

Coastal Structures Risk Communication of the Great Lakes Districts of the US Army Corps of Engineers



US Army Corps of Engineers
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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 16 Aug 11
- #2 18 Jan 12
- #3 IN/IL
- #4 West MI
- #5 NE MI
- #6 SE MI
- #7 East Erie
- #8 East Ont
- #9 MN
- #10 UP MI



Great Lakes Navigation System (GLNS)

- 104+ miles of navigation structures on the Great Lakes
- Structures include piers, jetties, revetments, and breakwaters
- Most were built between 1860 and 1940
- Jetties and piers were constructed perpendicular to shore to keep the channel open for navigation
- Off shore breakwaters were constructed to allow safe navigation entry to harbors and channels



Navigation structures are regularly subjected to extreme winds and waves



... and ice forces



Typical Coastal Structures



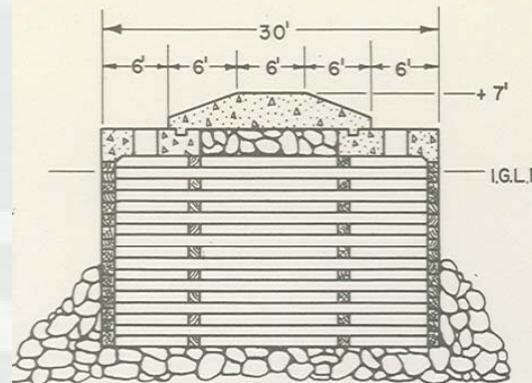
Steel Sheet
Pile
Structures



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 Risk Communication

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



Great Lakes Structure Condition

- 50% of GL coastal structures were built before WWI
- Over 80% of all coastal structures exceed 50 years of age
- 45% have never undergone any significant repair effort due to funding constraints
- Over 30% of structures have timber crib core sections; recent low water levels have accelerated deterioration of the wood



Regional Condition Assessments

A Great Lakes regional team was established in 2008 to conduct Asset Management-based condition assessments of all Great Lakes commercial navigation structures; the Team works with USACE Engineering Research and Development Center and collaborates with the National Coastal Asset Management Board.

- Conditions assessment by segments: 45% of structures are rated C or worse
 - 22 miles (21%) rated C – Probably inadequate
 - 22 miles (21%) rated D - Inadequate
 - 3 miles (3%) rated F – Failed
- Cost to conduct major repair of structures: \$15 – 20M per mile

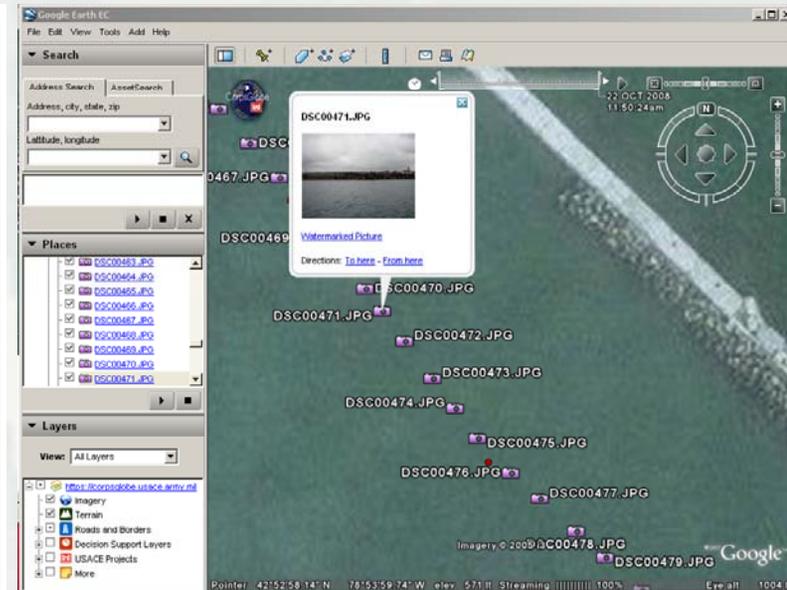


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Regional Condition Assessments

- Structural Index is developed from assessment of major structure components / parameters with most direct link to structure reliability and function
- The structural index value is converted to an A thru F condition level which is used to communicate risk for planning and budgeting purposes
- Collecting complete continuous overlapping still photography and video of each structure at each project. Photos are labeled and geotagged for easy reference in Google Earth.

Condition Classification	Definitions
A Adequate	<ul style="list-style-type: none"> - There is a high level of confidence that the project will perform well under the designed operating conditions. This confidence level is supported by data, studies or observed project characteristics which are judged to meet current engineering or industry standards. - There is a limited probability that the verified degraded conditions will cause an inefficient operation, or degradation or loss of service.
B Probably Adequate	<ul style="list-style-type: none"> - There is a low level of confidence that the project will perform well under designed operating conditions, and may not specifically meet engineering or industry standards. The project may require additional investigation or studies to confirm adequacy. - There is a low probability that the verified degraded conditions will result in inefficient operation, or degradation or loss of service.
C Probably Inadequate	<ul style="list-style-type: none"> - There is a low level of confidence that the project will not perform well under designed operating conditions. The project does not meet current engineering or industry standards. The project may require additional investigation or studies to confirm adequacy. - There is a moderate probability that the verified degraded conditions will result in inefficient operation, or degradation or loss of service.
D Inadequate	<ul style="list-style-type: none"> - There is a high level of confidence that the project will not perform well under designed operating conditions. Physical signs of distress and deterioration are present. Analysis indicates that factors of safety are near limit state. The project deficiencies are serious enough that the project no longer performs at a satisfactory level of performance or service. - There is a high probability that the verified degraded conditions will result in inefficient operation, or degradation or loss of service.
F Failed	<ul style="list-style-type: none"> - The project has FAILED. - Historically the project regularly experiences scheduled or unscheduled closures or loss of service for repairs.



