MINUTES OF
SOUTHEAST LOUISIANA FLOOD PROTECTION AUTHORITY-EAST
COASTAL ADVISORY COMMITTEE MEETING
HELD ON MARCH 21, 2014

PRESENT: G. Paul Kemp, Chair
Rick Luettich, Committee Member
John Lopez, Committee Member
Albert Gaude, Committee Member
Carlton Dufrechou, Committee Member

The Coastal Advisory Committee (CAC) of the Southeast Louisiana Flood Protection Authority-East (SLFPA-E or Authority) met on Friday, March 21, 2014, in Meeting Room 201, Orleans Levee District Franklin Administrative Complex, 6920 Franklin Avenue, New Orleans, Louisiana. Mr. Kemp called the meeting to order at 9:40 a.m.

Opening Comments: Mr. Kemp advised that after the presentation he would request input on survey, water level and levee monitoring aspects and issues so that the CAC can proceed in a coherent direction.

Adoption of Agenda: The agenda was approved as presented.

Approval of Minutes: The minutes of the February 21, 2014 CAC meeting were approved.

Public Comments:

Mr. Kemp requested that Bob Marshall address the CAC concerning a proposed small satellite project.

Mr. Marshall, a reporter for the Lens, a non-profit news site located in New Orleans, explained that a company that will be launching a series of toaster-size satellites that will photograph the earth contacted ProPublica, the nation's largest non-profit public news site, and in turn ProPublica contacted the Lens, to determine whether the satellites would be useful relative to local coastal issues. Mr. Marshall advised that he reached out to several scientists in the State, and was now reaching out to the CAC, with the question, where would they like to receive a shot each day of an area of the coast and how would this be of help? He briefly discussed the work of data reporters (computer programmers with some training in journalism). Mr. Marshall and a representative from ProPublica are in the process of picking out about ten sites along Louisiana's coast.

New Business:

A. Presentation on System Engineering Analysis for the Hurricane Surge Defense System of the East Bank of the Greater New Orleans by Ezra Boyd, Ph.D., John Lopez, Ph.D., Rune Storesund, P.E.

Mr. Lopez advised that the project was funded through the Crestview Foundation of the Lake Pontchartrain Basin Foundation (LPBF). The LPBF's grant partners were the Gulf Restoration Network, the Coalition to Restore Coastal Louisiana and the Center for Sustainable Economic Development. The LPBF's role in the grant was essentially the Systems Engineering Analysis.

Ezra Boyd, Ph.D., explained that the purpose of the project was largely to specify the system using the multiple lines of defense strategy. As an example of a system specification, Mr. Boyd showed a map of the U.S. Army Corps of Engineers' (USACE) Greater New Orleans Hurricane and Storm Damage Risk Reduction System (HSDRRS), dated June, 2013, which exclusively exhibits a structural view of the system. The State Master Plan (SMP) specifies the system using the structural system (levees, pump stations, floodwalls and floodgates) and coastal lines of defense, including marshlands, natural ridges and other coastal elements of the Hurricane Surge Defense System (HSDS). The SMP merges coastal elements of the system with the structural elements and includes community lines of defense (e.g., relocation, elevation and insurance). One element that was felt missing from the SMP is evacuation routes. Evacuation routes are under the purview of the Department of Transportation and State Police. The SMP evaluated projects looking at the economic outcomes and not public health impacts. He pointed out an example of an evacuation route that for a comparatively minor expenditure would rid the system of one of its weakest links; however, it is not included in the SMP because it does not protect property and evacuation was not considered.

Mr. Boyd explained that the multiple lines of defense (coastal, structural and community lines of defense) approach is a more complete specification of the system. A graphic map was shown depicting the multiple lines of defense. Elements of the lines of defense not shown on the map include barrier islands, sounds, marshlands, natural ridges, coastal highways, home elevations and flood insurance. A multiple lines of defense strategy was used in the project to specify the HSDS; that is, all of the significant elements of the HSDS were utilized in order to determine how the different elements relate to one another structurally and functionally. The system was considered "as is" at the time of the study. In order to keep the project manageable, the study focused on the east bank of the Greater New Orleans area.

Mr. Boyd reviewed the concepts and tools used in the project:

- Systems Engineering – A professional discipline/methodology to ensure that complex projects are designed and built as integrated systems. This ensures that the parts are not designed in isolation, but are designed to integrate within the system. The HSDS was designed using a highly siloed disciplinary approach; that is, a considerable

amount of communication did not take place between flood engineers, coastal scientists, traffic engineers and emergency planners.

