Date: 27 April 2018

Project: Performance of Single-Family Residential Buildings in Hurricane Irma – Evaluating the Impact of the 1st March 2002 Florida Building Code and Homeowner/Occupant Survey on Risk Perceptions, Mitigations, Evacuation

Project Sponsor: Florida Department of Business and Professional Regulation
Principal Investigator: David O. Prevatt
                                  University of Florida, Gainesville, FL USA

UF Research Contract Number: 0058409
Project Date: Project Start: 6 November 2017
                         Project End: 30 June 2018

Subject: **Status Report 2**

   This Interim Report summarizes our work performed and results for Phase II of the project. UF leads this exercise, along with sub-contractor, Auburn University and Consultant Carnegie-Mellon University. The research will extract additional data from our post-Hurricane Irma damage survey, specifically to evaluate the effectiveness of the Florida Building Code on the structural performance of residential structures affected by hurricane-strength winds and storm surge.
   This report is divided into three sections summarizing the efforts of the three participating universities so far, and cataloguing remaining work.

Background:

   The University of Florida's Wind Hazard Damage Assessment Group cataloged the damage to over 1,100 homes distributed throughout Florida. Using this dataset, the researcher will select approximately 100 homes for further study. Homeowners/Occupier will be contacted and interviewed to share their experience during the hurricane and associate evacuation, as well as to detail the extent of interior damage their residences suffered, and their economic losses.

1.   CARNEGIE MELLON UNIVERSITY (CMU) STATUS REPORT

- February – March 2018:
    - Drafted and finalized survey protocol
- March 2018:
    - Drafted recruitment materials including mailers and postcards
    - Obtained addresses for 784 households in areas impacted by Hurricane Irma with exterior damage
    - Submitted IRB application for approval
- April 2018:
    - Received IRB approval
    - Recruitment mailers sent out to 784 households on April 6, 2018 (19 surveys of interior damage completed)
    - Recruitment postcards sent out to 784 on April 24, 2018 (a total of XX surveys of interior damage completed)
    - A total of 76 mailers returned, indicating the homeowner is no longer receiving mail at residence. Thus total response rate of 19/708 or 2.7%.
    - It is important to note that in a similar study with similar recruitment methods, we sent out mailers to 30,000 residents and received 294 completed surveys for a response rate of ~1%.

2.   AUBURN UNIVERSITY (AU) STATUS REPORT

- February, March 2018
  - Finalized QC of Hurricane Irma dataset. The dataset of 1121 records contains the following number of structures by assessment type:

Table 1. Breakdown of records in dataset by assessment type

Assessment Type	Number of Assessments
Single Family Residence	850
Mobile Home	155
Apartment/Condo	31
Utilities	17
Churches	8
Retail Store	7
Hotel/Motel	6
Other	47

Out of the 850 single-family residences, 40 are missing critical information related to the location, address or other characteristics that make them unsuitable for inclusion in this study. Taking these out leaves a final database of 810 single-family homes available for further analysis. Of the 810 single-family homes, 155 were built in 2002 or later, and 655 in 2001 or prior.

  - Records were subdivided into separate geographic regions small enough such that a common peak wind speed estimate could be assigned to all homes within the geographic subset. Wind speeds were estimated in each geographic subset using the wind fields of peak 3-second gust wind speeds at 10 m height in open terrain provided by Applied Research Associates (Vickery et al. 2017).

Table 2. Geographic subsets and estimated peak 3-second gust, 10 m height, open exposure wind speed within each region.

Region	Number of Homes	Peak Gust Wind Speed (mph)
Marco Island	170	107
Big Pine Key	84	117
Everglades City	71	113
Little Torch Key	59	114
Naples	59	100
Goodland	56	109
Cudjoe Key	50	113
Ramrod Key	47	113
Marathon	46	120

Region	Number of Homes	Peak Gust Wind Speed (mph)
Sugarloaf Key	32	113
Ponte Vedra Beach	30	60
Summerland Key	22	114
Key West	21	112
St. Augustine	4	135 [1]
[1] Damage induced by cyclone-induced tornado, rated EF2 by National Weather Service.		

- April 2018
  - Data is being assimilated regarding surge height / flood depth above ground level at the location of each surveyed structure from the United States Geological Survey (USGS).
  - Vector file of the Florida coastal construction control line (CCCL) has been obtained and is being used to separate structures as being seaward or coastward of the CCCL. Clarity needed on homes in the Keys as there is no CCCL present in these areas.
  - Building permit records are being collected for all homes which have so far responded to the mailers from CMU. Permit records are available online through the respective county websites.

3.   UNIVERSITY OF FLORIDA (UF) STATUS REPORT

- UAV images are being processed with the Pix4D software to create digital 3D point cloud from overlapping photographic imagery.
- These georeferenced images will be used along with the photographs from the ground surveys to estimate the extent of damage to specific houses, down to each 3D point in the point cloud. Measurements are made directly in the 3D model to more accurately estimate damage not visible from the ground.

Table 3. Grids created from UAV aerial photographs.

Location	PD4 File Name	Latitude	Longitude	Number of Pictures
St. Augustine	St_Aug_Grid	29.72117	-81.23535	349
South Ponte Vedra Beach	Ponte_V_Grid	30.01006	-81.32037	71
Little Torch Key	Torch_Key_N_Grid	24.67705	-81.38881	172
Little Torch Key	Torch_Key_S_Grid	24.65517	-81.38676	264

- Once houses are identified, building permit information that documents post-hurricane repairs will be collected and reviewed to determine extent of repairs, costs if available.
- Currently UF is identifying the specific appraiser's website and running trials to extract this information. No two websites present the information in the exact format – so this activity for now is done by trial and error.
- Examples for three houses collected, will be provided for the following categories:
    - Permit Status
    - Permit Type
    - Contractor/Applicant pulling permit
    - Valuation of Permit
    - Issue Date