Harbor Structure Condition Assessments



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



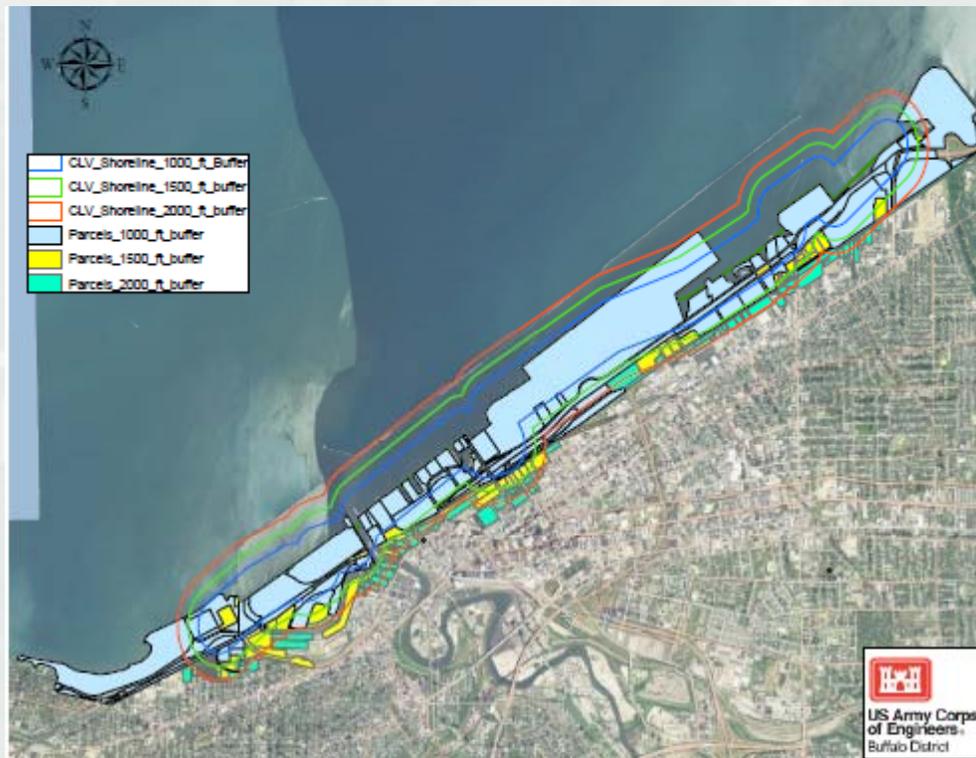
Harbor Infrastructure Inventory Report Content

- **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

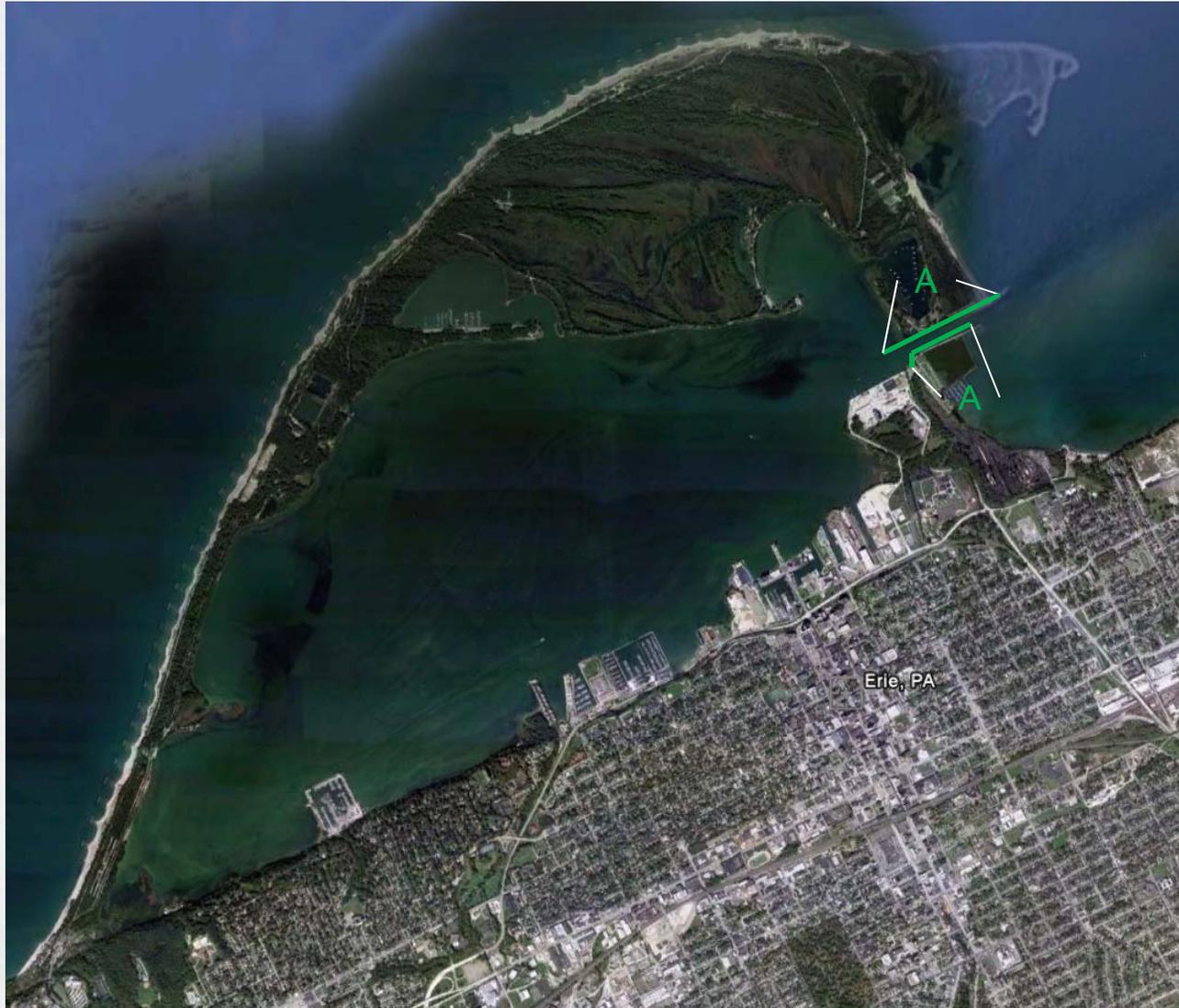
- Three potential impact areas were defined at 500 ft intervals
- Shows potential value of land and infrastructure within each “potential impact area” based on tax assessment data



Harbor Structure Condition Assessments



Erie Harbor



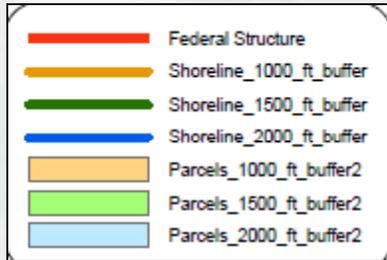
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Erie Harbor:



