

Joint Interim Committee to Study a Coastal Barrier System

Report to the 84th Texas Legislature

December 1, 2014



Co-Chairman:  
Senator Larry Taylor  
Representative Joe Deshotel

Clerk:  
Nicole Sunstrum



Joint Interim Committee to Study a Coastal Barrier System

December 22, 2014

The Honorable David Dewhurst  
Lieutenant Governor of Texas  
P.O. Box 12068  
Austin, Texas 78711

The Honorable Joe Straus  
Speaker, Texas House of Representatives  
P.O. Box 2910  
Austin, Texas 78768

Dear Lieutenant Governor Dewhurst and Speaker Straus:

House Bill 3459, passed by the 83rd Legislature during the regular session, established the Joint Interim Committee to Study a Coastal Barrier System. The Committee submits this report in accordance to HB 3459.

The Committee has carefully considered all of the testimony received on this issue and looks forward to continued discussions during the 84th legislative session.

Respectfully submitted,

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Co-Chair Larry Taylor

Handwritten signature of Joe Deshotel in black ink.

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Co-Chair Joe Deshotel

Handwritten signature of Greg Bonnen in black ink.

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Senator Bob Deuell

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Representative Greg Bonnen



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Senator Rodney Ellis



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Representative James Frank



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Senator Kevin Eltife



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Representative Craig Goldman



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Senator Craig Estes



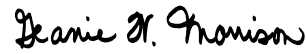
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Representative Abel Herrero



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Senator Troy Fraser



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Representative Geanie Morrison

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Senator Glenn Hegar



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Senator Juan "Chuy" Hinojosa



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Representative Chris Paddie



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Senator Eddie Lucio, Jr.



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Representative Tan Parker

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Senator Robert Nichols



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Senator Kel Seliger

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Representative David Simpson

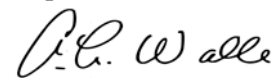


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Representative Drew Springer

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Senator Carlos Uresti



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Representative Armando Walle

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## **Executive Summary**

The Texas Gulf Coast is home to a vital part of Texas' vibrant economy. Its location however, leaves the region vulnerable to hurricanes and other damaging weather events. In the 83rd legislative session, the legislature made significant efforts to further protect access to public beaches, private property, and the Texas coastline.

House Bill (HB) 3459, by Representative Craig Eiland and Senator Larry Taylor, permitted the Land Commissioner to issue an order, following a storm, which could suspend line of vegetation determinations for a period of up to three years. The suspension allows property owners to repair and or rebuild their homes within local guidelines and gives the beach time to stabilize and heal itself.

In addition, the bill instructed the legislature to establish a joint committee to study the desirability and feasibility of constructing a coastal barrier protection system. The Joint Interim Committee to Study a Coastal Barrier System met on August 4, 2014, in Galveston, Texas to provide a forum for discussion on this complex issue and gather information for the upcoming 84th session. More information about the creation of the joint committee can be found under the Committee Composition and Proceedings section.

## **Committee Composition and Proceedings**

The Lieutenant Governor and Speaker of the House were instructed to appoint members to the joint committee consisting of the Senate Committee on Natural Resources, the House Committee on Land and Resource Management and two additional coastal members from each house. Senator Larry Taylor and Representative Joe Deshotel were appointed by Lieutenant Governor Dewhurst and Speaker Straus as Co-Chairs. In addition, Senator Eddie Lucio of Brownsville, Representative Greg Bonnen of Friendswood and Representative Geanie Morrison of Victoria were selected to serve on the committee. Full membership is as follows:

### **Senate Members:**

Co-Chair Larry Taylor  
Bob Deuell  
Rodney Ellis  
Kevin Eltife  
Craig Estes  
Troy Fraser  
Glenn Hegar  
Juan "Chuy" Hinojosa  
Eddie Lucio, Jr.  
Robert Nichols  
Kel Seliger  
Carlos Uresti

### **House Members:**

Co-Chair Joe Deshotel  
Greg Bonnen  
James Frank  
Craig Goldman  
Abel Herrero  
Geanie Morrison  
Chris Paddie  
Tan Parker  
David Simpson  
Drew Springer  
Armando Walle

The Committee held one hearing to gather information and public input. Academics, business leaders, local officials and coastal residents gave testimony on their experiences and the competing coastal barrier protection concepts.

