City of Corpus Christi’s Salt Flats Levee and FEMA’s Nueces County LAMP Pilot Project

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Team Acknowledgments and Roles

- City of Corpus Christi
  - Dan Biles, PE Director of Public Works
  - Natasha Fudge, PE Acting Director of Capital Programs
  - Bill Green, PE Interim Director of Environmental & Strategic Initiatives

- HDR
  - Carl Crull, PE - Principal
  - Mark Stanley, PE, Garrett Harris, PE, Rollie Boehm, PE - Geotech
  - Dan Heilman, PE – Wave Analysis
  - Doug Hearn, PE – Closure Structures

- Urban Engineering
  - Murf Hudson, PE – Pump Stations
Location

- Corpus Christi, Texas
- Pop 316,863
- Protected Bay
- Historic Seawall (1941)
- 6th largest port in U.S.
Background

- Effective FIRM
  - July 1985
- Protected area as Zone B

Downtown Flood Protection System

- Consists of
  - Salt Flats Levee
    - 4 closures
  - Port / Museum Flood Wall
    - 1 closure
  - Sea Wall
    - Coastal structure, Stepped concrete on wooden piles
  - 2 Pump Stations
    - Power Street A
    - Kinney Street B

Background

- **Draft FIRM**
  - July 2012
- **Protected area as Zone AO**
  - (Depth 3 FT) & (Depth 2 FT)
- **Bay Zone VE**
  - (EL 15)
  - Surge = 8.4’
  - Setup = 4.0’
  - Runup = 3.0’


Corpus Christi’s Salt Flats Levee & Nueces County LAMP Pilot
Background

- FEMA requested certification from City in March 2012
- “Earthen levee on west side” (Salt Flats)
- “Small floodwall on northeast corner”
- Seawall is a coastal structure, not subject to LAMP

Background

- City signed PAL in June 2012
- Initial report by Urban Engineering December 2012
  - Survey of Seawall and Salt Flats Levee

Levee Analysis & Mapping Procedures (LAMP)

- Proposed Approach
  - December 2011

- Final Approach
  - July 2013

- Reach Based
  - Natural Valley
  - Sound Reach
  - Freeboard Deficient
  - Overtopping
  - Structural Based


Corpus Christi’s Salt Flats Levee & Nueces County LAMP Pilot
Levee Analysis & Mapping Procedures (LAMP)

- Natural Valley
  - Map the BFE on the landward side as if the levee does not exist
  - No additional data needs
  - Default for minimal data
    - Unidentified owner
    - Not maintained
    - No structural analysis

Levee Analysis & Mapping Procedures (LAMP)

- Sound Reach
  - Meets 44 CFR 65.10
    - Freeboard
    - O&M records
  - No reach-specific modeling necessary
  - SFHA for interior drainage on landward side

Levee Analysis & Mapping Procedures (LAMP)

- Freeboard Deficient
  - Levee crest is higher than BFE
  - All other 65.10 criteria are met

Levee Analysis & Mapping Procedures (LAMP)

- Overtopping
  - Levee crest is below BFE
  - Structure was designed to overtop without failure
    - Armored
  - Levee modeled as a lateral weir
  - Structural requirements are met and documented

Levee Analysis & Mapping Procedures (LAMP)

- Structural Based
  - Known weaknesses
  - Historic issues
  - Identify locations and identify failure scenarios

Levee Analysis & Mapping Procedures (LAMP)

- Combined Map
  1. Zone D for entire Natural Valley
  2. Interior hydrology
  3. Levee reaches

- Requires evaluation of specific data for each reach

Corpus Christi’s Salt Flats Levee & Nueces County LAMP Pilot
Nueces County LAMP Pilot Project

Figure 3-1. New Levee Analysis and Mapping Process


Corpus Christi’s Salt Flats Levee & Nueces County LAMP Pilot
Data Collection
Bay BFE

- Draft FIRM
  - July 2012
- Protected area as Zone AO w/ (Depth 3 FT) & (Depth 2 FT)
- Bay Zone VE (EL 15)
  - Surge = 8.4’
  - Setup = 4.0’
  - Runup = 3.0’

Data Collection
Bay BFE

- MIKE-21 Spectral Wave
- Combined survey with NOAA 1991 bathymetry
- Bathymetric TIN of Bay
Data Collection
Bay BFE

- MIKE-21 Spectral Wave
- Wave heights
  - 80 mph wind
  - 0º to 180º
- Proposed Zone VE at (EL 13)
  - Surge = 8.4’
  - Setup = 3.0’
  - Runup = 1.6’

HDR

Corpus Christi’s Salt Flats Levee & Nueces County LAMP Pilot
Data Collection
Salt Flats Levee

- Earthen Levee
  - Constructed in 1957
  - “Compacted Mudshell” over “Muck”, 1H:1V SS
  - 4 timber closure structures

Data Collection
Salt Flats Levee

- Inspection
  - Minor Deficiencies
- Seepage Analysis
- Gate Installation
  - Annual City drill
- O&M Manuals
- Rehabilitation Plan
Data Collection
Salt Flats Levee

- Closure Structures
  - All 4 were upgraded in 2001
  - Aluminum stop logs with concrete storage vaults
Data Collection
Port / Museum Flood Wall

- Concrete Flood Wall
  - Constructed by USACE in 1960
  - 1 closure structure (also updated in 2001)
Data Collection Pump Stations

- Protected Area
  - Interior Hydrology
  - Including wave overflows
  - 2D Model to refine
Downtown Flood Protection System in LAMP

- Assumes
  - BFE is Zone VE (EL 13) in Bay
  - Salt Flats Levee and Museum Flood Wall are rehabilitated
  - Pump Stations are adequate
    - Interior flows
    - Overtopping
  - Interior SFHA refined with 2D

Conclusions

• PAL and LAMP are accomplishing FEMA’s RiskMAP goals:
  • Community Engagement
  • Leads to Mitigation Actions
  • Strengthens Resilience
• Process takes time
  • Accurate BFEs
  • Certified system
• KO Meeting in Sept 2013
• Next LLPT Meeting in mid-July