Erie Harbor: Potential Impact Areas

Buffer Feet	Land Value	Improvements Value	Total Value
1,000	\$20.7M	\$6.9M	\$27.6M
1,500	\$21.8M	\$27.9M	\$49.7M
2,000	\$22.5M	\$56.2M	\$78.7M



Barcelona Harbor



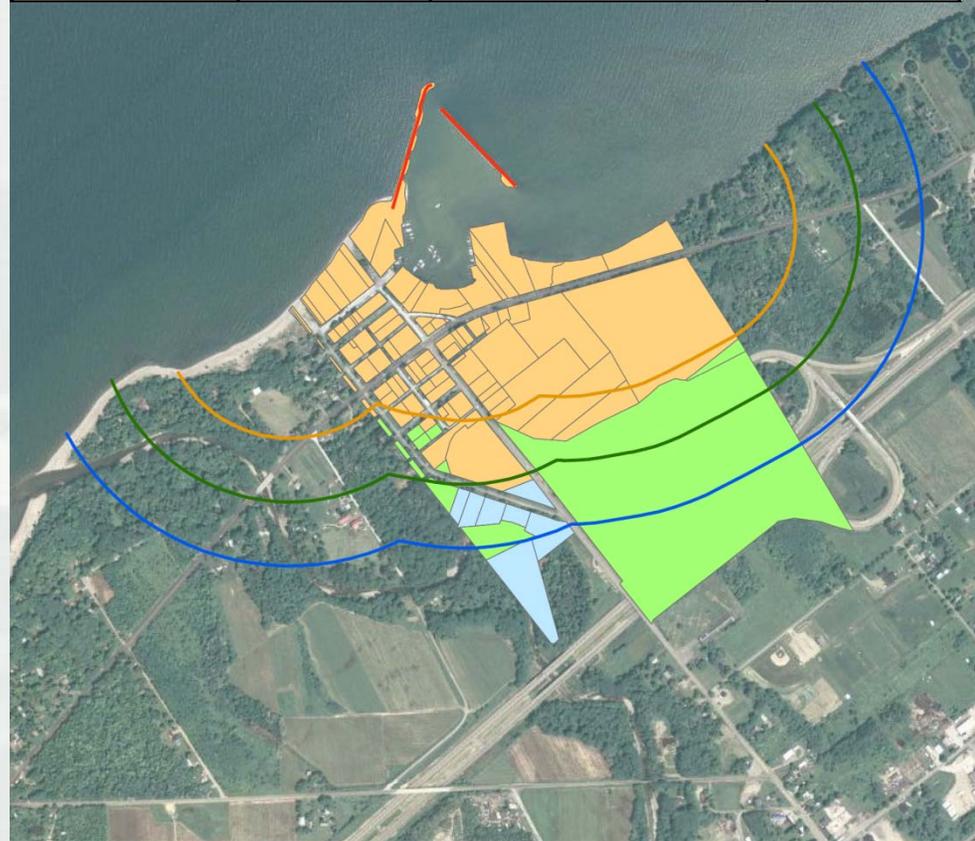
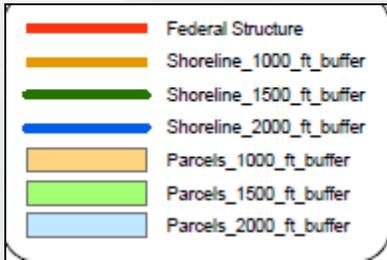
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Barcelona Harbor:



Barcelona Harbor: Potential Impact Areas

Buffer Feet	Land Value	Improvements Value	Total Value
1,000	\$2M	\$3.7M	\$5.7M
1,500	\$5.7M	\$4.2M	\$9.9M
2,000	\$5.7M	\$4.5M	\$10.2M



Dunkirk Harbor



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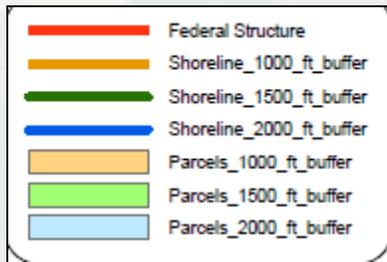
Dunkirk Harbor:

\$21M estimated cost to upgrade D rated structures to an acceptable level of risk (Level B)



Dunkirk Harbor: Potential Impact Areas

Buffer Feet	Land Value	Improvements Value	Total Value
1,000	\$4.9M	\$348.5M	\$353.4M
1,500	\$6.4M	\$362.8M	\$369.2M
2,000	\$7.9M	\$384.4M	\$392.3M



