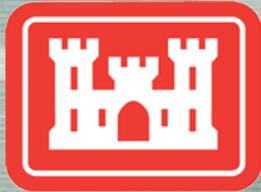


# Coastal Structures Risk Communication Lower Eastern Lake Michigan Harbors

Dave Wright  
Chief Operations  
Detroit District  
Nov 8, 2011



®

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



# Introduction and Agenda

---

## **Purpose:**

Communicate the risk of breakwater and structure conditions to local stakeholders and navigation system users. With a focus on structure condition, function, and economic consequences of coastal structures on the Great Lakes.

## **Focus Topics:**

1. Coastal Structure Risk Communication
2. Condition Assessment of Coastal Structures
3. Harbor Infrastructure Inventory Process
4. Next Steps and Open Discussion



# Regional Risk Communication Meetings



Regional Meetings	
#1	15 Aug
#2	8 Nov
#3	IN/IL
#4	NE MI
#5	SE MI
#6	West Erie
#7	East Erie
#8	East Ont
#9	MN
#10	UP MI



# Coastal Structures

---

## Great Lakes Navigation



- 104+ miles of navigational structures on the Great Lakes
- Most built between 1860 and 1940
- Timber crib construction (typical)
- Low Lake water levels since the 1990's have accelerated deterioration



# Typical Coastal Structures



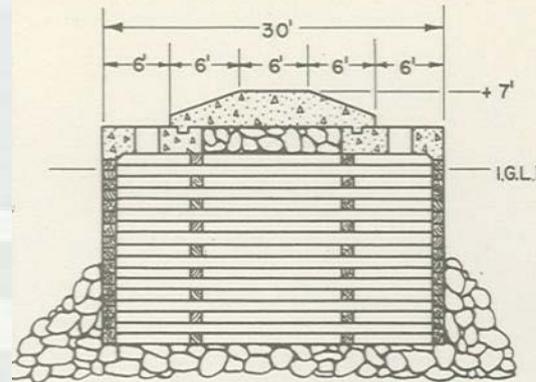
Steel Sheet  
Pile  
Structures



Rubble  
Mound/Laid-Up  
Stone Structures



Other  
Components:  
safety  
(railings,  
walking  
surface, etc.)



Typical Wood  
Crib/ Concrete  
Cap Structures  
Cross-section



# Structure Function/Consequences

---



*Calumet Harbor, IL&IN*

**Contain and reduce shoaling in navigation channel**



*Milwaukee Harbor, WI*

**Protect navigation channel and shoreline infrastructure**



*St. Joseph Harbor, MI*

**Control wave climate within navigation channel and harbor**



# Coastal Structure Communication Objective

---

Program Objective: Communicate the risk of breakwater and structure conditions to local stakeholders and navigation system users

## Process:

### 1. **Conduct Condition Assessments**

- Commercial Harbors- Use detailed Breakwater Assessment Team (BAT) Evaluation
- Recreational Harbors- Rely on expert elicitation

### 2. **Conduct Harbor Infrastructure Inventory on all structures**

### 3. **Prepare summary document** that conveys the current condition of the harbor infrastructure as well as the risk involved in the event of failure

### 4. **Share with stakeholders** in regional meetings



# Harbor Infrastructure Inventory Process

---

- Gather information on critical infrastructure protected by federally maintained navigation structures
  - ▶ Review Documents:
    - Project Drawings
    - Harbor Fact Sheet
    - Aerial/Satellite Photography; Photo document critical infrastructure
  - ▶ Identify Critical Infrastructure to Visit
  - ▶ Research Identified Critical Infrastructure
- Site Visit Tasks
  - ▶ Met with Local Officials, Port Authority, Harbor Master, when available
  - ▶ Visit Identified Areas/Critical Infrastructure & Gather Information
- Post Site Visit Tasks
  - ▶ Create Report Following the Standard Report Template



# Harbor Infrastructure Inventory Report Content

---

- **HARBOR LOCATION**
- **PROJECT DESCRIPTION**
  - Authorization, harbor type (commercial or recreational), length of breakwater structures and channel
- **DATE OF SITE VISIT**
- **SUMMARY OF STRUCTURES**
  - Lists all structures and facilities that are believed to be protected by the federal navigation structures; also identify any other potential stakeholders
- **SUMMARY OF IMPACT**
  - Summarizes any potential damage that could be experienced if the federal breakwater fails.
- **DESCRIPTION OF STRUCTURES**
  - Aerial photo with all potential affected structures shown along with pictures and a brief description of each potentially affected structure