## **Background and History**

The Texas coast, especially Galveston, has long been susceptible to damage from storms and major weather events. Since 1980, at least 69 tropical or subtropical cyclones affected the State of Texas. According to David Roth of the Weather Prediction Center, "a tropical cyclone makes landfall along the coastline about three times every four years, and on any 50 mile (80 km) segment of the coastline a hurricane makes landfall about once every six years."<sup>i</sup> In addition to tropical storms, Texas experienced 12 major hurricanes between 1851 and 2005.<sup>ii</sup> With such active weather patterns, the Gulf Coast remains vulnerable to natural disasters year after year.

In 2008, Hurricane Ike hit the Texas coast causing severe damage. It is speculated that if the hurricane had hit further west, the destruction could have been catastrophic. Before it landed, there was a predicted 25 foot storm surge in Galveston Bay. This could have caused upwards of \$100 billion in damage, killed hundreds of people, left thousands more homeless and jobless, and devastated the largest petrochemical complex in the nation.<sup>iii</sup>

## **Importance of protecting the Bay Area/Houston Region**

The Bay Area/Houston Region is home to six million people and growing in numbers daily. There is a huge human interest in protecting the homes and lives of not only coastal residents, but those Texans whose jobs are dependent on a healthy and safe coast.

The economic interest in the region is huge. It is home to the second largest petrochemical complex in the world and is the number one exporting region in the United States (\$110 billion) with a regional GDP of \$450 billion.<sup>iv</sup> In addition, there has been over \$50 billion in private sector investment made in the area. The Houston Ship Channel alone

"supports more than 150,000 jobs for Houstonians and more than one million jobs in Texas. It generates annual payrolls in excess of \$13 billion and more than \$178 billion in economic impact, with customers at the Port of Houston contributing nearly \$5 billion annually in tax revenues."<sup>v</sup> "The Perryman Report estimates that a 'Katrina-like' storm would cause aggregate losses to the Texas economy of \$73 billion in gross product, \$61.3 billion in income and 863,000 jobs."<sup>vi</sup>

Various lucrative industries are supported by the people and resources in the region. Those industries include aerospace, chemical, oil and gas, healthcare, tourism, maritime activity, and education. The Bay Area/Houston Region is currently home to over one million jobs, and will increase with the \$35 billion planned chemical plant expansions over the next five years.<sup>vii</sup>

There is also a large environmental interest in protecting Galveston Bay; it is home to the 7<sup>th</sup> largest estuary and produces more seafood than any other estuary (except Chesapeake Bay).<sup>viii</sup> In addition to seafood production, the Bay has large and active recreational boating and fishing communities.<sup>ix</sup>

### **Damage from Hurricane Ike**

Hurricane Ike resulted in extensive and costly damage; 34 Texas counties were declared federal disaster areas. In Harris County there were 92,000 homes damaged, 2,400 reported injuries, 11 fatalities, and 7,100 businesses damaged. Galveston County was left with 24,165 structures damaged (including residential), 646 businesses damaged, and \$428 million in other damages. Chambers County was extensively affected with 700 homes destroyed, and 3,418 homes with major damage. Bolivar Peninsula alone had 3,266 homes



destroyed. Other losses included 1,100,000 damaged traffic signs and \$132 million in damages to transportation systems.<sup>x</sup> The extent of this destruction could have been far worse had the storm landed in a different location on the coast.

### **Coastal Barrier Protection**

After Hurricane Ike, ideas began forming about how to protect the Texas coast. Texas A&M University at Galveston (TAMUG) and the Severe Storm Prediction, Education, and Evacuation from Disasters Center at Rice University (SSPEED) developed coastal protection concepts to be applied to the Texas Gulf Coast. TAMUG developed the "Ike Dike" as a "concept to prevent major storm surge"<sup>xi</sup> at the coastline while SSPEED has been working on designs for surge protection at the entry of the Port, the "Centennial Gate."<sup>xii</sup> Both concepts were presented and discussed at the August 4, 2014 Joint Interim Committee hearing.

## **Issues and Findings**

The committee, tasked with studying the desirability and feasibility of constructing a coastal barrier system, held a public hearing in August at Texas A&M University Galveston and invited testimony was provided by two agencies involved in the coastal barrier projects, the Texas General Land Office (GLO) and US Army Corps of Engineers.