Cattaraugus Creek Harbor



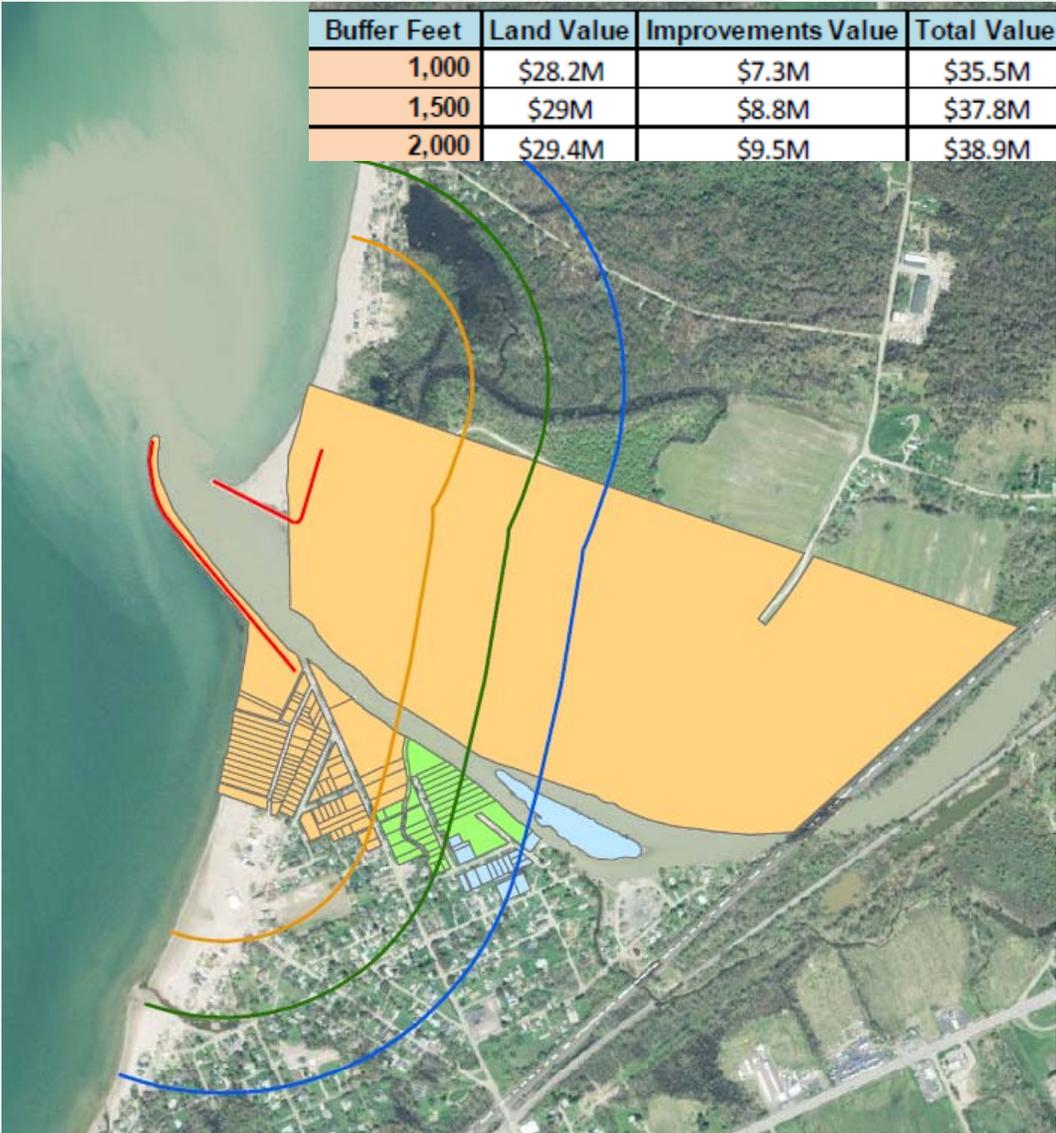
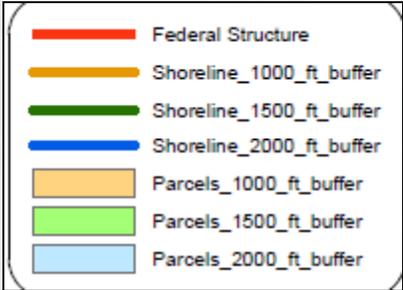
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Cattaraugus Creek Harbor:



Cattaraugus Creek Harbor: Potential Impact Areas

Buffer Feet	Land Value	Improvements Value	Total Value
1,000	\$28.2M	\$7.3M	\$35.5M
1,500	\$29M	\$8.8M	\$37.8M
2,000	\$29.4M	\$9.5M	\$38.9M



Buffalo Harbor



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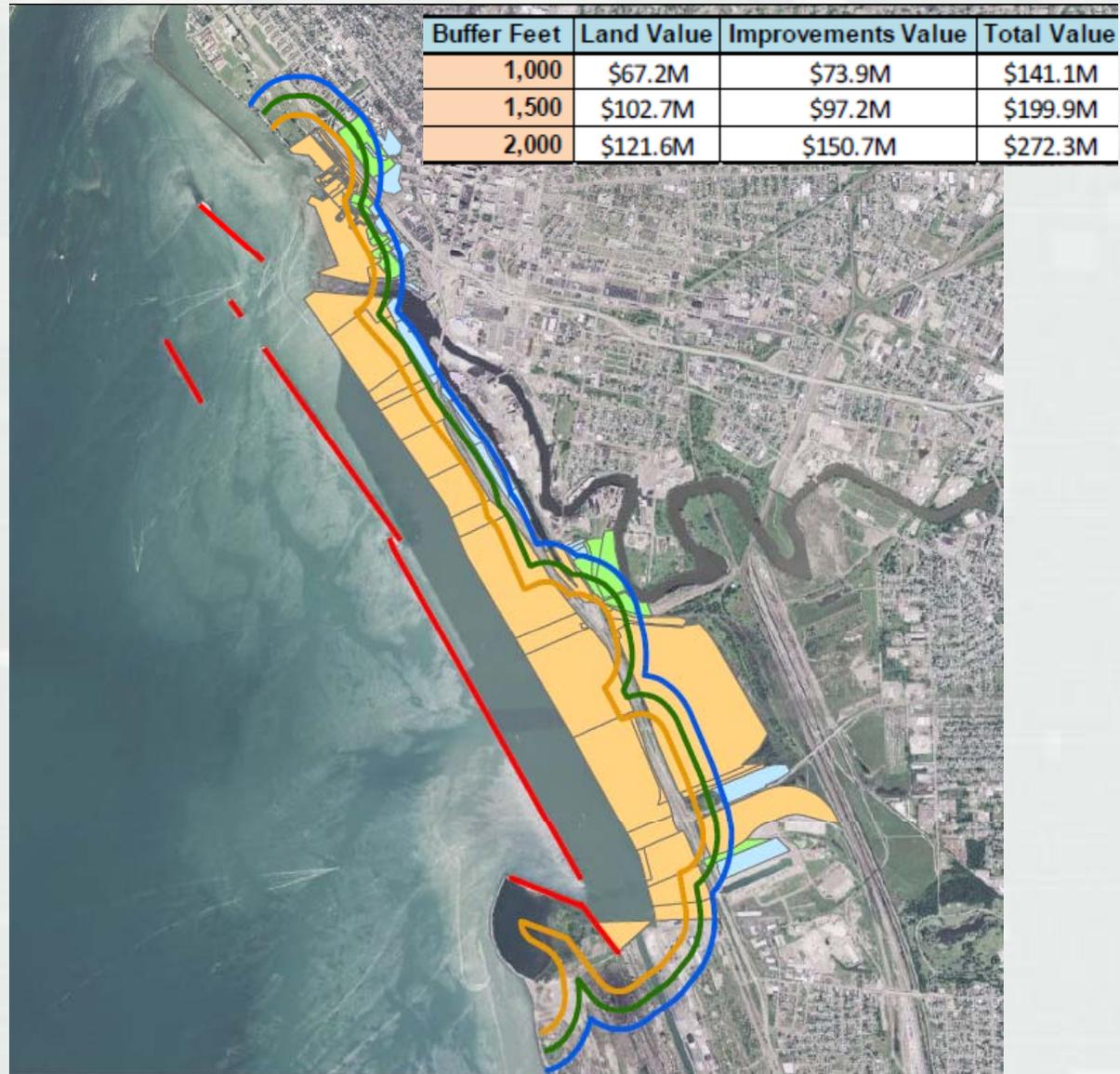
Buffalo Harbor: \$61M estimated cost to upgrade D rated structures to an acceptable level of risk (Level B)