- Quality Management Assessment System (QMAS) - A facilitated discussion whereby system assessors share their experiences and facilitators formalize the resulting knowledge into a system specification.
- Systems Modeling Language (SysML) – SysML was used to formalize the knowledge produced from the QMAS into a system specification. The process starts with system requirements, structures are then specified, and system behavior is modeled in order to ensure that the behavior meets requirements.

Mr. Boyd discussed examples of system interactions:

- Central Wetlands Unit and 40 Arpent Levee – This is an example of a potentially positive interaction that enhances performance. A pattern emerges in the Central Wetlands of arcs of resilient wetlands and cypress trees adjacent to the pump stations along the 40 Arpent Levee. Levee breaches did not occur in the sections adjacent to the resilient wetlands during Hurricane Katrina. There is a two part interaction: 1) the pump stations interact with the wetlands and trees to maintain their resiliency, and 2) the wetlands and trees interact with the levee to enhance its performance.
- I-10 East Evacuation Route and Chandeleur Islands – A low spot of the I-10 (the approach to the new Twin Span Bridge) located outside of the levee system serves as an example of the weakest link determining the level of protection. The low spot has an approximate elevation of 7-ft. above sea level. The estimated traffic capacity of this evacuation route during Hurricane Katrina was 2,000 vehicles per hour (about 5,000 people per hour). The Chandeleur Islands are located approximately 90 miles away from the I-10. Storm surge simulations produced by ADCIRC modeling reveal that as the Chandeleur Islands degrade, the peak of the surge will be higher and come in sooner. Therefore, as the Chandeleur Islands degrade the I-10 low spot will potentially flood and close this crucial evacuation route sooner. The timing of the surge constraining evacuation procedures is an example of a system interaction. There is potentially a 5,000 person reduction in evacuation if the I-10 low spot floods one hour earlier.
- IHNC/GIWW Closure Operations – This is a complex subsystem that involves a complicated set of procedures with multiple stakeholders and requirements that if not timely and successfully accomplished can potentially limit the performance of the system. The IHNC/GIWW is a Regulated Navigation Area (NRA); therefore, the U.S. Coast Guard has the authority and responsibility to evacuate vessels in the NRA prior to the storm surge. A number of bridges (Seabrook, Almonaster Avenue, Florida Avenue, Judge Seeber and St. Claude Avenue) along the Industrial Canal must be in the up position for the vessels to evacuate the corridor; however, at the same time one million people may be attempting to evacuate and need the bridges in the down position to facilitate traffic flow. In addition, the IHNC Surge Barrier navigation gates (sector and barge gates), the navigation gates at Bayou Bienvenue and Seabrook, and the USACE Navigation Lock must be closed when certain criteria are met.

Mr. Boyd explained that about 25 system assessors (individuals with hands on expertise with an element of a system) participated in the three QMAS workshops. The group discussed the system definition (identifying the key elements and structure of the system), factors of concern (system elements or behavior that could adversely impact system performance), and scenarios of concern (extreme and fair weather scenarios where the factors of concern could be manifested).

Mr. Boyd discussed some of the major factors of concern that came out of the workshops:

- Basis for storm surge – The method used to determine 100-year and 500-year surge levels.
- IHNC impact loads - The RNA addresses the evacuation of vessels; however, the clearing out of the RV park and the removal of boats in dry dock and objects that could potentially become floatable and impact the floodwalls is not addressed.
- The SMP focuses on property, not mortality. Evacuation issues include timing, communications and the personal decision making process.
- Funding
- Drainage – The drainage, which is designed for a 10-yr. rainfall event, is a crucial part of a system designed to protect against a 100-year storm event.
- Flood protection – Issues such as armoring, operations and maintenance and future levee lifts were brought out.
- Public communications – Accessibility of information about the system to the public is lacking.

Mr. Boyd reviewed the SysML Model of the HSDS. The things learned from the QMAS workshops and other research were formalized into a technical systems engineering framework. The process began with the system requirements. The first requirement is the 100-year level of protection. The SMP discusses a sustainable long term solution. SysML blocks are used to representative elements of the system and list various types of data and attributes. The blocks of data and information come into the analysis to ensure that the system meets the desired requirements and functions. Mr. Boyd discussed the diagram on the system structure. The Multiple Lines of Defense System (MLODS) hierarchy classifies the structure of the system at three different levels. The first level is the HSDS, which is divided into coastal, structural and community lines of defense. Each line of defense has a set of blocks with the attributes, data and responsibilities of its features.