Other invited testimony included the SSPEED Center at Rice, Texas A&M Galveston, and the Economic Alliance Houston Port Region. Public testimony was then taken and included comments from private citizens, interest groups, the Bay Area Coastal Protection Alliance, Bay Area Houston Economic Partnership (BAHEP), and the Gulf Coast Community Protection and Recovery District. The hearing revealed different roles and interests of the agencies, academic institutions and interested parties.

## **General Land Office**

Currently, there are multiple studies underway to determine the best coastal protection system for the Gulf Coast. The Gulf Coast Community Protection & Recovery District (the District) is studying proposed coastal concepts with the goal of determining the best alternatives. The District was established through an Executive Order by Governor Perry and the Governor's Commission for Disaster Recovery and Renewal Board of Directors, comprised of judges from six counties and three at-large members.<sup>xiii</sup>

The study of proposed concepts is being led by Dannenbaum Engineering to investigate the feasibility of reducing the "vulnerability of the upper Texas coast to hurricane surge and flood damages through the construction of an integrated flood protection system that relies on natural or nature based features, nonstructural and structural interventions."<sup>xiv</sup>

The final report will be presented to the District board and the GLO in May 2016 for review and comment. After review and acceptance by the GLO, the report will be made available to the public through the District website and any other relevant public forums.<sup>xv</sup>

### **US Army Corps of Engineers**

The Coastal Texas Study is one of a few studies authorized by Congress in fiscal year 2014 that will allow the Corps to examine coastal storm damage reduction and ecosystem restoration for the entire coastline of Texas.<sup>xvi</sup> "Texas is one of the few states that does not have a coastal plan, and this study is an opportunity to develop a comprehensive plan for the entire coast and also allows the potential to conduct a detailed focus on a specific region."<sup>xvii</sup> The Corps has recently started the reconnaissance phase of this project and will host a series of public meetings in each of the four major regions along the coast. One of the key purposes of the reconnaissance phase will be identifying a non-federal sponsor or sponsors who will share in the cost for the feasibility phase of the project.<sup>xviii</sup>

### **SSPEED Center at Rice University**

The SSPEED Center, led by Rice University, was formed in 2007 as a resource for research and education related to protection strategies for severe storms and hurricanes.<sup>xix</sup> In addition, the center researches structural and non-structural coastal barrier solutions. Among other coastal barrier solutions, the SSPEED Center has been studying the Centennial Gate concept.

The Centennial Gate is a proposed gate and levee structure that would be located across the mouth of the San Jacinto River, where it empties into Galveston Bay.<sup>xx</sup> SSPEED has studied

the examples of similar existing gates, including the "MOSE Project in Venice, Italy, which consists of a system of flood gates that float from the seafloor to form a surge barrier, the Thames River Barrier, in London, which consists of multiple rotating gates, and the Delta Works in the Netherlands, which is an integrated system of gate and levee structures."<sup>xxi</sup>

This gate and levee system is proposed to protect against a possible 25 foot storm surge in the Houston Ship Channel. This number comes from historical surges over the past 100 years. Computer stimulations have shown that this system would be adequate in reducing the surge and runoff passing through the gate. The SSPEED Center research also reported that there are no major land use conflicts with this system.<sup>xxii</sup>

It is estimated that the structure would cost in the vicinity of \$900 million with the total system currently estimated to cost less than \$2 billion.<sup>xxiii</sup> The SSPEED Center is presently investigating financing options for the Centennial Gate.<sup>xxiv</sup> Financing by the federal government is possible through the US Army Corps of Engineers and the United States Congress, but such action takes substantial time, and the willingness of Congress to allocate additional funds is unclear. The Corps has embarked upon a three-year feasibility study and the results of the SSPEED Center work will be turned over to the US Army Corps of Engineers for their use in performing their study of this region.<sup>xxv</sup>

Other structural options for coastal barrier protection include elevating State Highway 146 to protect the communities west of the highway from a 25 foot surge. An additional alternative is to construct a levee along the shoreline of Galveston Bay, intended to protect communities along the west side of Galveston Bay. According to the SSPEED Center, "neither of these two structural alternatives has generated any significant support in the west side communities"<sup>xxvi</sup>. Those supporting a structural option generally support the TAMUG

alternative, the Ike Dike. However, the SSPEED Center has expressed concerns regarding surge flooding and other side effects associated with the Ike Dike. Additionally, many support various forms of non-structural alternatives.<sup>xxvii</sup>

The SSPEED Center is also considering non-structural options to assist in mitigating severe storm and hurricane damage. Among those options that do not involve the building of structures are risk disclosure to inform potential real estate buyers of storm risk, real-time flood information systems to aid in evacuation and re-entry, and reviewing building codes.