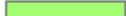
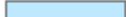


1. Port of Buffalo
2. U.S. Army Corps of Engineers Buffalo District CDF#4
3. Holcim US
4. Vacant Grain Elevator
5. U.S. Army Corps of Engineers Buffalo District CDF#1
6. NFTA Small Boat Harbor
7. Former Freezer Queen Plant
8. Empire Liquidators
9. Vacant Outer Harbor Land and Slips
10. U.S. Army Corps of Engineers
11. Buffalo District CDF#2
12. U.S. Coast Guard Marine Safety Office Buffalo
13. Erie Basin Marina
14. Buffalo Naval Park
15. Erie Canal Harbor and Commercial Slip



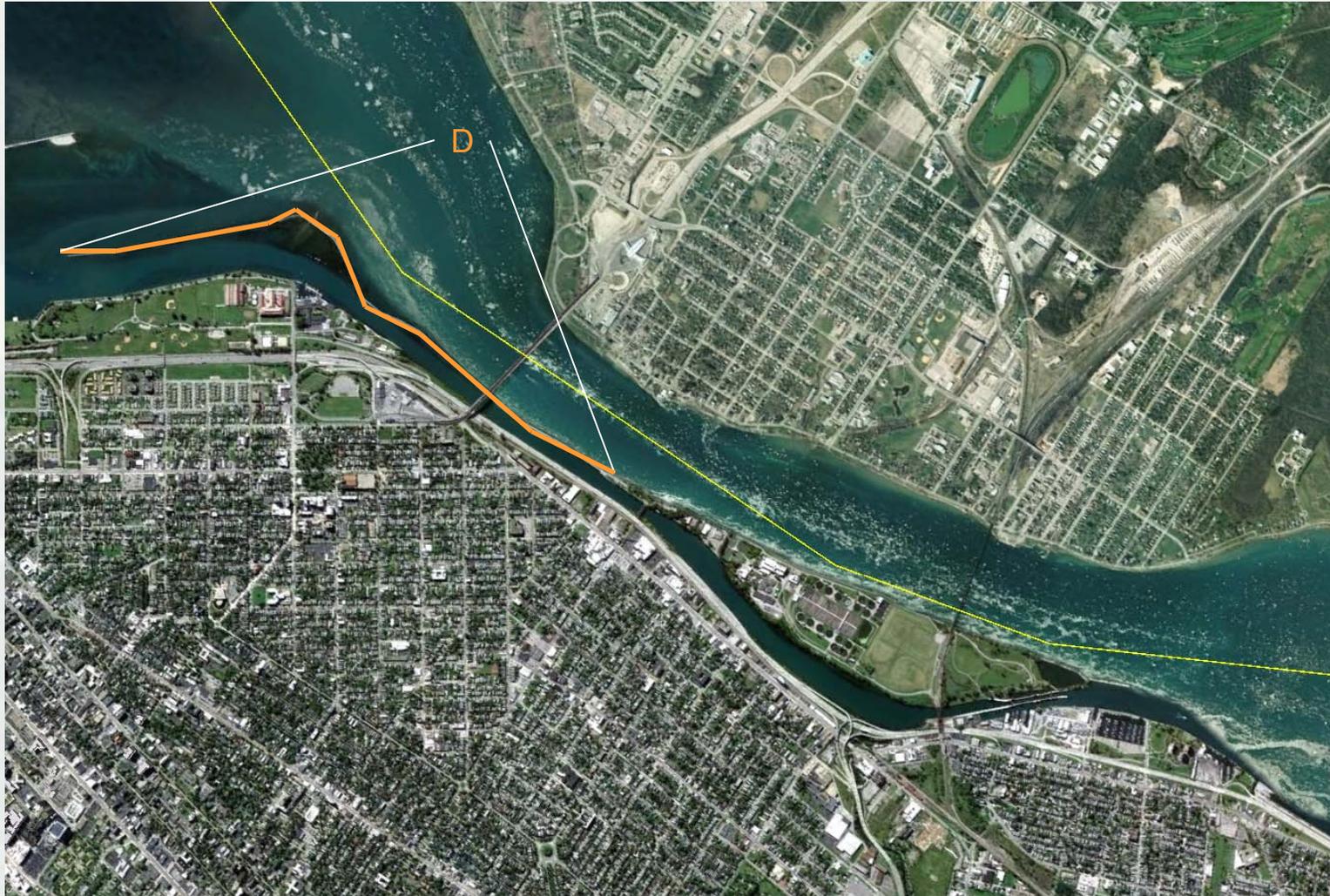
Buffalo Harbor: Potential Impact Areas



-  Federal Structure
-  Shoreline_1000_ft_buffer
-  Shoreline_1500_ft_buffer
-  Shoreline_2000_ft_buffer
-  Parcels_1000_ft_buffer
-  Parcels_1500_ft_buffer
-  Parcels_2000_ft_buffer



