FDEP
- Ramana Kari, SWA of Palm Beach County
- Joe O'Neill, Hillsborough County
- Kim Byers, Hillsborough County
- Cindy Pelley, Hillsborough County
- Jason Gorrie, JMG Engineering, Inc.
- John Power, Pasco County
- Fletcher Herrald, FDEP
- Kim Walker, FDEP
- Timothy Ruelke, FDOT
- David Dee, GBW Legal
- Christopher Eckert, City of Tampa
- William Embree, Pinellas County
- Keith Howard, Lee County
- Ron Beladi, Neel-Schaffer
- David Gregory, Orange County
- Joost Böggemann, INASHCO
- Johanna Faddis, Miami-Dade County
- Scott Morrison, Meldgaard

- Jay Berry, Wheelabrator
- Elizabeth Kromhout, FDEP
- Koren Taylor, FDEP
- Joe Dertien, FDEP
- Mohammad Sayemuzzaman, FDEP

**Metrics:**

- *Graduate Students:*

Name	Rank	Department	Professor	Institution
Kyle Clavier	PhD Student	Environmental Engineering	Timothy Townsend	University of Florida
Yalan Liu	PhD Student	Environmental Engineering	Timothy Townsend	University of Florida
Chad Spreadbury	PhD Student	Environmental Engineering	Timothy Townsend	University of Florida

- *Undergraduate Students:*

Name	Rank	Department	Professor	Institution
Ian Vicnansky	Undergraduate Research Assistant	Civil Engineering	Timothy Townsend	University of Florida
Mohamad Shawar	Undergraduate Research Assistant	Civil Engineering	Timothy Townsend	University of Florida

- *Research publications resulting from THIS Hinkley Center project: **None.***
- *Research presentations resulting from (or about) THIS Hinkley Center project: **TAG Meeting (10/06/17), see project website.***
- *Who has referenced or cited your publications from this project: **None.***
- *How have the research results from THIS Hinkley Center project been leveraged to secure additional research funding? What additional sources of funding are you seeking or have you sought? **None.***
- *What new collaborations were initiated based on THIS Hinkley Center project? **None.***
- *How have the results from THIS Hinkley Center funded project been used (not will be used) by the FDEP or other stakeholders? **None.***