

Moving Forward Toward Hurricane Surge Resilience

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Since Hurricane Ike devastated portions of the Houston-Galveston area in 2008, many on the east side of Houston and around Galveston Bay have been promoting surge reduction strategies to provide some level of protection against the next “big one”. Our state and local politicians have been advocating for federal assistance to pay for this protection, yet to date nothing has come of it. Then came Harvey.

Hurricane Harvey has changed the flood protection and management terrain in Houston. In Harvey, we experienced a huge rainfall event beyond prior experience. Luckily, we did not have a huge surge event to go along with it. But the reality is that, after Harvey and with Irma devastating Florida, there are now serious competing needs for federal aid and support. And thus, we have to find more cost-effective solutions in order to be able to maximize the use of limited federal funds, if any, as our region struggles to recover from a multi-billion-dollar tragedy.

This funding situation affects surge protection strategies for our area in the following way. The “Ike Dike” is a major coastal barrier proposal to provide the residents and industries around Galveston Bay with some level of protection from surge flooding. It is effective for storms like Ike, but not for larger hurricanes, like Irma, and is very expensive, costing upwards of \$10 billion. There is, however, another option that provides more benefits than the Ike Dike for Houston and Harris County, yet at a cost of about \$3 billion. That option is known as the “Mid-bay” alternative developed by the SSPEED Center. Given the magnitude of the damage from Harvey and the federal money already allocated for Houston for its recovery, it makes sense for Houston and Harris County residents and local/state politicians to seriously consider implementing this alternative as a less costly yet more effective surge protection system.

The Mid-bay alternative is one part of the larger Houston-Galveston Area Protection System (H-GAPS) developed by the SSPEED Center for providing surge protection for this area. H-GAPS includes many structural pieces that can be implemented in short order and can be combined into a regional surge protection strategy, which includes both a coastal barrier system as well as an in-bay barrier system. The Mid-bay alternative, as shown in Figure 1, proposes an in-bay berm system (with periodic gate structures for circulation and small boats) that runs generally along the Houston Ship Channel, starting in western Chambers County and coming across to connect to the Ship Channel’s existing dredge disposal sites, then running south along these disposal sites just east of and next to the channel, crossing

over the Houston Ship Channel near San Leon (including a large navigation gate for ship traffic), and then continuing down the western side of the ship channel and connecting with the Texas City surge protection levee. With this alternative, a backside levee for the City of Galveston is also proposed, along with elevated roads along western Galveston Island and the Bolivar Peninsula to provide additional surge protection. The effectiveness of the Mid-bay alternative in reducing the surge impact on the bay's western shoreline communities and along the Houston Ship Channel from a major hurricane is shown in Figure 2. And to reiterate, this Mid-bay solution along with the backside levee and elevated roads in Galveston can be constructed for about \$3 billion.



Figure 1. The elements of the Mid-bay alternative as well as a backside levee for the City of Galveston and elevated roads on Bolivar Peninsula and west Galveston Island.

