

**Greater New Orleans
Hurricane and Storm Damage
Risk Reduction System**

Sod Industry Day

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**US Army Corps of Engineers
BUILDING STRONG®**



Hurricane Katrina

Aug 29, 2005



- One of America's largest natural disasters
- Cat 5 less than 12 hrs before landfall
- 127 MPH wind at Louisiana landfall
- Maximum surge of 28 to 30 feet along Mississippi coast
- 80 percent of the city of New Orleans flooded

Hurricane Rita

Sep 24, 2005



- Cat 4 less than 12 hrs before landfall
- 175 MPH max sustained winds in Gulf of Mexico
- 120 MPH max sustained winds at landfall
- Cat 3 strength at landfall

Wave Overtopping Effects

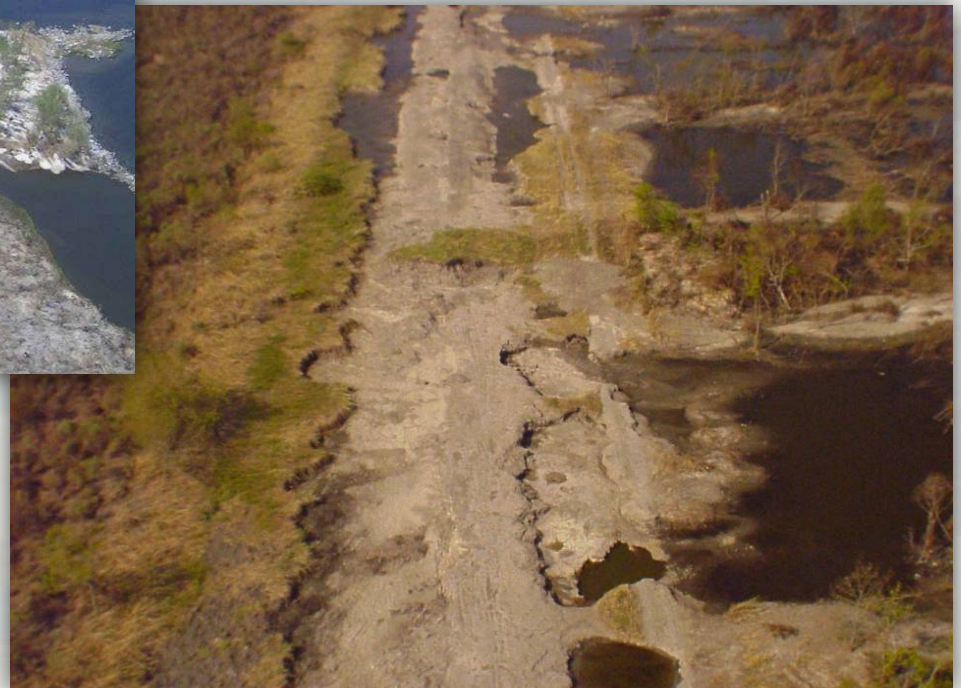


Effects of Hurricane Katrina



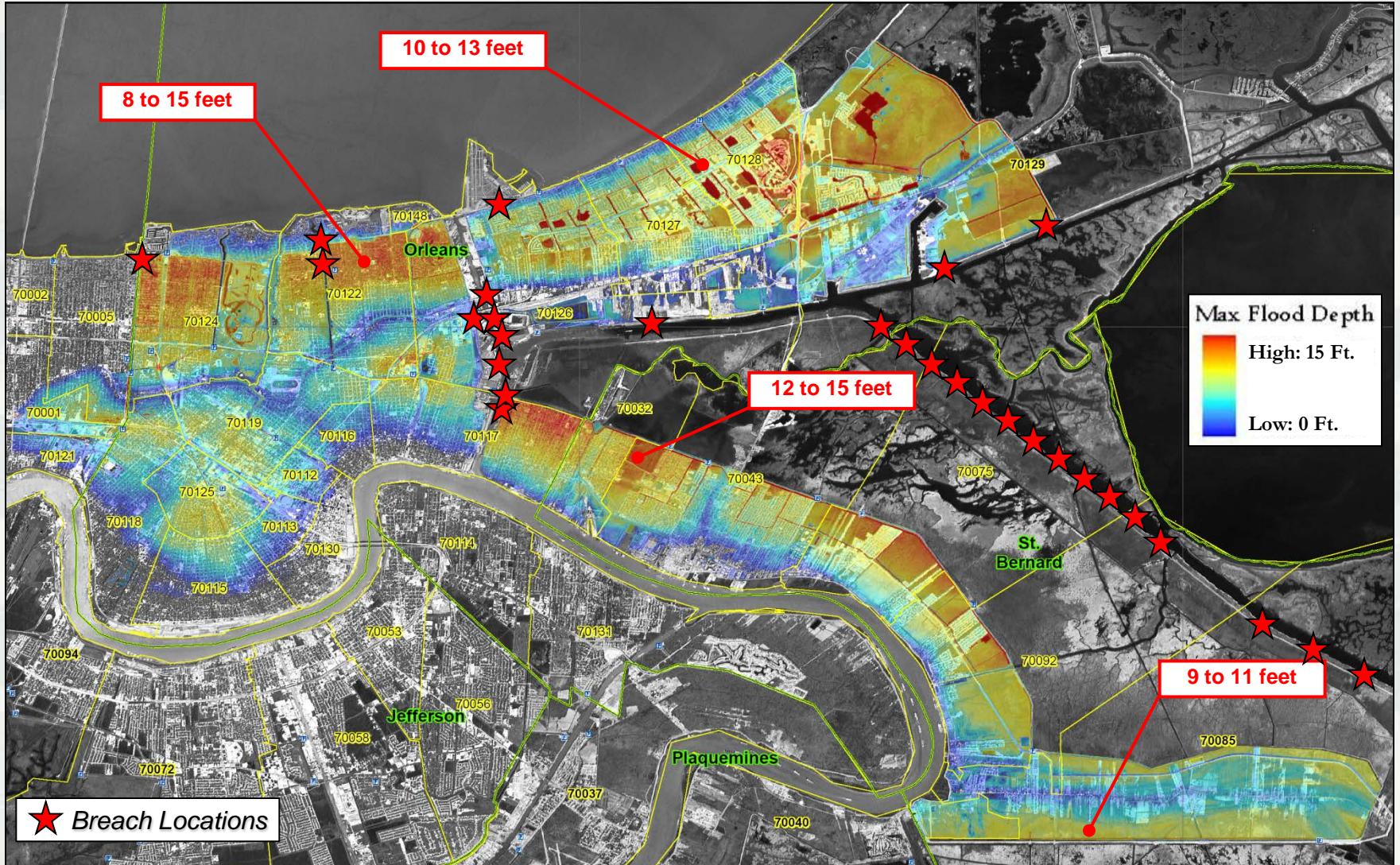
Transition Erosion

Levee Erosion



New Orleans

Levee and Floodwall Breaches



IPET Findings / Lessons Learned

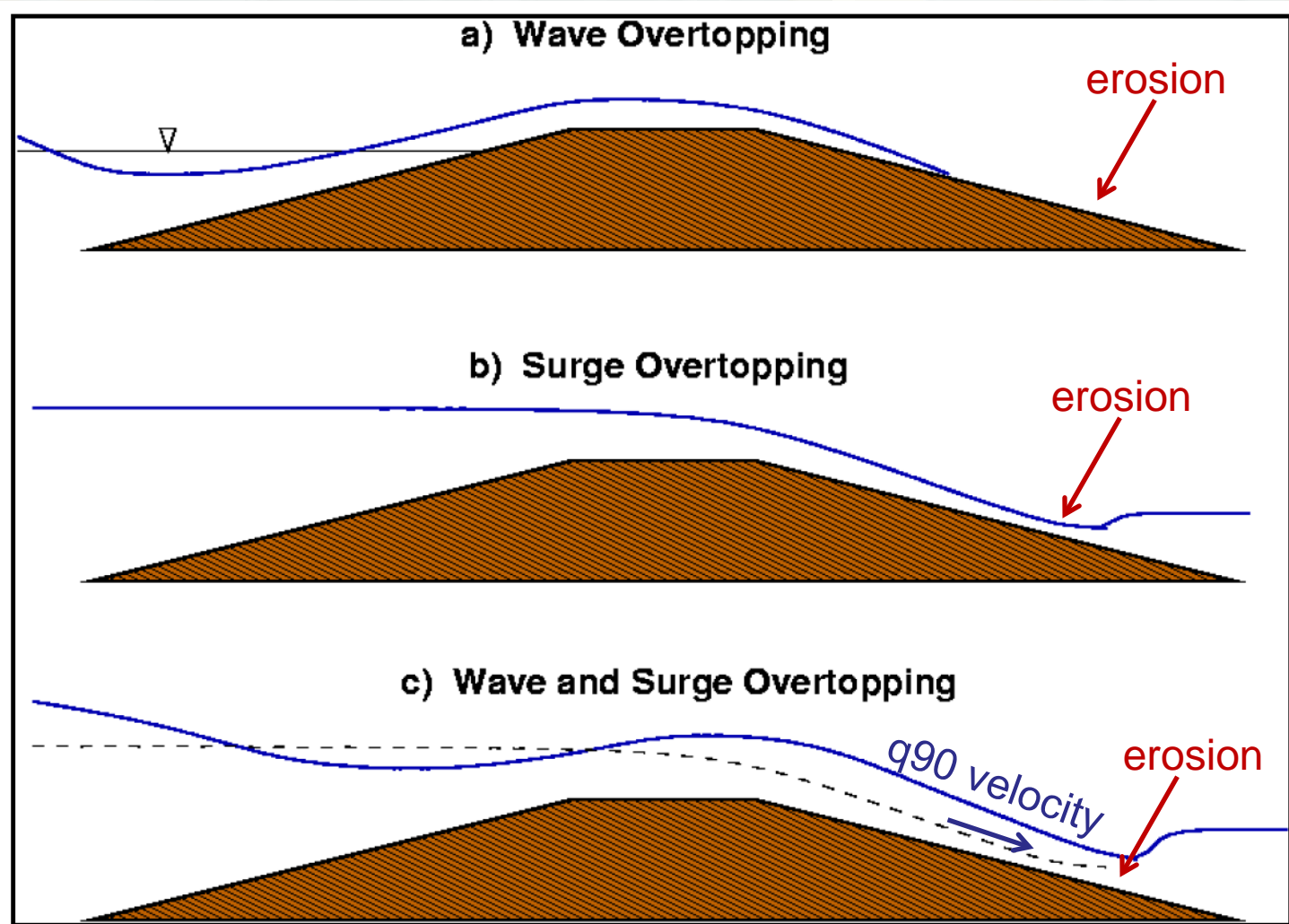
Findings

- The majority of the 50 levee and floodwall breaches resulted from overtopping and subsequent breaching from scour or scour induced instability.
- For levee breaches, the degree of erosion and breaching was directly related to the character of the in place levee materials
- No levee breaches occurred without overtopping.

Lessons Learned

- Design criteria should routinely provide **resilience** of the structure to reduce vulnerability to breaching.
- While levee resilience is directly related to the quality of levee materials and their emplacement, armoring can augment existing levee materials to provide additional **resilience**.
- Design methodologies for structures that are a single line of defense for life and safety need to systematically and conceptually consider:
 1. Adaptability for changing hazards (e.g., subsidence, wetland loss)
 2. Adaptability for future use/needs
 3. Redundancy
 4. **Resiliency**
- Losses for a storm that exceeds design criteria can be expected to be significant, but dramatically less if the HSDRRS is resilient to levee and floodwall breaching.

