Water Level Monitoring and Flood Hazard Emergency Management in Chesapeake Bay

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Should we care about climate change?
Jamestown Water Levels and Flood Hazard Emergency Management Project

Project Goals:

• To provide emergency managers with water level data in near real-time during tropical storm and hurricane events via the Internet
• Establish a data base of measured water level extremes as an aid to community planning
• Provide water level histories needed to verify numerical models
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In the coastal zone, extreme flooding is caused by

**STORM TIDES**
Storm Tide:
Sum of a Storm Surge and the Astronomical Tide

**Storm Surge**: Water level change due to storm effects (wind, low pressure)

**Astronomical Tide**: Water rise and fall due to gravity of earth, moon and sun
ERNESTO Storm Surge: 3.56 feet
Storm Tide: 5.51 feet
What a Difference a “Phase” Makes …

September, 2006
Hampton Roads (Sewells Pt), VA

‘ERNESTO’

storm tide
astronomical tide
storm surge
mmsl (lunar)
Windmill Point, VA

‘ERNESTO’

Water Level (feet above MLLW)

storm tide
astronomical tide
storm surge
mmsl (lunar)
50 Years of Storm Tides at Sewells Point

1957 – 2006

Four Northeasters and a Hurricane
Yearly Maximum Storm Tides: Sewells Point, VA

Water levels from U.S. National Oceanic and Atmospheric Administration

- 1962 (7.22)
- 1978 (6.41)
- 1998 (6.57)
- 2006 (6.66)
- 2003 (7.89)

Height in feet above 1983-2001 MLLW

Data from 1957 to 2005.
Sea Level Change at Hampton Roads, Virginia

1930 - 2005
Monthly Mean Sea Level, Hampton Roads (Sewells PT), VA

*Sea Level Trend: 1.4 ft/century*
Monthly Mean Sea Level, Hampton Roads (Sewells PT), VA

Sea Level Trend: 1.4 ft/century

Water levels from U.S. National Oceanic and Atmospheric Administration
Lower Chesapeake Bay
Storm Tide Comparisons

‘ERNESTO’ - September, 2006
Northeaster – October, 2006
Northeaster – November, 2006
Extratidal High Water (XHW)

A new metric for comparing storm tides
JAMES RIVER (SEWELLS POINT)

EXTRATIDAL HIGH WATER

Feet

‘ERNESTO’

Sep-06  Oct-06  Nov-06
EXTRATIDAL HIGH WATER

RAPPAHANNOCK RIVER (WINDMILL POINT)

'ERNESTO'

Sep-06
Oct-06
Nov-06

Feet

0 1 2 3 4 5 6
YORK RIVER (USCG TRAINING CENTER)

EXTRATIDAL HIGH WATER

Feet

6
5
4
3
2
1
0

Sep-06  Oct-06  Nov-06

‘ERNESTO’
HURRICANES

EXTRATIDAL HIGH WATER

Feet

AUG, 1933  ISABEL  KATRINA
Work in Progress at Jamestown ... 

Jamestown water level station