The SSPEED Center continues to model and study multiple storm surge protection options.

### **Texas A&M University Galveston**

The Ike Dike is a coastal barrier protection concept conceived by Dr. Bill Merrell of Texas A&M University at Galveston in response to the extensive surge damage caused by Hurricane Ike in September of 2008. It is a strategy to "keep storm surge out of Galveston Bay by using a gated coastal barrier."<sup>xxviii</sup> Upon its completion, this concept would protect the Houston-Galveston region, including Galveston Bay, from hurricane storm surge.

The Ike Dike would enhance the existing coastal protection provided by the Galveston Seawall. It would extend "along the rest of Galveston Island and along the Bolivar Peninsula, with a 17ft high revetment near the beach or raising the coastal highways."<sup>xxix</sup> The Ike Dike, or coastal spine, would be comprised of flood gates at Bolivar Roads, the entrance to the Houston, Texas City, and Galveston Ship Channels, and at San Luis pass, creating a barrier against Gulf surges into the bay.<sup>xxx</sup> Like the Centennial Gate, the Ike Dike has referred to existing coastal

barrier systems in formulating this concept. Specifically, TAMUG has worked extensively with the Netherlands to study how their successful Delta Works Project could be applied along the Texas coast. Dr. Merrell argues that the Ike Dike could be built using the technology and examples already in place in the Netherlands. TAMUG has spent significant time working with the Dutch in developing this project.

Current estimates for this project are at \$6 billion. The cost will be significantly less than the New Orleans gate and pump system. The pump and gates installed in New Orleans were estimated to have cost around \$15 billion. The Ike Dike project will not need a pump station which will save a significant amount (about \$1 billion)<sup>xxx1</sup>.

The Ike Dike has garnered significant local support. As of December 1, 2014, 29 resolutions have been passed by surrounding cities and local organizations in favor of supporting the Ike Dike.

### **Other Testimony**

Other interested parties expressed interest in protecting the coast as a security issue. Protecting the refining capacity and other port facilities is of importance to the national economy and national security. If the Port infrastructure was compromised by a storm, it could take weeks and even months to bring these facilities back to working order. The resulting rise of gas prices and scarcity of petrochemical based products would have an impact beyond the Texas coast.<sup>xxxii</sup>

## **Recommendations**

The committee was also instructed to include recommendations in the report to the 84th Legislature. After information was presented and gathered, the committee has made recommendations.

### Identify the best plan for coastal barrier protection

There are many studies reviewing the options for coastal barrier protection plans along the Gulf Coast. While other non-structural alternatives and options may be used in conjunction, there should be one structural coastal barrier protection system identified and efforts with resources dedicated to its implementation.

### Urgency for preparedness

A sense of urgency should be used when identifying a coastal barrier system. We are unsure of the arrival of the next hurricane but historical trends indicate there could be another within eight years. Therefore, the collaboration of information and discussions will be useful in developing the best strategy in protecting the coast in a timely fashion.

### Identify potential funding sources

The proposed structural coastal barrier options' costs are in the billions. Funding for such a large infrastructure project will likely need many levels of support. All sources of funding including federal, state and local should be considered. Other sources such as grants or the recent RESTORE Act funds should also be considered.

## Continue the Committee to Study a Coastal Barrier System

The Joint Committee to Study a Coastal Barrier System provided a public forum for discussion on this important issue. Continuing the committee, and therefore the discussion at a state level, will be vital to keeping in the forefront this issue that is so important to Texas.

