

ADDENDUM: TECHNICAL APPROACH AND PROPOSAL FOR VULNERABILITY INDEX DEVELOPMENT, MAPPING AND ASSESSMENT

MARCH 8, 2018

TOWN OF PALM BEACH

Woods Hole Group respectfully submits this request for an addendum to the original scope and budget for the flood risk vulnerability investigation. The addendum request follows discussion at the January 23, 2018 Shore Protection Board meeting. At this meeting, an update on project progress was provided, along with recommendations for next steps both within the existing approved scope and for supplemental analysis outlined herein. The original technical approach (Attachment A) was provided to assist the Town of Palm Beach plan for present and future risks of inundation and coastal flooding. This work is specifically included in the 10-year coastal program as Item #7, which was developed in 2013. Based on our work to date, we recommend the use of a dynamic probabilistic flooding model rather than an enhanced bathtub model approach as originally planned.

Since the original scope was developed, the methods for analyzing this type of flood risk have advanced substantially. For instance, a probabilistic method was developed by Woods Hole Group in conjunction with Mass DOT, U.Mass Boston, and other partners under grant funding by the Federal Highway Administration. The outcome of this project (which required independent funding of nearly \$1M) was a method that received a Federal Highway Environmental Excellence Award for 2017 and acknowledgement in the Wall Street Journal¹. Additionally, the initial data gathering and analysis steps in the project, an essential part of any vulnerability investigation regardless of the modeling approach, led us to reconsider the most appropriate model.

We are proposing to apply a similar version of this new and improved technical approach (i.e., probabilistic and dynamic model) for Palm Beach. In addition to providing more reliable information, this approach also is necessary because our analysis to date shows there are areas of the barrier island that are vulnerable to overtopping under certain storm and water level conditions. Without the dynamic approach proposed herein, the flood risks will be overestimated. Since the purpose of this vulnerability assessment overall is to provide the Town with realistic planning level information to understand present and future flood risks to Town infrastructure as the basis for prioritizing public works projects, we want to ensure the Town has the best information at its disposal.

¹ "Boston Agonizes Over How to Protect Itself From Future Storms", WSJ, January 18, 2018.

This modified approach is recommended because:

- As a barrier island, the TOPB is in a unique position between the ocean and the intercoastal waterway. Based on analysis we completed to date on the project, we identified flooding pathways where there is potential for overwash between the ocean and the lake under certain flood scenarios (e.g., Figure 1 identifies some preliminary areas of focus). These were discovered through the LiDAR and aerial photographic analysis in the office, and then ground-truthed onsite. Based on these interim findings, we recommend shifting the modeling from a traditional bathtub model to the dynamic modeling described herein. Based on these new findings, the bathtub modeling approach would sacrifice resolution in distinguishing where inundation is most problematic, and overestimate risk.
- Nuisance flooding is an important contributor, as evidenced by the regular flooding of the Lake Trail at high tides. This flooding pathway (which is not generally believed to be overtopping the seawall/bulkhead) would not be captured by bathtub approaches of the original scope.
- Probabilities provide more powerful decision-making and planning tools. With probabilistic maps, the Town can not only identify areas and assets at risk of flooding, but also have an estimate of the annual likelihood. Some assets will have a higher risk tolerance than others (e.g., open park space can accommodate flooding more than a fire station or an evacuation route). Having this information will help prioritize future projects.
- Dynamic models will extend the planning horizon. Without the dynamic model, we are currently unable to perform a realistic assessment beyond the 2030 time horizon.
- New dynamic probabilistic flooding model are available and have been proven to provide more useful information (they weren't readily available when the original scope was developed). Sample output from the dynamic modeling at another site is shown by Figure 2.

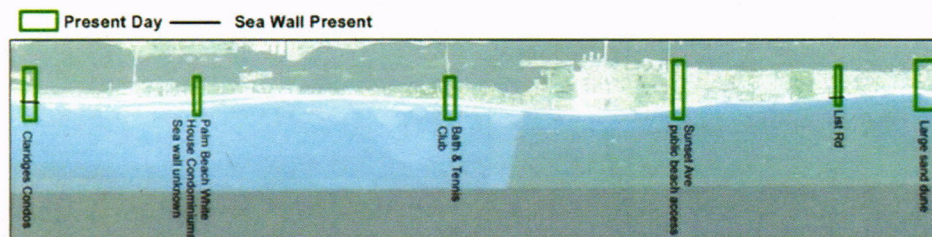


Figure 1. Preliminary areas of focus for potential overwash present day.