Overtopping Erosion



Authority: 4th Supplemental - P.L. 109-234

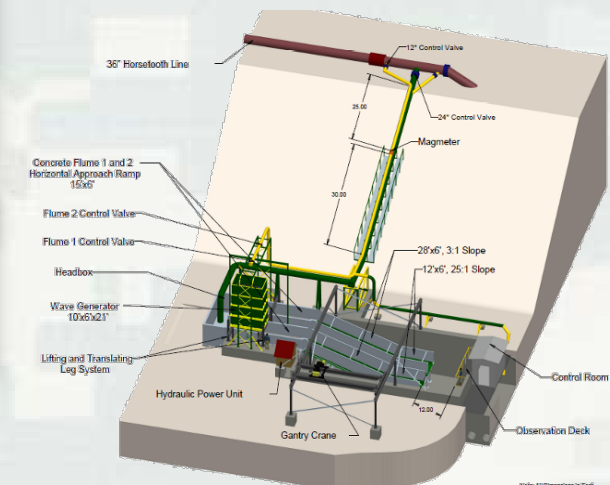
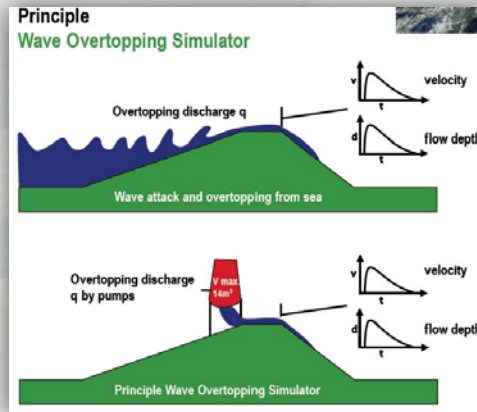
“...shall be used for armoring critical elements of the New Orleans hurricane and storm damage reduction system”

Key point: Authority for Armoring is unique to the HSDRRS. No USACE design standards existed to inform Armoring application.

Armoring R&D Program

Wave Overtopping Simulation

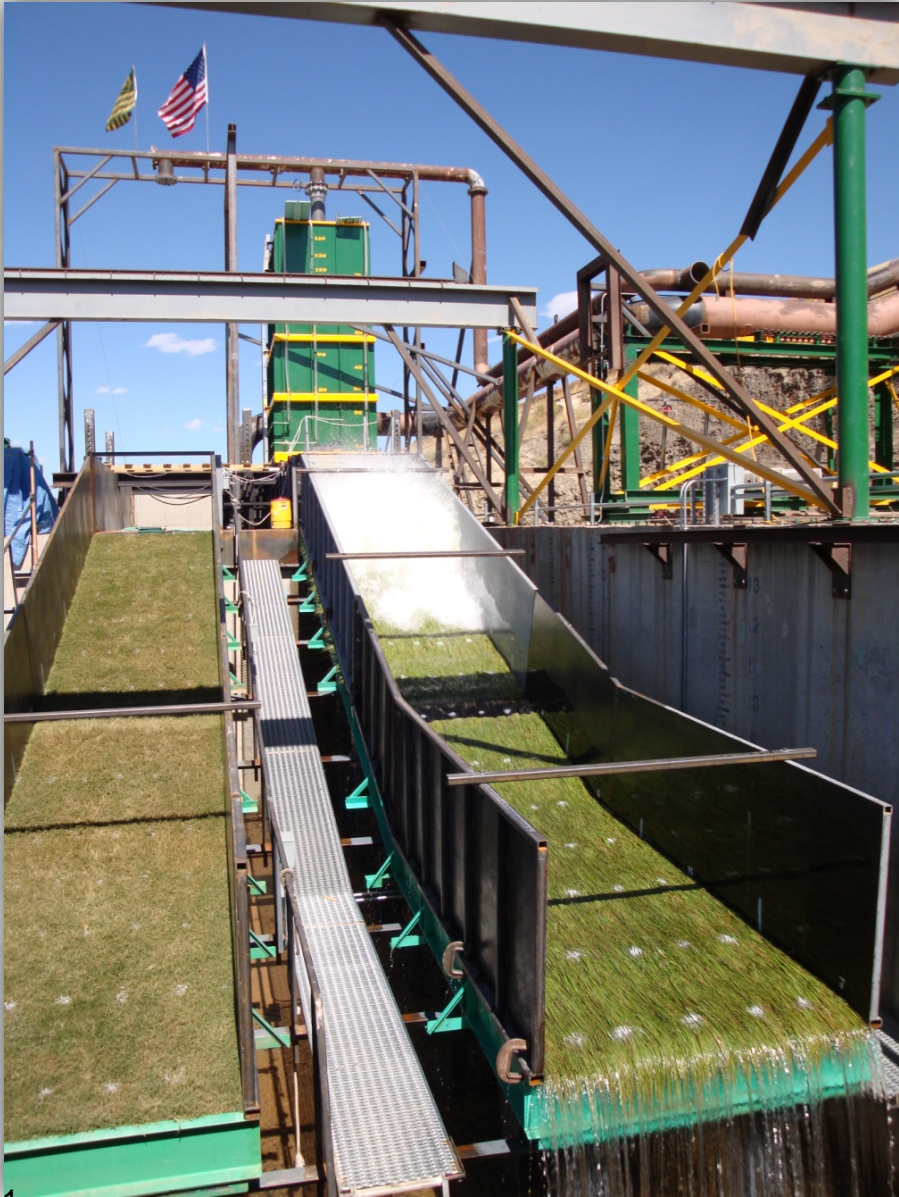
- Commissioned Colorado State University to erect a full scale wave overtopping simulator
 - ▶ Apparatus applied Dutch mobile wave overtopping simulator design to a full scale levee section
 - ▶ Designed to test erosion resistance of alternative Armoring materials for 500-yr HSDRRS overtopping conditions