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<sup>i</sup> Texas A&M Galveston Presentation to the Joint Committee to Study a Coastal Barrier System, August 4, 2014

<sup>ii</sup> Texas A&M Galveston Presentation to the Joint Committee to Study a Coastal Barrier System, August 4, 2014

<sup>iii</sup> See website: <http://www.tamug.edu/ikedike/>

<sup>iv</sup> Texas A&M Galveston Presentation to the Joint Committee to Study a Coastal Barrier System, August 4, 2014

<sup>v</sup> See website: [http://sspeed.rice.edu/sspeed/downloads/Gate\\_Solution\\_2013.pdf](http://sspeed.rice.edu/sspeed/downloads/Gate_Solution_2013.pdf)

<sup>vi</sup> See website: [http://www.tamug.edu/ikedike/About\\_Ike\\_Dike.html](http://www.tamug.edu/ikedike/About_Ike_Dike.html)

<sup>vii</sup> See website: <http://www.allianceportregion.com/about/>

<sup>viii</sup> Texas A&M Galveston Presentation to the Joint Committee to Study a Coastal Barrier System, August 4, 2014

<sup>ix</sup> Texas A&M Galveston Presentation to the Joint Committee to Study a Coastal Barrier System, August 4, 2014

<sup>x</sup> Texas A&M Galveston Presentation to the Joint Committee to Study a Coastal Barrier System, August 4, 2014

<sup>xi</sup> See website: <http://www.tamug.edu/ikedike/>

<sup>xii</sup> See website: [http://sspeed.rice.edu/sspeed/downloads/Gate\\_Solution\\_2013.pdf](http://sspeed.rice.edu/sspeed/downloads/Gate_Solution_2013.pdf)

<sup>xiii</sup> Texas General Land Office Presentation to the Joint Committee to Study a Coastal Barrier System, August 4, 2014

<sup>xiv</sup> Texas General Land Office Presentation to the Joint Committee to Study a Coastal Barrier System, August 4, 2014

<sup>xv</sup> Gulf Coast Community Protection and Recovery District Presentation to the Joint Committee to Study a Coastal Barrier System, August 4, 2014

<sup>xvi</sup> US Army Corp of Engineers Presentation to the Joint Committee to Study a Coastal Barrier System, August 4, 2014

<sup>xvii</sup> US Army Corp of Engineers Presentation to the Joint Committee to Study a Coastal Barrier System, August 4, 2014

<sup>xviii</sup> US Army Corp of Engineers Presentation to the Joint Committee to Study a Coastal Barrier System, August 4, 2014

<sup>xix</sup> See website: <http://sspeed.rice.edu/sspeed/>

<sup>xx</sup> Testimony of the SSPEED Center to the Joint Committee to Study a Coastal Barrier System, August 4, 2014

<sup>xxi</sup> Testimony of the SSPEED Center to the Joint Committee to Study a Coastal Barrier System, August 4, 2014

<sup>xxii</sup> Testimony of the SSPEED Center to the Joint Committee to Study a Coastal Barrier System, August 4, 2014

<sup>xxiii</sup> Testimony of the SSPEED Center to the Joint Committee to Study a Coastal Barrier System, August 4, 2014

<sup>xxiv</sup> Testimony of the SSPEED Center to the Joint Committee to Study a Coastal Barrier System, August 4, 2014

<sup>xxv</sup> Testimony of the SSPEED Center to the Joint Committee to Study a Coastal Barrier System, August 4, 2014

<sup>xxvi</sup> Testimony of the SSPEED Center to the Joint Committee to Study a Coastal Barrier System, August 4, 2014

<sup>xxvii</sup> Testimony of the SSPEED Center to the Joint Committee to Study a Coastal Barrier System, August 4, 2014

<sup>xxviii</sup> Texas A&M Galveston Presentation to the Joint Committee to Study a Coastal Barrier System, August 4, 2014

<sup>xxix</sup> See website: [http://www.tamug.edu/ikedike/About\\_Ike\\_Dike.html](http://www.tamug.edu/ikedike/About_Ike_Dike.html)

<sup>xxx</sup> See website: [http://www.tamug.edu/ikedike/About\\_Ike\\_Dike.html](http://www.tamug.edu/ikedike/About_Ike_Dike.html)

<sup>xxxi</sup> Texas A&M Galveston Presentation to the Joint Committee to Study a Coastal Barrier System, August 4, 2014

<sup>xxxii</sup> Testimony of Bill Sargent Submitted to the Texas Joint Interim Committee on Coastal Barrier Systems, August 4, 2014