Black Rock Lock and Tonawanda Harbor

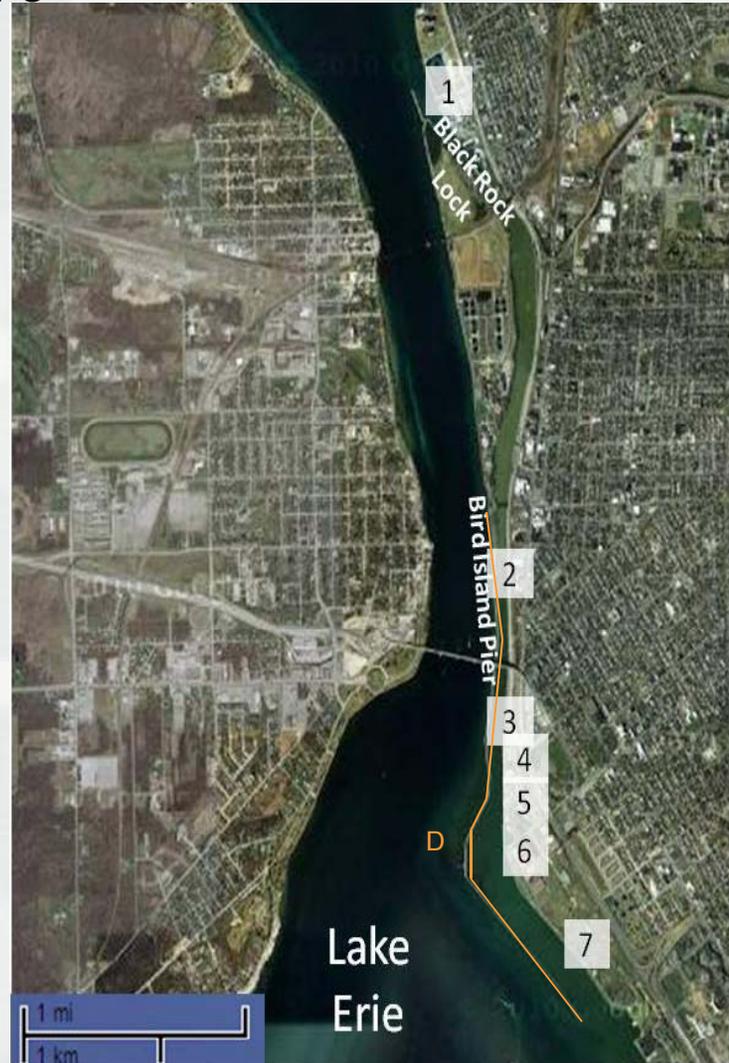


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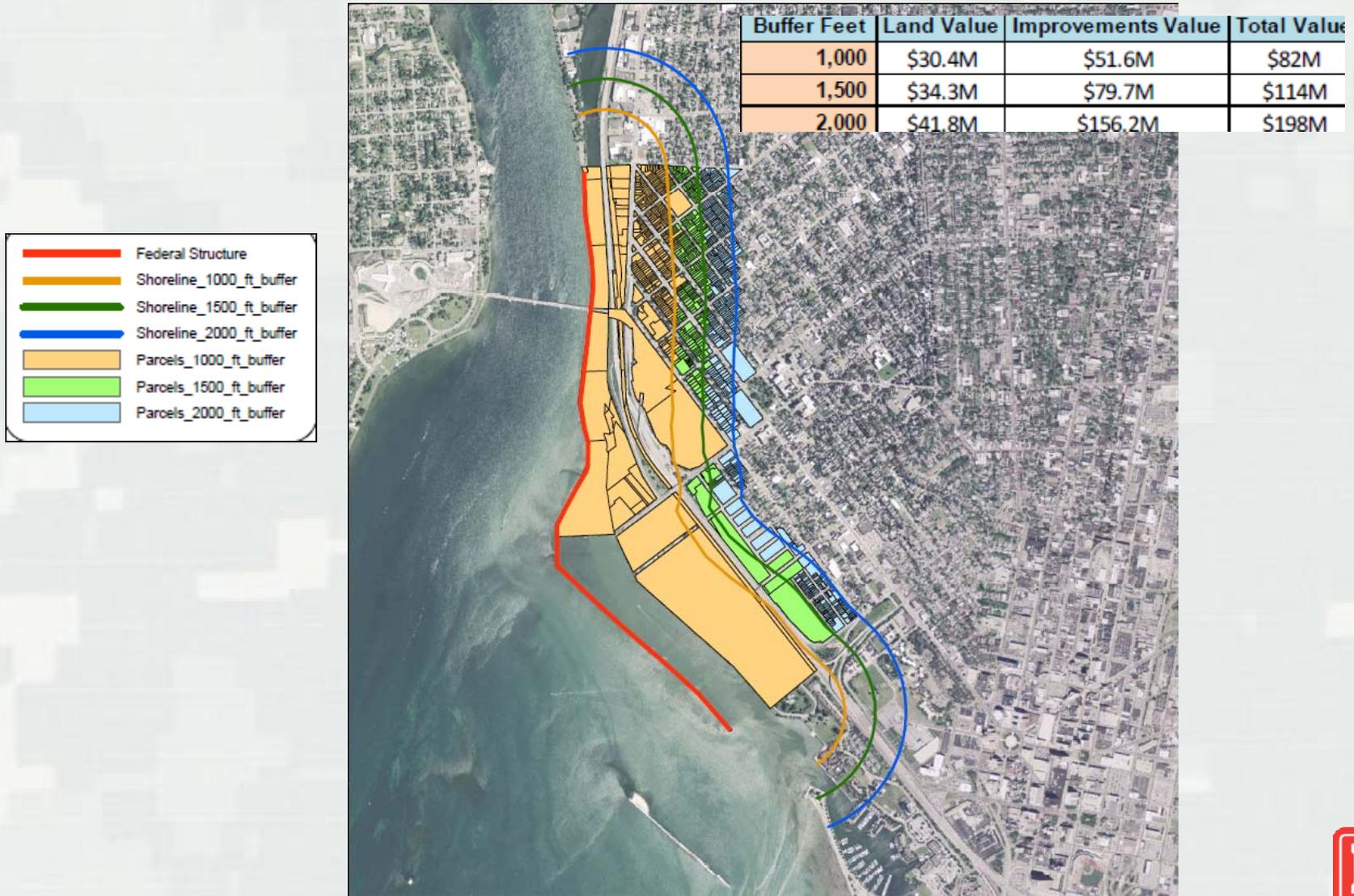
Black Rock Lock and Tonawanda Harbor:

\$5M estimated cost to upgrade D rated structures to an acceptable level of risk (Level B)

1. Rich Marine Sales
2. Interstate 190 – New York State Department of Transportation
3. West Side Rowing Club
4. Frank Lloyd Wright's Fontana Boathouse
5. Buffalo Yacht Club
6. Buffalo Water Authority – Colonel Ward Pump Station
7. La Salle Park