# High Level Display of Potential Impact Areas

- Three potential impact areas were defined at 500 ft intervals
- Shows potential value of land and infrastructure within each “potential impact area” based on tax assessment data





**Ludington Harbor:**  
C – Medium Risk of Failure





*Settlement Due To Loss Of  
Fill*



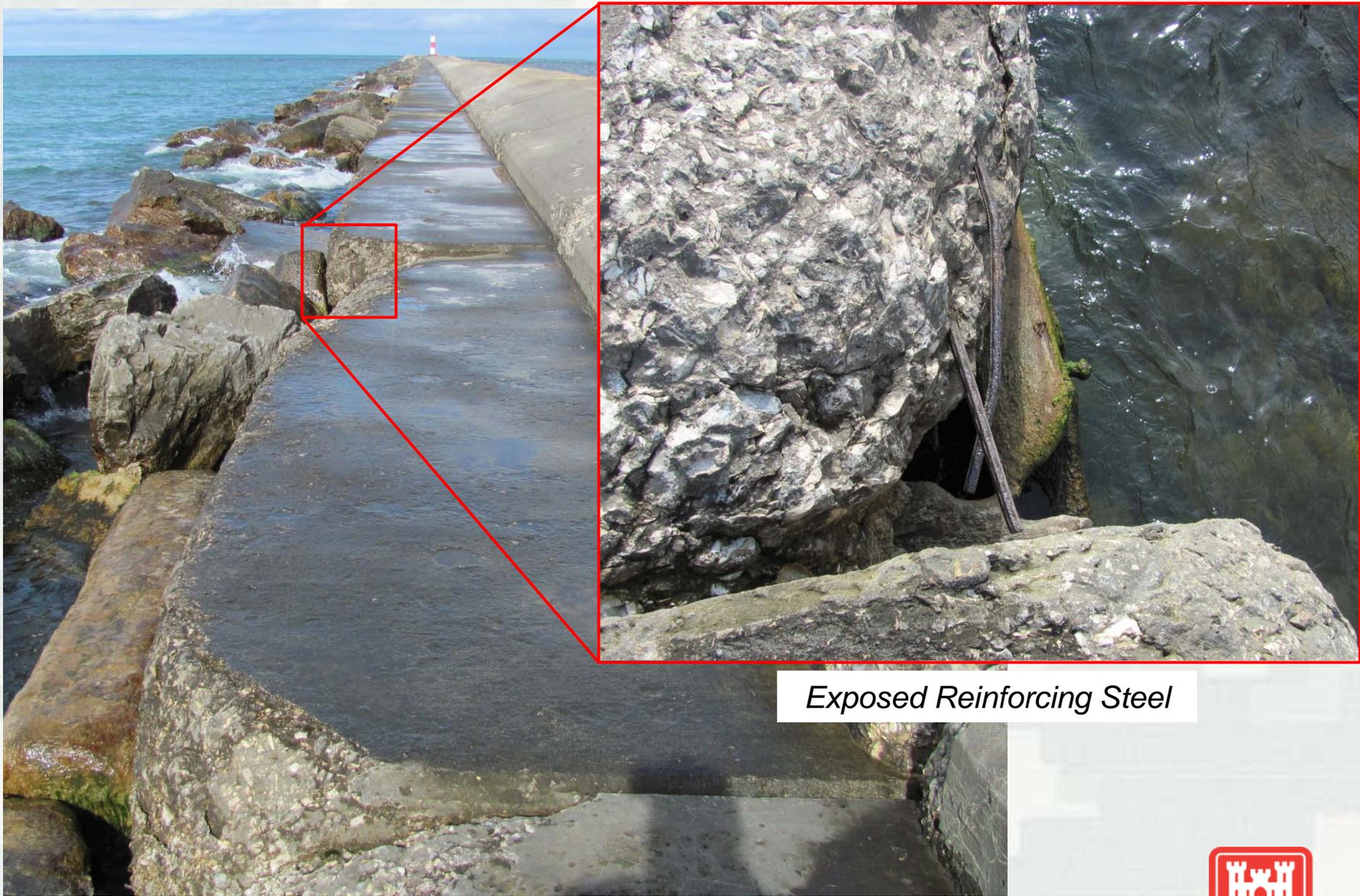
*Cracking That Should Be  
Investigated Further*





*Exposed / Deteriorating  
Foundation*





*Exposed Reinforcing Steel*



# Ludington Harbor:

Overall rating of 'C', North Breakwater Head and portions of South Connector rated 'D'