Colorado State University Wave Overtopping Simulator



Grass Growth & Wave Overtopping Testing at CSU



**Largest
Wave
Discharge**

Armoring R&D Program

Bermuda Grass Performance Observations

Fall 2010 Testing

- **Green Bermuda (unreinforced/reinforced)** – survived 4.0 cfs/ft for 3 simulated storm hours

Spring 2011 Testing

- **Dormant Bermuda reinforced w/ HPTRM** – survived 4.0 cfs/ft for 3 simulated storm hours
- **Dormant Bermuda (unreinforced/reinforced w/TRM)** – failed at 2.0 cfs/ft

**Overtopping rates were progressively raised to assess erosion resistance capabilities of tested materials*

***Maximum capacity of the wave overtopping simulator = 4 cfs/ft*

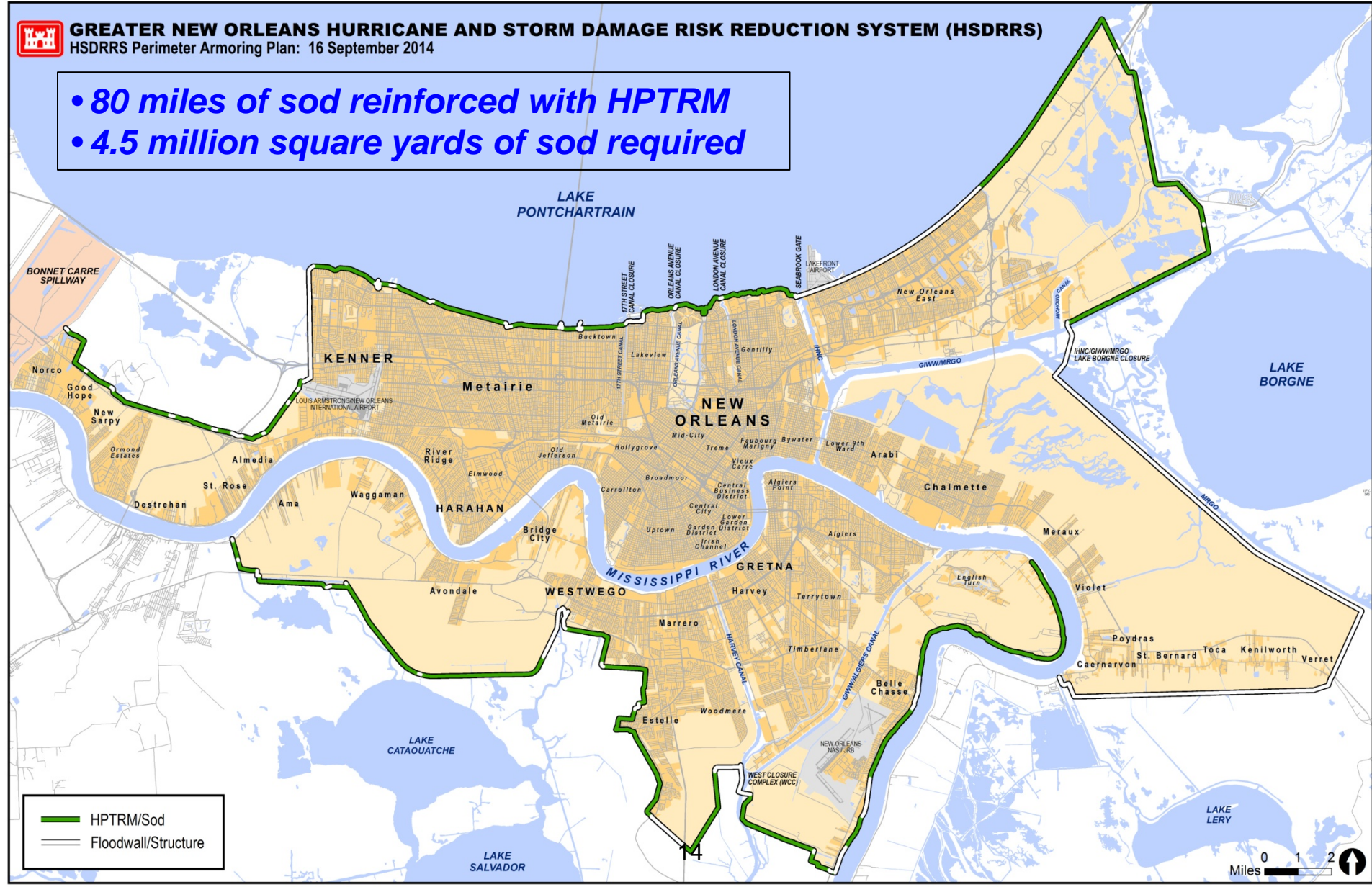
Armoring Plan



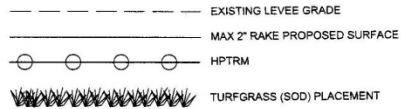
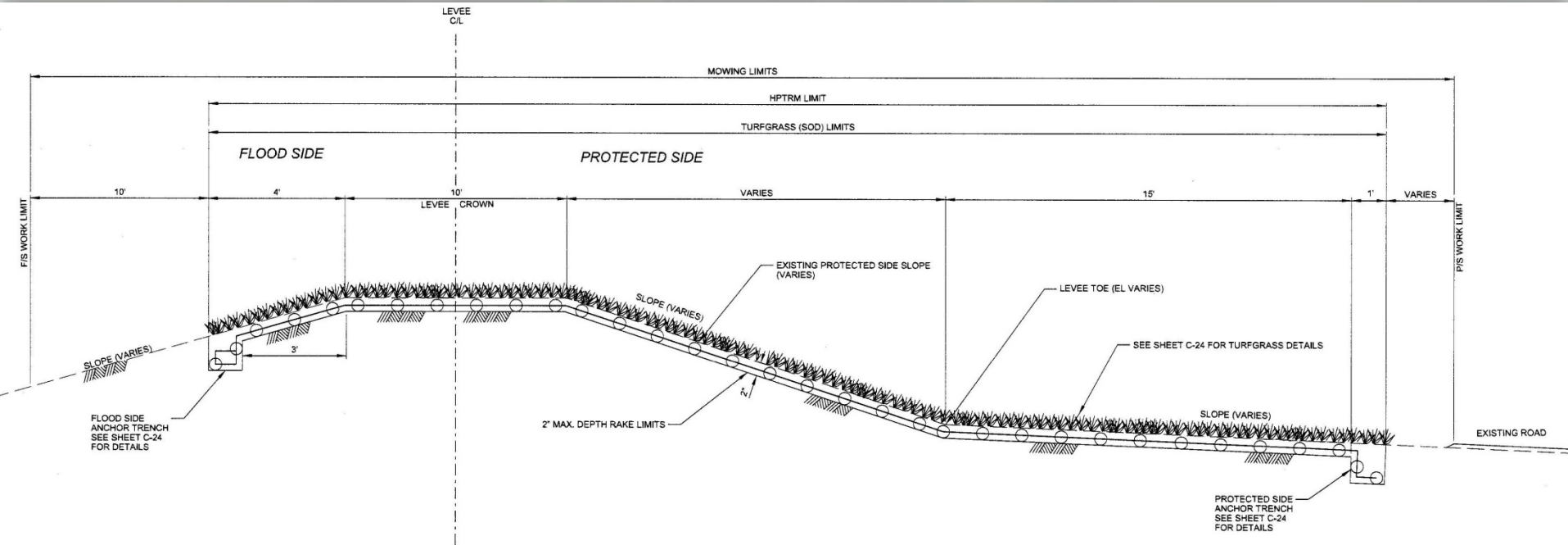
GREATER NEW ORLEANS HURRICANE AND STORM DAMAGE RISK REDUCTION SYSTEM (HSDRRS)

HSDRRS Perimeter Armoring Plan: 16 September 2014