Mr. Boyd discussed the behavior or sequence diagram that was produced on evacuation route-barrier island interaction. The diagram showed the interaction between the evacuation subsystem, coastal lines of defense subsystem, time (higher events precede lower events) and messages (information exchanged between elements and serving as trigger for events). The interaction of IHNC Surge Barrier closure operations (bridge and floodgate closure requirements) as outlined in the SysML Model with evacuation was brought out. All of the elements are linked from a functional standpoint and must function as a group.

Mr. Boyd reviewed the conclusions:

- The approach using Systems Engineering, QMAS, and SysML is a good solid first step towards the goal of a systems design.
- The assessment found modest progress toward addressing systems level vulnerability:
  - Major upgrades to the structural protection have addressed many of the design vulnerabilities exploited by Hurricane Katrina.
  - Floodgates and floodwalls at the IHNC/GIWW and the three Orleans Parish outfall canals have closed major "gaps in the system".
  - Thousands of homes, businesses and government buildings have been elevated.
  - Local Citizen's Assisted Evacuation Plans
  - New I-10 Twin Span Bridge
  - The 2012 State Master Plan links coastal management with flood risk reduction

Mr. Boyd pointed out that work still needs to be done and reviewed five primary FOC themes described by the QMAS Assessment Team that would enhance the performance of the system:

- Unpredictability of HSDS System Interactions
- HSDS System Integrity Over its Life-cycle
- Jurisdiction and Coordination over HSDS
- Long Term HSDS Funding
- Stakeholder Education and Engagement of "system" aspects of their flood protection, i.e., the HSDS

Mr. Turner explained that the current flood protection system is significantly more complex than the system that was in place prior to Hurricane Katrina. It has more complex mechanical and electrical facilities that must function properly in order to close the system. Human factors must also be taken into account and the coordination of the system is much more complex. Dr. Lopez commented on the Lake Pontchartrain Basin Foundation's (LPBF) role in educating the public in terms of the system and its complexity. Mr. Turner pointed out that elements of the system can be improved in order to decrease risks (e.g., utilization of the Central Wetlands as additional water storage capacity for the IHNC corridor). Mr. Kemp noted that the SLFPA-E should also be involved in the educational role and stressed the importance of communication and the role of citizens in the success of the system. He added that an analysis is needed of the weaknesses of the system and that priority targets for improvement should be developed.

B. <u>Discussion of Geodetic I-levee options.</u>

Mr. Kemp advised that the CAC has been gathering information for the past several months on technology, elevations and monitoring. Mr. Luettich explained that the Board is seriously considering the operation and maintenance of the flood protection system now

that the construction has been completed. He stressed the importance of monitoring in the role of maintenance and pointed out that a monitoring strategy is critical. Information has been received concerning regional subsidence, shifting datums, the State's iLevee Program, and satellite and LIDAR based over-flights to scan the system. A strategy is needed to determine the right integration of technologies to meet the SLFPA-E's priorities. The collection of the data is only half of the process; someone is needed who knows what to do with the data and create the products that can be used by the decision makers. The data must also be archived and used for future comparisons. He pointed out that there are some needs that are clear and can be immediately acted upon, such as the current velocity gage at Seabrook. In addition, the data should be integrated with the SLFPA-E Levee Information Management System. He suggested that a Request for Proposals (RFP) be issued for the design of a monitoring program that would include a cost analysis. Mr. Turner commented that a first step should be a feasibility study. Mr. Kemp pointed out that the effort should tie into the systems approach.

Mr. Luettich pointed out that parts of the effort discussed overlap with the CPRA's mission and should be coordinated. He suggested that a RFP be developed and that discussions take place with CPRA staff to ensure that they are not already doing this work. Mr. Turner noted that the I-Storm group (an international group that deal with surge barriers) is a SLFPA-E resource in addition to the CPRA and USACE.

Mr. Luettich advised that, in addition to the development of a monitoring strategy, a continuous or annual process is needed for updating the modeling systems and the underlying databases. Some of the model databases and grids are updated to some extent by the CPRA in the Master Plan on a five year basis; however, data is collected more frequently. The CAC discussed the use of Arcadis, which has done much of the modeling of the system, for this effort. He recommended that a written description of what the SLFPA-E is seeking in this effort be developed.

There was no further business; therefore, the meeting was adjourned at 11:16 a.m.