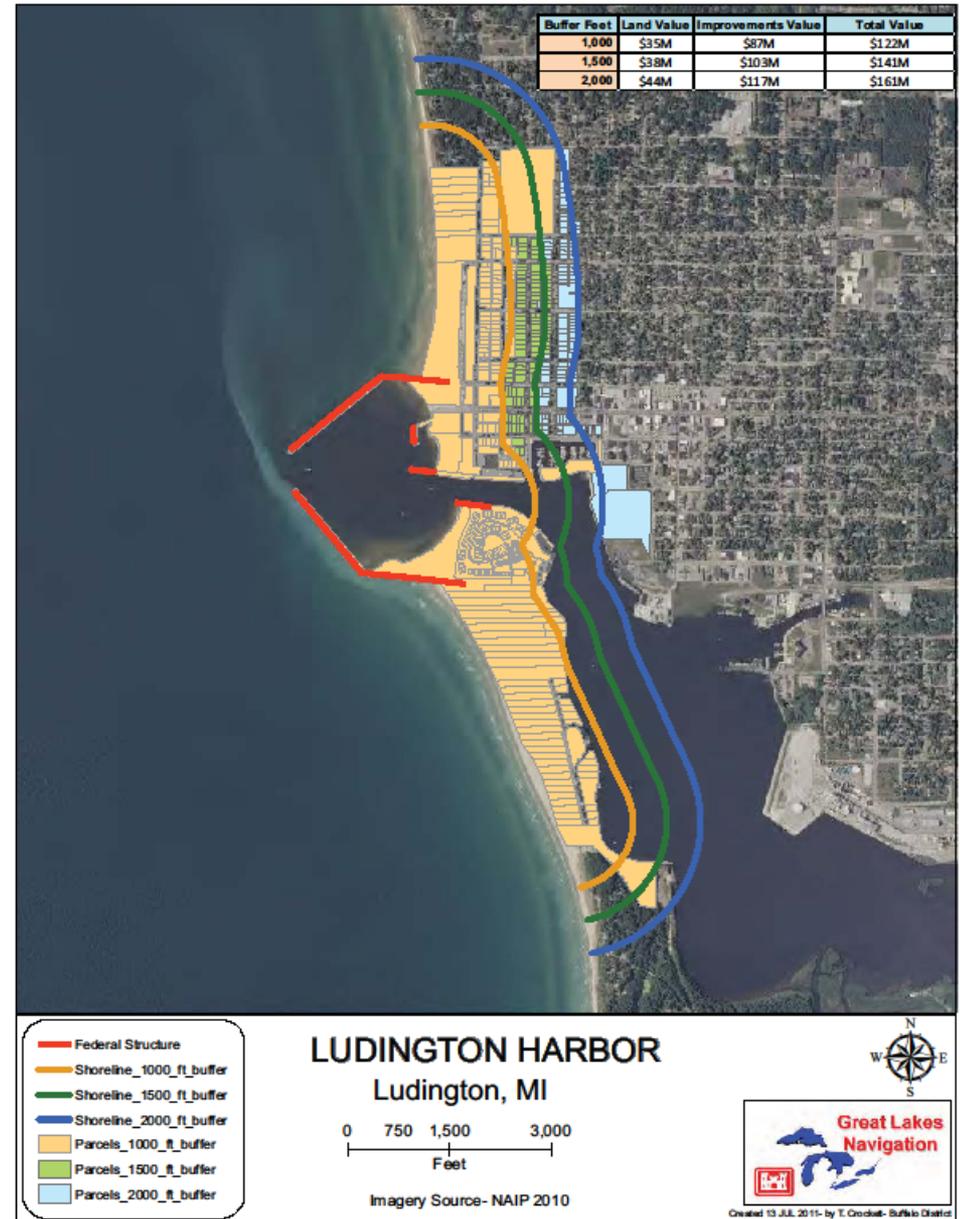
## Infrastructure:

1. Crosswinds Condominiums
2. Stearns Park
3. City of Ludington Boat Launch
4. United States Coast Guard
5. Starboard Tack Condominiums
6. Harbor Village Condominiums
7. Ludington Municipal Marina
8. Ludington Waterfront Park
9. Harbor View Marina



# Ludington Harbor: Potential Impact Areas

Buffer Feet	Land Value	Improv. Value	Total Assessed Value
1,000	\$35M	\$87M	\$122M
1,500	\$38M	\$103M	\$141M
2,000	\$44M	\$117M	\$161M