- 80 miles of sod reinforced with HPTRM
- 4.5 million square yards of sod required



HPTRM Typical Design Section



NOTES:

- 1) SEE "TYPICAL LEVEE HPTRM SECTION" SHEETS FOR DIMENSIONS OF ALL EXISTING LEVEE SECTIONS WITHIN REACH 1A, 1B, 2A, AND 2B.
- 2) TYPICAL LEVEE HPTRM SECTION - 1 SHALL HAVE PROTECTED SIDE HPTRM LIMITS AS SHOWN IN ON SHEET C-19.
- 3) REFER TO THE TYPICAL NEW ACCESS ROAD - DETAIL ON SHEET C-27 FOR THE P/S WORK LIMIT ALONG NEW ACCESS ROADS.

HPTRM THEORETICAL SECTION

N.T.S.

Bermuda Sod Requirements



Note: thatch layer thickness may vary
Soil: fine texture high in silt and/or clay content



Initial Spec:

- Celebration or Tifway 419 Bermuda Sod
- Soil having a Unified Soil Classification System (USCS) classification of silt (ML) or clay (CL) (max. of 30% sand)
- Min. soil thickness of $\frac{3}{4}$ " (up to a max. of 1 inch) to protect the mat from tractor wheels during mowing.
- 2-inch sod facilitates root penetration through the HPTRM to provide adequate anchorage of the mat into the underlying soil.

Overall Material Requirements



SOD

~4,500,000 square yards



HPTRM

~4,500,000 square yards

****Peak installation rate: ~400,000 square yards per month***



Armoring Implementation

15 Dec 14	Establish MATOC
15 Dec 14	Award 1 st LPV contract (St. Charles Parish) (100k – 150k sy)
12 Jan 15	Award 1 st WBV contract (Plaquemines Parish) (100k – 150k sy)



***Additional contract awards to follow thru spring of 2016
(10,000 – 350,000 square yards required per contract)***

Acquisition Plan

- Multiple Award Task Order Contract (MATOC)
- Contractor supplied materials
 - ▶ HPTRM (thru approved sources)
 - ▶ Bermuda Sod
- Fed Biz Opps
 - ▶ MATOC awardees announced
 - ▶ www.FBO.gov



Questions?
Contact Public Affairs
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Solicitation on FedBizOpps
[Click Here](#)

