

Deriving Residential First Floor Elevations Located in Galveston Using UAS-Based Data

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Accurate first-floor elevations (FFE) are the key missing variable in the field of flood risk planning and management. In landscapes where inches matter, the inability to precisely measure and map first floor elevations for a large number of structures has confounded practitioners and researchers alike. The result of this lack of data make it difficult to accurately quantify the degree and location of impacts during flood events, and evaluate and implement policies that will reduce risk over the long term. To date, decision makers and hazards scholars have relied on inaccurate elevation assumptions and “ballpark” estimates.

Our efforts were used to develop a rapid, accurate, and scalable methodology for capturing first-floor building elevations. TCRF funds were used to purchase an RTK-enabled UAS, which was used to obtain georeferenced aerial imagery, which was further developed to create detailed 3D models that were accurate within +/- 2 cm. From these models, ground and FFE measurements were obtained to better assess the risk and potential flood damage. Three residential communities within Galveston Island were chosen based on location, elevation differences, and structure types. Results have thus far indicated that our approach is feasible and accurate. We are currently awaiting a data request for traditional survey-based FFEs to complete a statistical analysis of our results.

TCRF funds were used to support Mr. Nicholas Diaz, a Master’s student in the Department of Marine Sciences and a critical member of the research team. Through our efforts Mr. Diaz, along with the faculty investigators, have presented a poster at one conference, and have been accepted to present at a second conference in late October. This work has also spurred other potential innovations, including automating processes through deep-learning methods, which will be explored through the continued employment of Mr. Diaz and post-doctoral researchers in the Center for Texas Beaches and Shores.

Finally, TCRF funds were also used to purchase three computers, necessary to process the large amounts of aerial and structural imagery captured during the project period. These machines are now housed within the Coastal Geospatial Lab. When not being used for this project, they are openly available to other students to promote other geospatial analyses.