# Pentwater Harbor: A – Failure Unlikely



Image © 2011 GeoEye

©2010 Google



**BUILDING STRONG®**



A

*South Pier*



B

*North Pier*



# Pentwater Harbor:

No reaches at Pentwater are rated below 'A' & 'B' risk level

## Infrastructure:

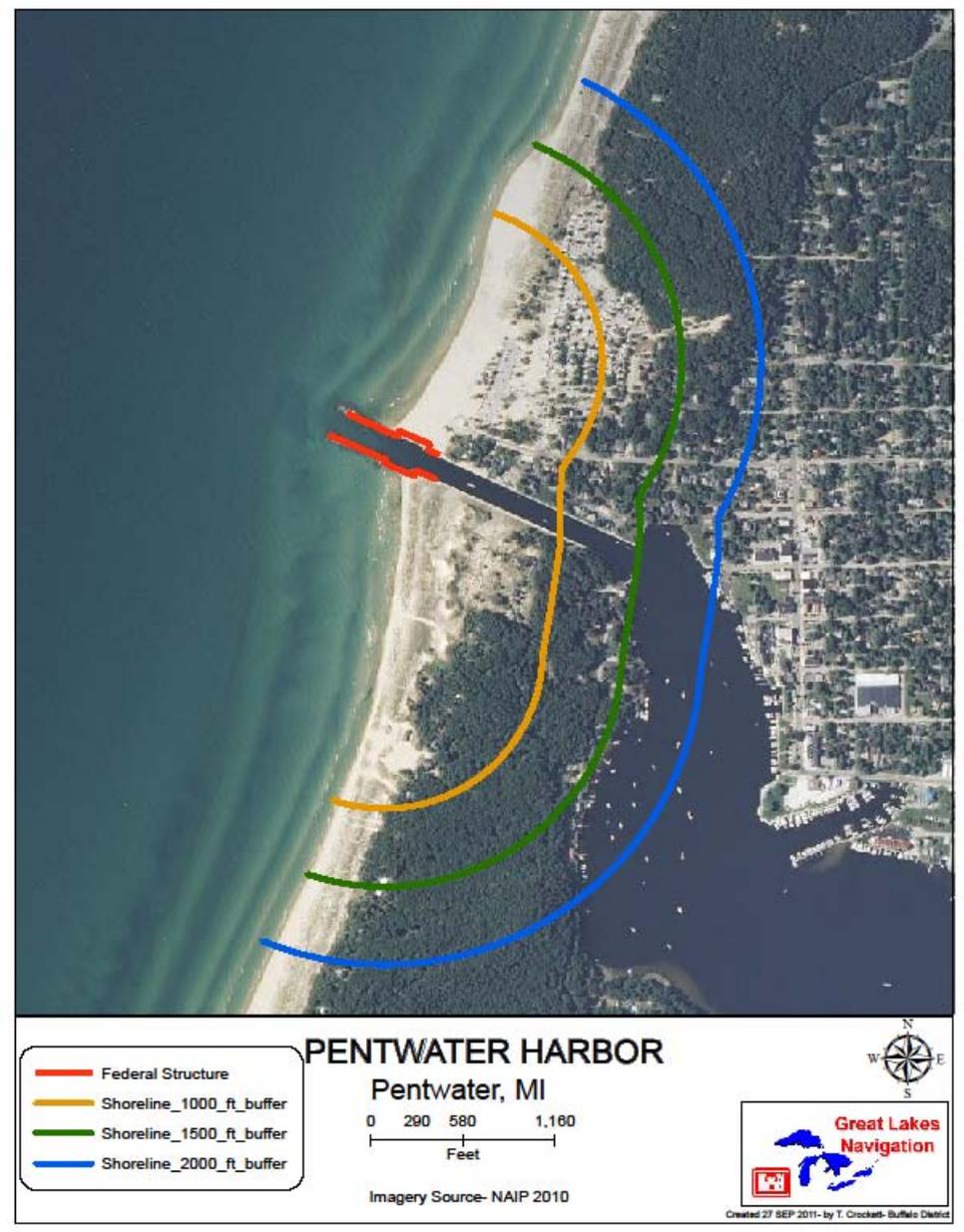
1. Charles Mears State Park
2. Channel Front
3. Pentwater Yacht Club
4. Spinnaker Condominium Complex
5. Harbor View Condominiums