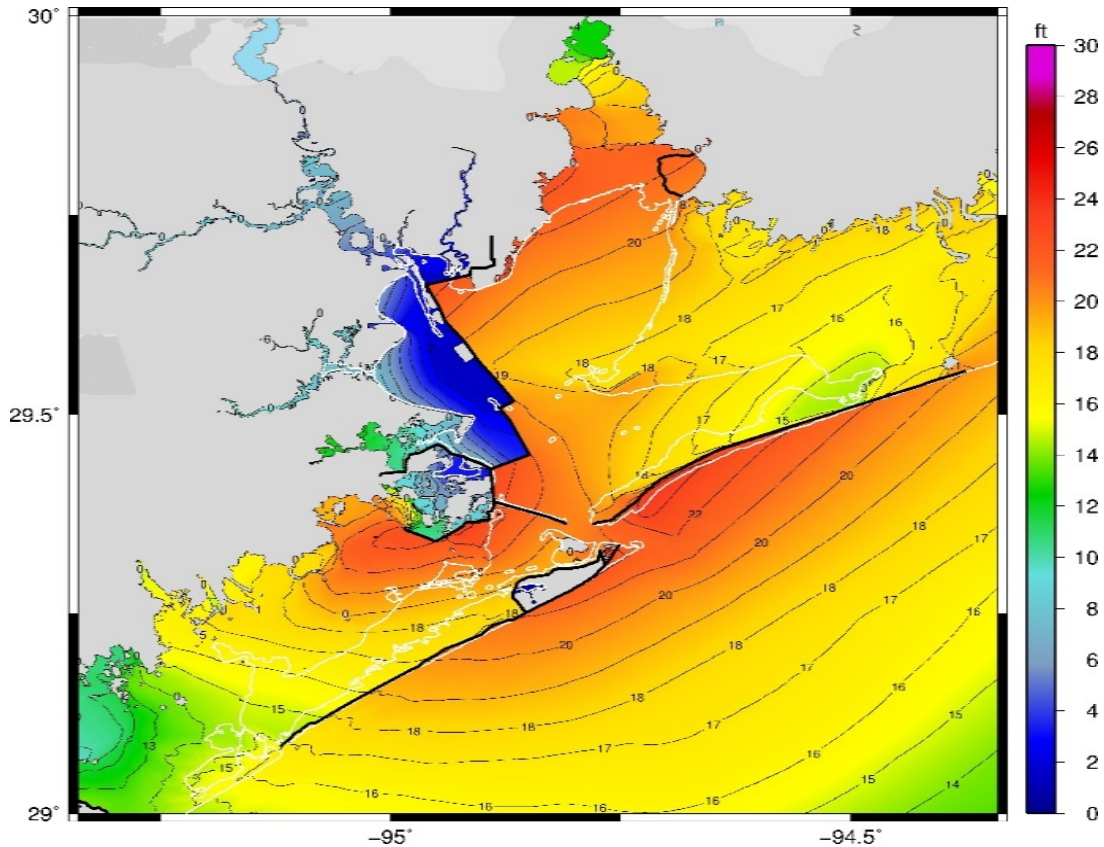


Figure 2. Diagram of surge protection from major hurricane offered by the Mid-Bay alternative, with a backside Galveston levee and elevated roads on Bolivar Peninsula and west Galveston Island.

There is no doubt that \$3 billion can be raised by our local and state governments if we decide to do it. And the project can be designed by local engineers and constructed by local contractors under permits issued by the U.S. Army Corps of Engineers. The application for a Corps of Engineers' permit of this scale will take many months to prepare and the processing and issuance of the permit could take up to an additional 18 months, including full environmental review; but then we will have a viable surge protection plan for our most vulnerable communities, with construction to begin perhaps as early as two years without having to wait for any money from the federal government.

As shown in Figure 2, the Mid-bay alternative offers significant protection for bay area residents and industry. In-bay berms rising to about 25 feet already exist along the upper part of the Houston Ship Channel, and the Texas City protection currently exists. With this solution in place, there is little to no surge along the west side of Galveston Bay for even a large hurricane, and with the ring levee, the City of Galveston is protected as well. Additionally, the elevated roads provide some protection for the rest of the bay shoreline. Finally, this in-bay berm system can be used to serve future disposal needs for dredging associated with the Houston Ship Channel and with beneficial use of this material.

State-of-the-art surge modeling completed by the SSPEED Center indicates that the Mid-bay alternative will offer about \$45 billion dollars in surge damage reduction benefits from a strong hurricane for the \$3-billion-dollar investment. Similarly, the presence of this surge reduction system can prevent the inundation of the Houston Ship Channel industries that would accompany a major hurricane coming ashore near the south end of Galveston Island. If that were to happen, over 2,200 storage tanks would be flooded, potentially leading to the release of an estimated 50 million gallons of oil and hazardous substances, destroying our industrial base and likely creating the worst environmental disaster in United States history.

We, as a community, should proceed now and take the necessary steps to develop this permit application as soon as possible. At worst, a permit application is prepared and the process yields a permit for a surge protection plan that is ready to get immediately constructed once funding becomes available. On the other hand, once the permit is issued and if federal funding has not arrived yet for the Ike Dike (which is too expensive to be built with local money), then we move forward with building the Mid-bay alternative. In the long run, this in-bay surge protection system will be functional and offer significant protection with or without the coastal barrier or the Ike Dike.

And while we are at it, we should think Texas big about what this Mid-bay protection system might be in terms of national and global symbolism. This is particularly true after Harvey. A system such as this could represent a world-class design statement about who we are as Texans and our determination to protect ourselves with our own ideas and with our own people. And as shown in Figures 3 and 4, the results could be dramatic. Recently, the design of the in-bay barrier system shown below won the 2017 Studio Award from the Texas Society of Architects.



Figure 3. Conceptual diagram of potential urban design alternatives within the Mid-Bay alternative prepared by Rogers and Associates for SSPEED Center.



Figure 4. Architectural rendering of gate location and associated design features for Mid-Bay alternative by Rogers and Associates.

We as a community are NOT powerless to act in order to protect and ensure our long-term economic, ecological and social future. We just have to find the will and courage to do it and not spend too much money on any one single component, but rather spread the limited money to begin to address our surge issues. To do this, we need to be flexible and not stuck to single approaches, and we need to consider and be willing to pay for much of this work NOW.