Given the uniqueness of the TOPB, the power of dynamic models and the availability of proven dynamic probabilistic flood models, we recommend modifying the originally proposed modeling approach for the TOPB. The work completed to date was needed regardless of the final modeling approach, and will be used in the dynamic model.

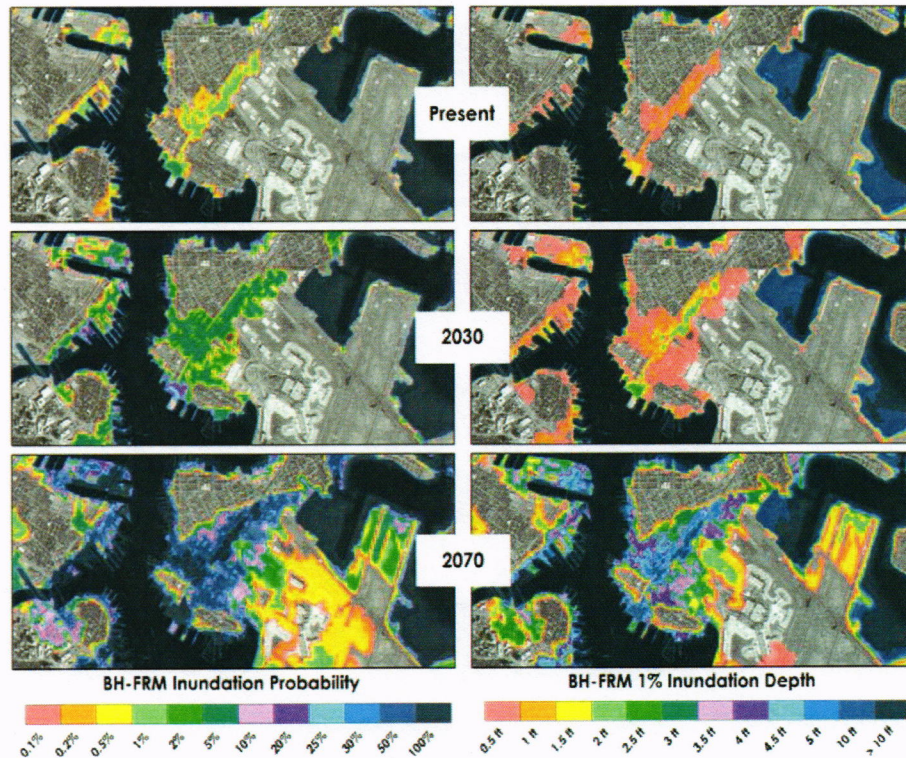


Figure 2. Sample dynamic modeling output showing percent probability of flood risk in Boston for present and future storm scenarios.

BUDGET

The implementation of a dynamic probabilistic flooding model will require additional budget of \$59,950. This will include the dynamic modeling recommend above, along with incorporation of flood pathways associated with nuisance flooding on the Lake Trail. We recommend the work continue on a time and materials basis so that resources can be conserved and dedicated where most needed. This incremental work will take the place of some of the originally proposed activities so there is an overall increase in efficiency. The dynamic modeling requires a larger effort and associated budget than the originally proposed bathtub model; however, we are able to recognize cost-efficiencies. First, the base model has already been set-up and tested for other projects under federal highway grants and other independent sources of financing. Second, the work completed to date informs and provides a foundation for the dynamic modeling effort. The unused portion of the budget originally intended for the bathtub approach in addition to the budget proposed herein will allow for completion of the proposed dynamic modeling. An approximate breakdown of the labor hours by category is provided on Table 1. As we have discussed, this additional budget assumes that the TOPB will provide seawall elevation data and guidance regarding the ranking of key assets. We will provide a separate document listing the additional requirements from the Town for planning purposes. The level of effort also will scale with the overall number of specific assets on each property, and total number of areas of concern.