# Pentwater Harbor:

## Potential Impact Areas

Buffer Feet	Land Value	Improv. Value	Total Assessed Value



**White Lake Harbor:**  
A- Failure Unlikely





A

*South Pier*



B

*North Pier*



# White Lake Harbor:

No reaches at White Lake Harbor are rated below 'A' & 'B' risk level

## Infrastructure:

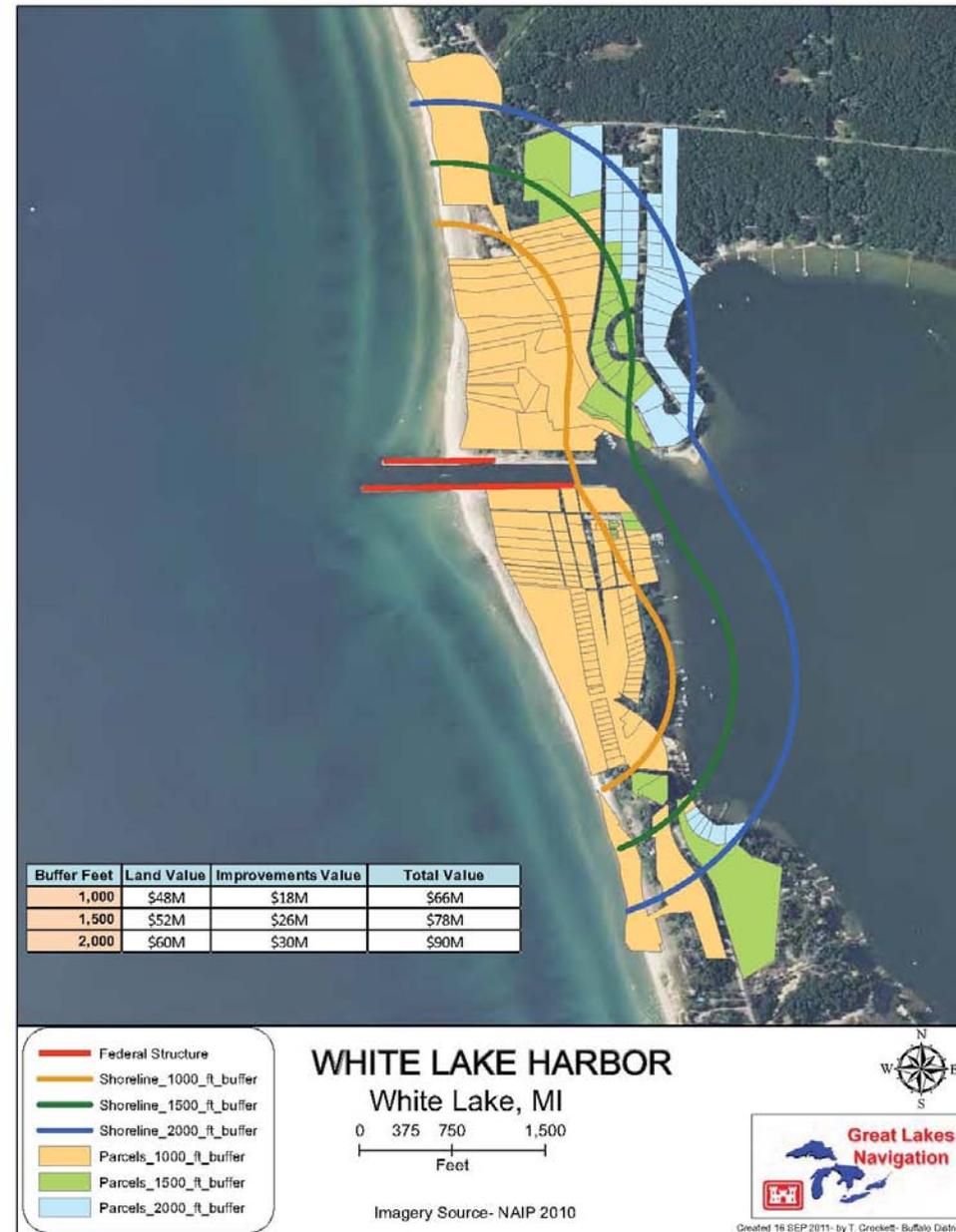
1. Lakefront Houses
2. White River Light Station – Great Lakes Maritime Museum
3. Hollister's The Water's Edge Lodge
4. Driftwood Dunes Condominiums



# White Lake Harbor:

## Potential Impact Areas

Buffer Feet	Land Value	Improv. Value	Total Assessed Value
1,000	\$48M	\$18M	\$66M
1,500	\$52M	\$26M	\$78M
2,000	\$60M	\$30M	\$90M



**Muskegon Harbor:**  
C: Medium Risk of Failure





*Settlement*



**BUILDING STRONG®**



*North Breakwater Head Condition*





*Exposed / Deteriorating Foundation*

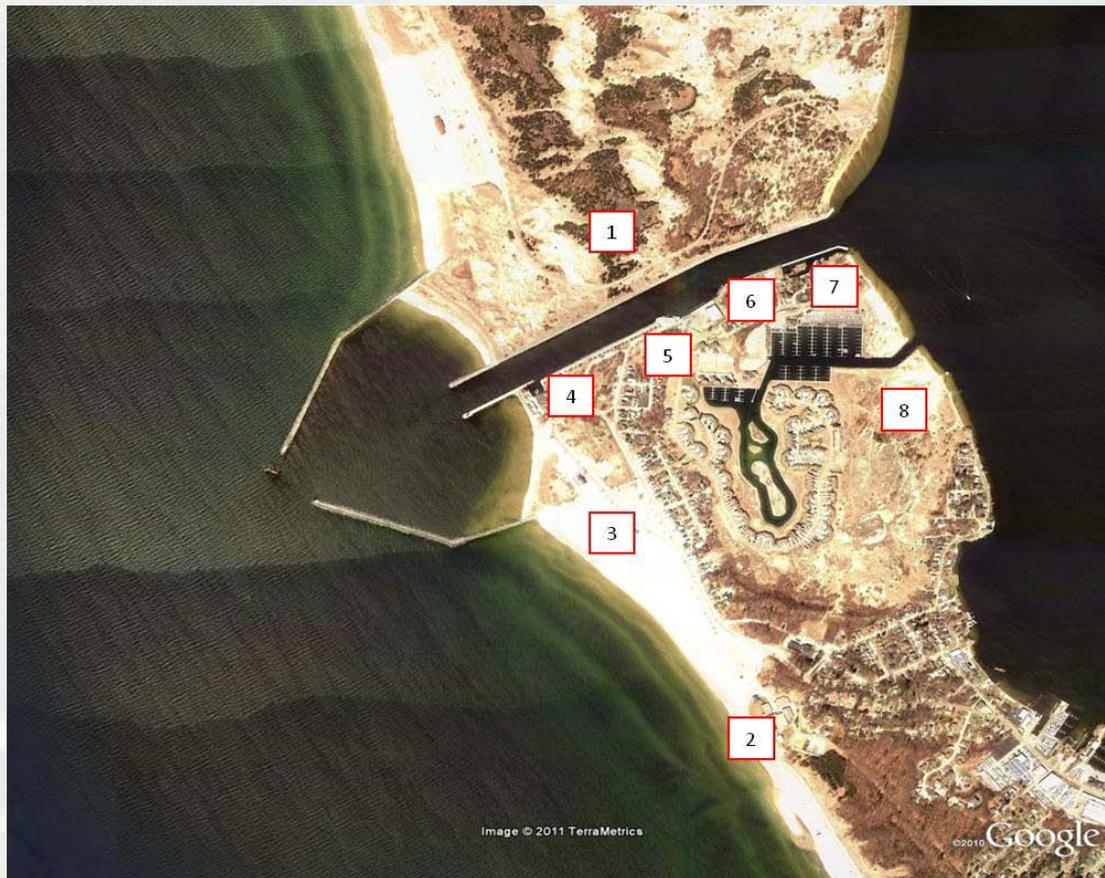


# Muskegon Harbor:

Overall rating of 'C', North Breakwater Head and portions of South Connector rated 'D'

## Infrastructure:

1. Muskegon State Park
2. City of Muskegon Water Filtration Plant
3. Pere Marquette Park
4. National Oceanic and Atmospheric Administration's Lake Michigan Field Office and United States Coast Guard Station
5. Margaret Drake Elliot Park
6. Great Lakes Naval Memorial and Museum (GLNMM) and USS Silversides
7. Channel Front Homes
8. Harbor Town Marina



# Muskegon Harbor:

## Potential Impact Areas

Buffer Feet	Land Value	Improv. Value	Total Assessed Value
1,000	\$24M	\$21M	\$45M
1,500	\$41M	\$63M	\$104M
2,000	\$48M	\$84M	\$132M



**Grand Haven Harbor:**  
C: Medium Risk of Failure





*Exposed Structural Connections*



*Settlement*





*Loss Of Fill*



# Grand Haven Harbor:

Overall rating of 'C',  
rating of 'D' where  
remaining failed earth  
anchors are located  
along boardwalk

## Infrastructure:

1. Grand Haven State Park
2. Stearns Park: United States Coast Guard-Grand Haven Station
3. Lakefront/Channel front Homes
4. Captain's Cove Condominiums



# Grand Haven Harbor:

## Potential Impact Areas

Buffer Feet	Land Value	Improv. Value	Total Assessed Value
1,000	\$56M	\$10M	\$66M
1,500	\$63M	\$74M	\$137M
2,000	\$80M	\$105M	\$185M



**Holland Harbor**  
B- Low Risk of Failure





*Dune On North Breakwater*



# Holland Harbor:

Overall rating of 'B', with isolated locations rated 'C'.

## Infrastructure:

1. Holland State Park
2. Channel Front Houses



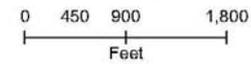
# Holland Harbor: Potential Impact Areas

Buffer Feet	Land Value	Improvements Value	Total Value
1,000	\$22M	\$42M	\$64M
1,500	\$26M	\$51M	\$77M
2,000	\$27M	\$57M	\$84M



- Federal Structure
- Shoreline\_1000\_ft\_buffer\_clip
- Shoreline\_1500\_ft\_buffer\_clip
- Shoreline\_2000\_ft\_buffer\_clip
- Parcels\_1000\_ft\_buffer
- Parcels\_1500\_ft\_buffer
- Parcels\_2000\_ft\_buffer

**HOLLAND HARBOR**  
Holland, MI



Imagery Source- NAIP 2010



Created 13 JUL 2011 by T. Crockett- Buffalo District

Buffer Feet	Land Value	Improv. Value	Total Assessed Value
1,000	\$22M	\$42M	\$64M
1,500	\$26M	\$51M	\$77M
2,000	\$27M	\$57M	\$84M

# Saugatuck Harbor:

A- Failure Unlikely



**BUILDING STRONG®**



*South Rubble Mound*



*North Revetment*



# Saugatuck Harbor:

No reaches at  
Saugatuck are rated  
below 'A' & 'B' risk level

Revetment Repairs in  
December 2010

## Infrastructure:

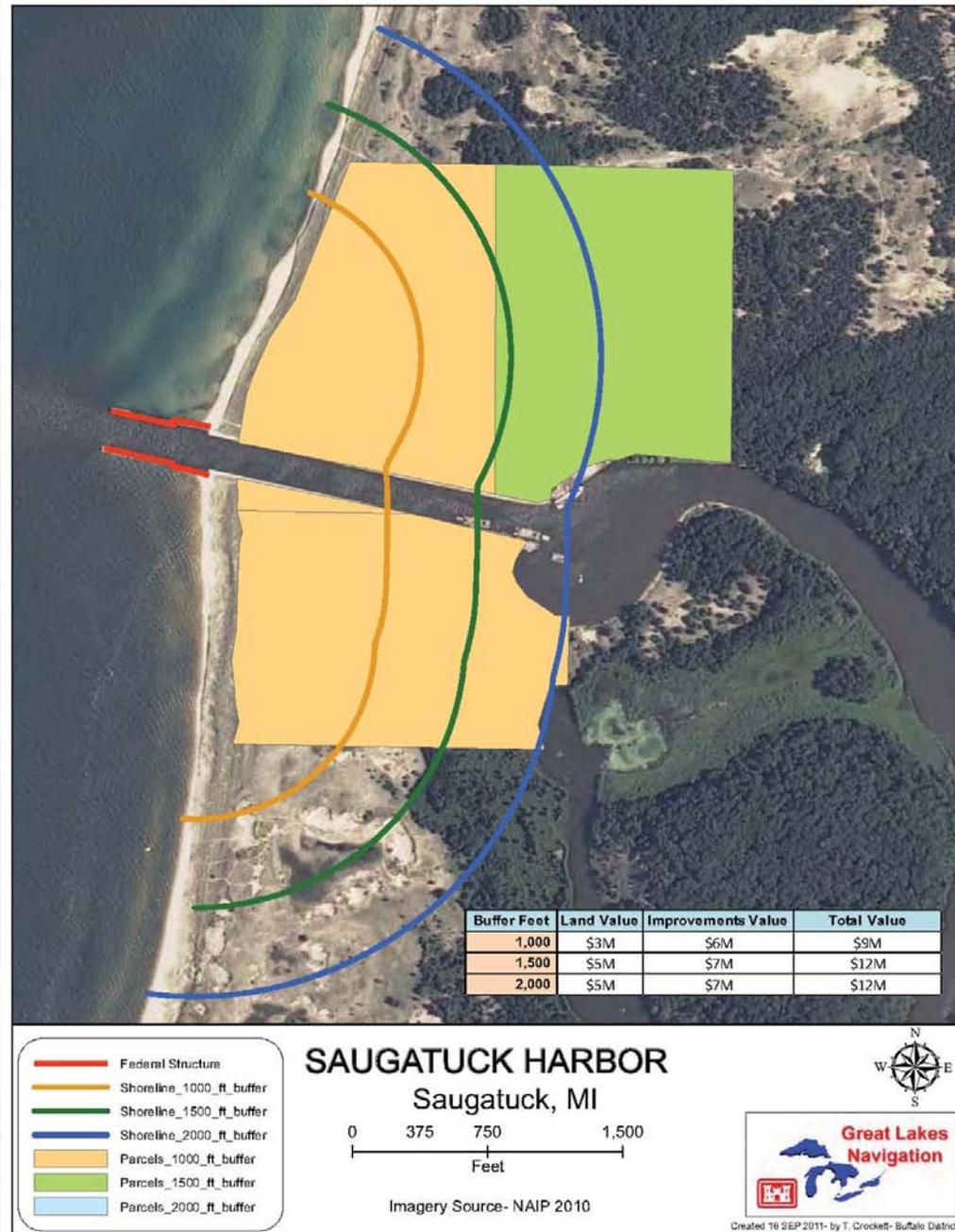
1. Lakefront House



# Saugatuck Harbor:

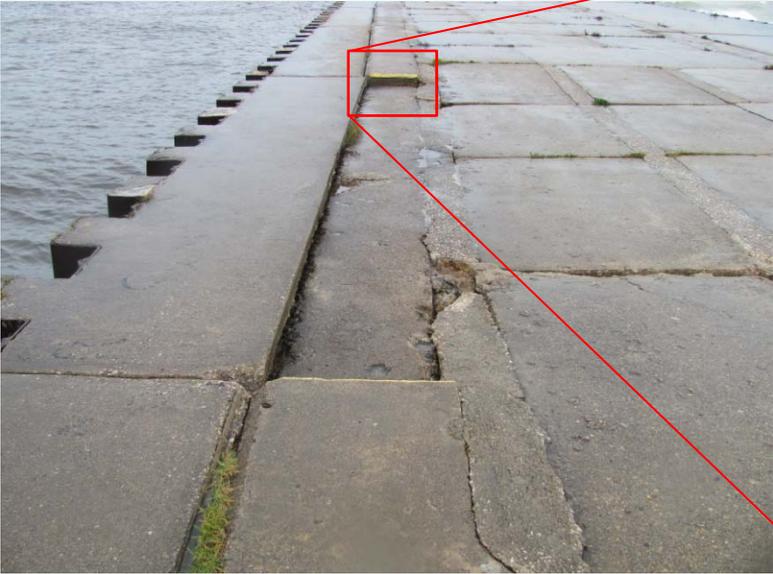
## Potential Impact Areas

Buffer Feet	Land Value	Improv. Value	Total Assessed Value
1,000	\$3M	\$6M	\$9M
1,500	\$5M	\$7M	\$12M
2,000	\$5M	\$7M	\$12M



**South Haven Harbor:**  
B- Low Risk of Failure





*Settlement*



*Exposed Structural Steel*





*Loss Of Fill*



*Settlement*



# South Haven Harbor:

Overall rating of 'B', with isolated locations rated 'C'.

## Infrastructure:

1. South Beach
2. North Beach
3. Channel Front houses
4. United States Coast Guard – South Haven Station
5. Northside Municipal Marina
6. Southside Municipal Marina
7. All Seasons Marina
8. Michigan Maritime Museum & the Museum Marina



# South Haven Harbor:

## Potential Impact Areas

Buffer Feet	Land Value	Improv. Value	Total Assessed Value
1,000	\$161M	\$160M	\$321M
1,500	\$215M	\$215M	\$430M
2,000	\$245M	\$278M	\$523M



# What Can Be Done?

---

- Federal Funding
  - ▶ Funding request through the Federal Budget process each fiscal year
    - Contract structural repair
    - Government floating plant repair
- Local Funding
  - ▶ Mechanisms in place to accept local funding
- Transfer to State/Local Entity
  - ▶ Section 216 Process



# Questions?