Black Rock Lock and Tonawanda Harbor: Potential Impact Areas



Wilson Harbor



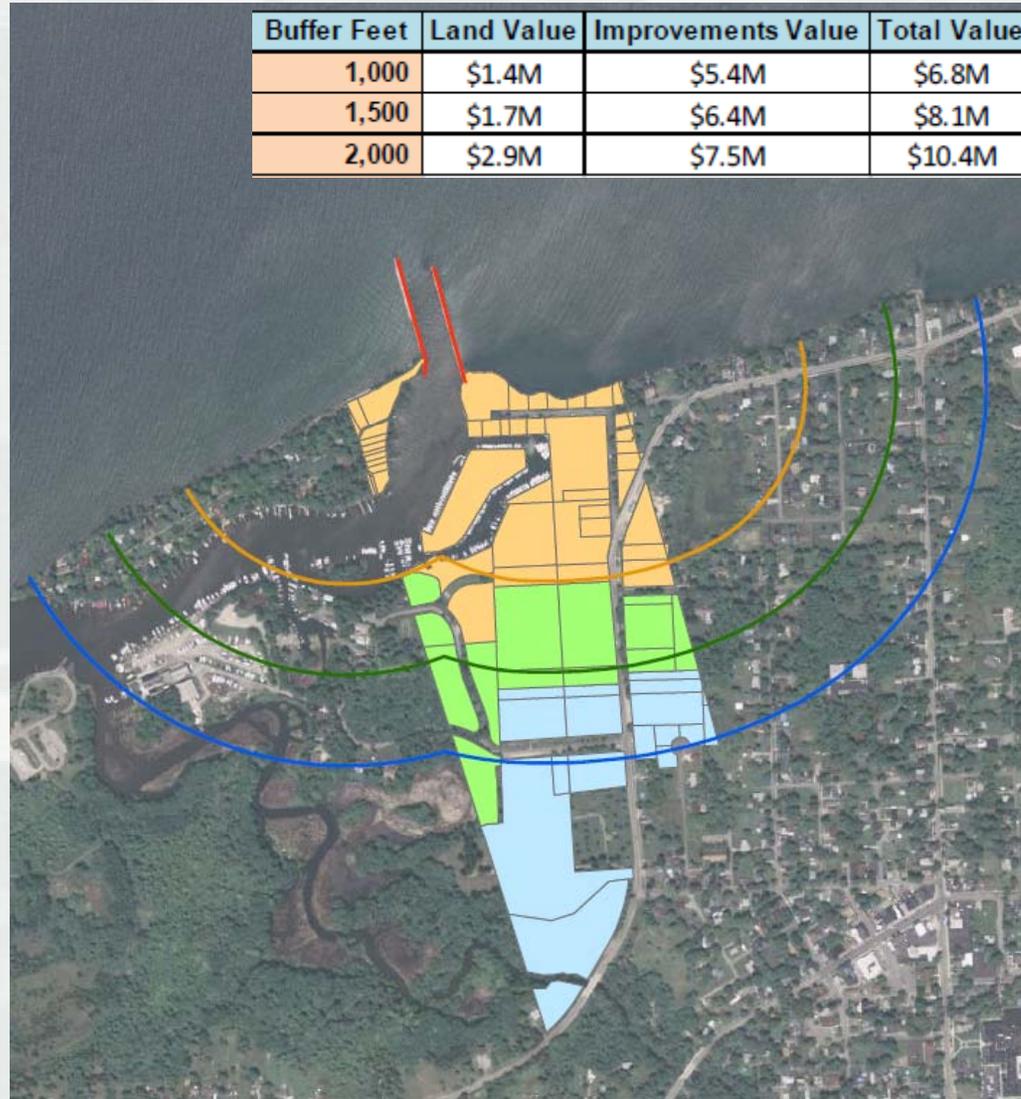
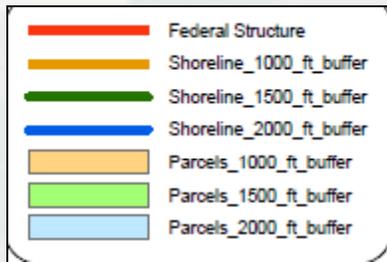
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Wilson Harbor:

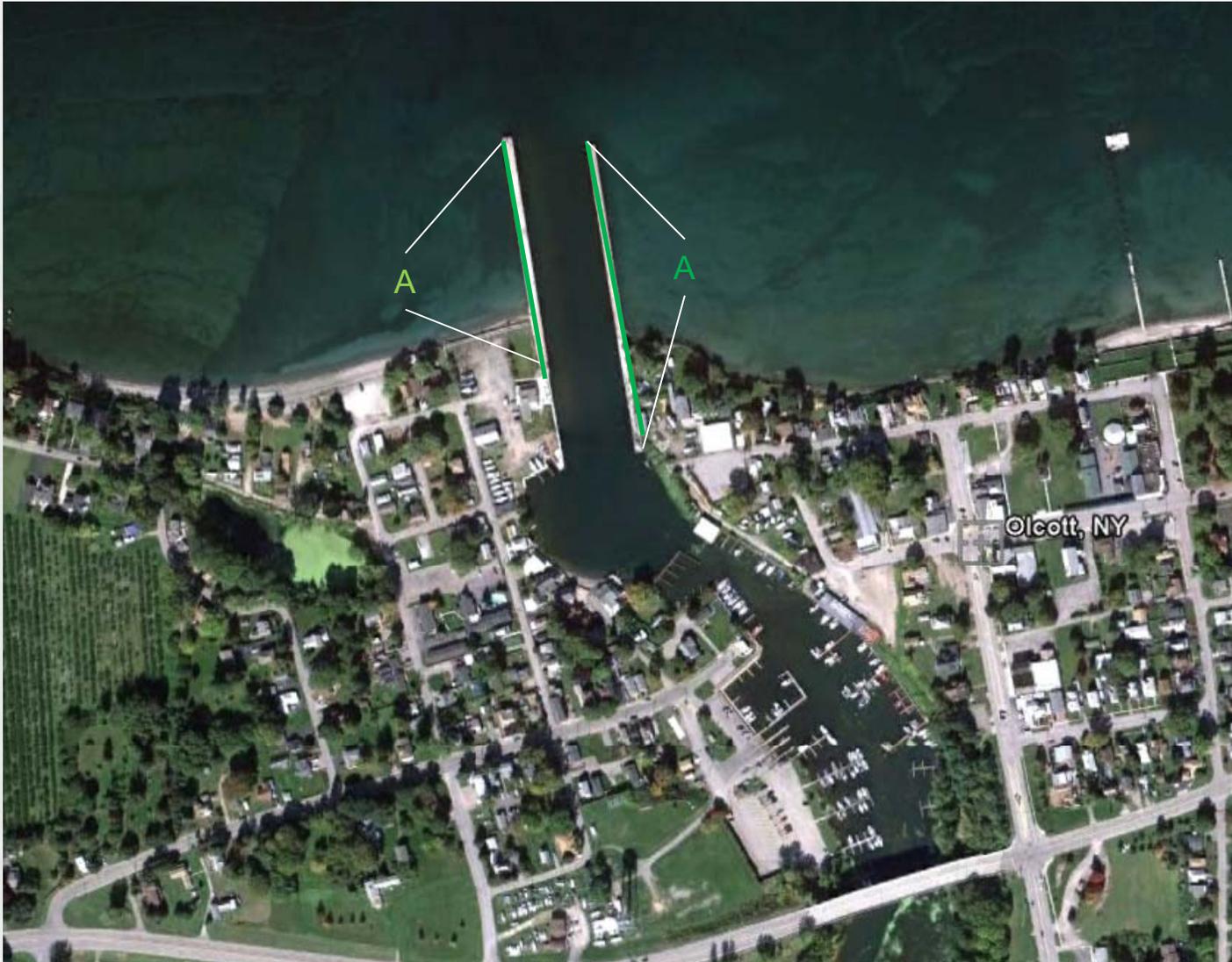


Wilson Harbor: Potential Impact Areas

Buffer Feet	Land Value	Improvements Value	Total Value
1,000	\$1.4M	\$5.4M	\$6.8M
1,500	\$1.7M	\$6.4M	\$8.1M
2,000	\$2.9M	\$7.5M	\$10.4M



Olcott Harbor



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Olcott Harbor:

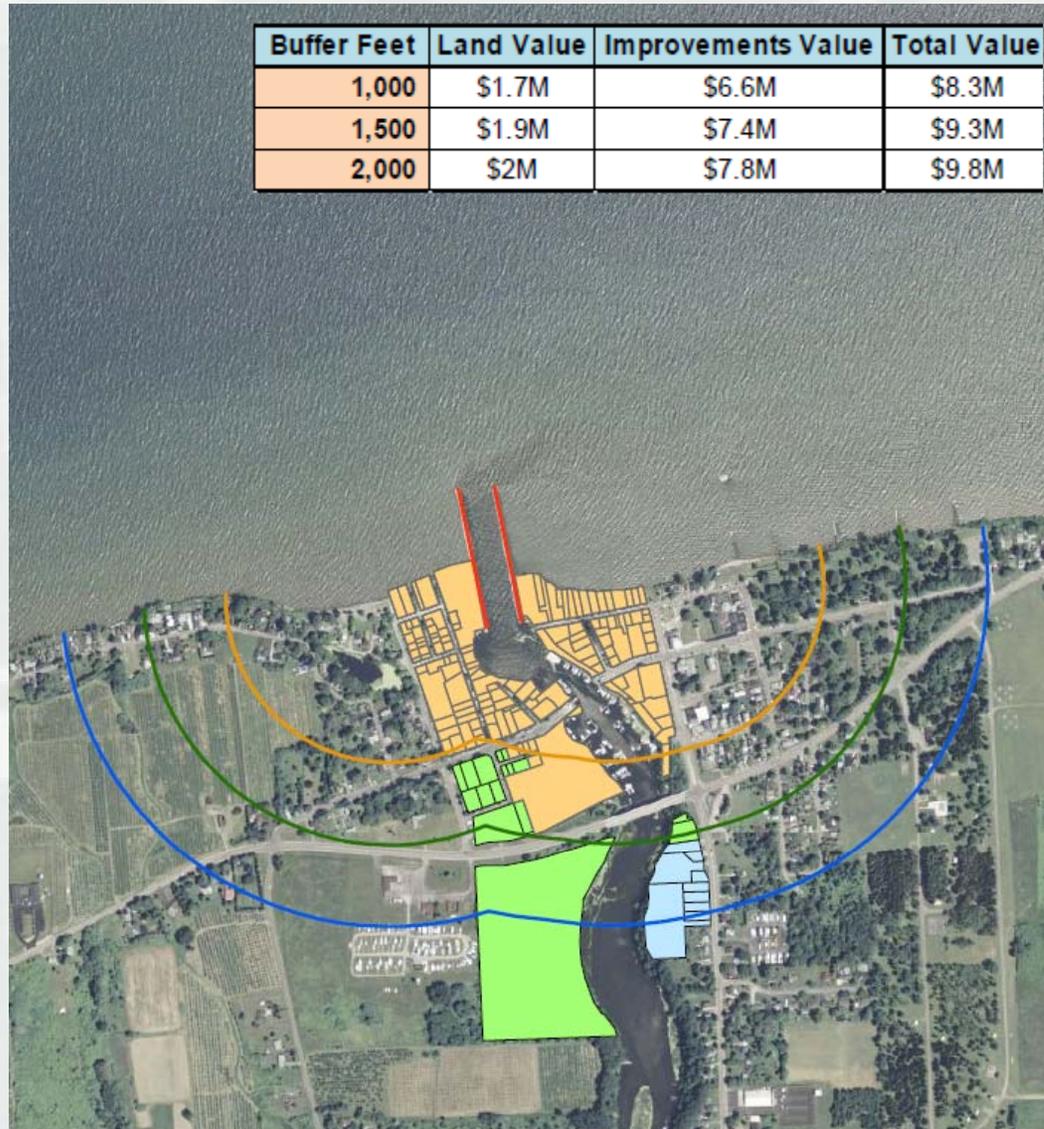
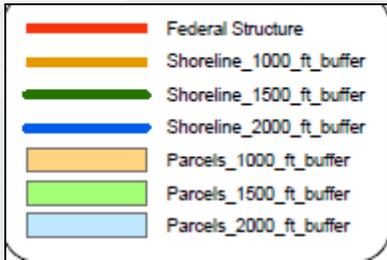


1. Olcott Yacht Club
2. Town of Newfane Marina
3. McDonough Marine & Restaurant
4. Liberty Excursion
5. Hedley Boat Co.

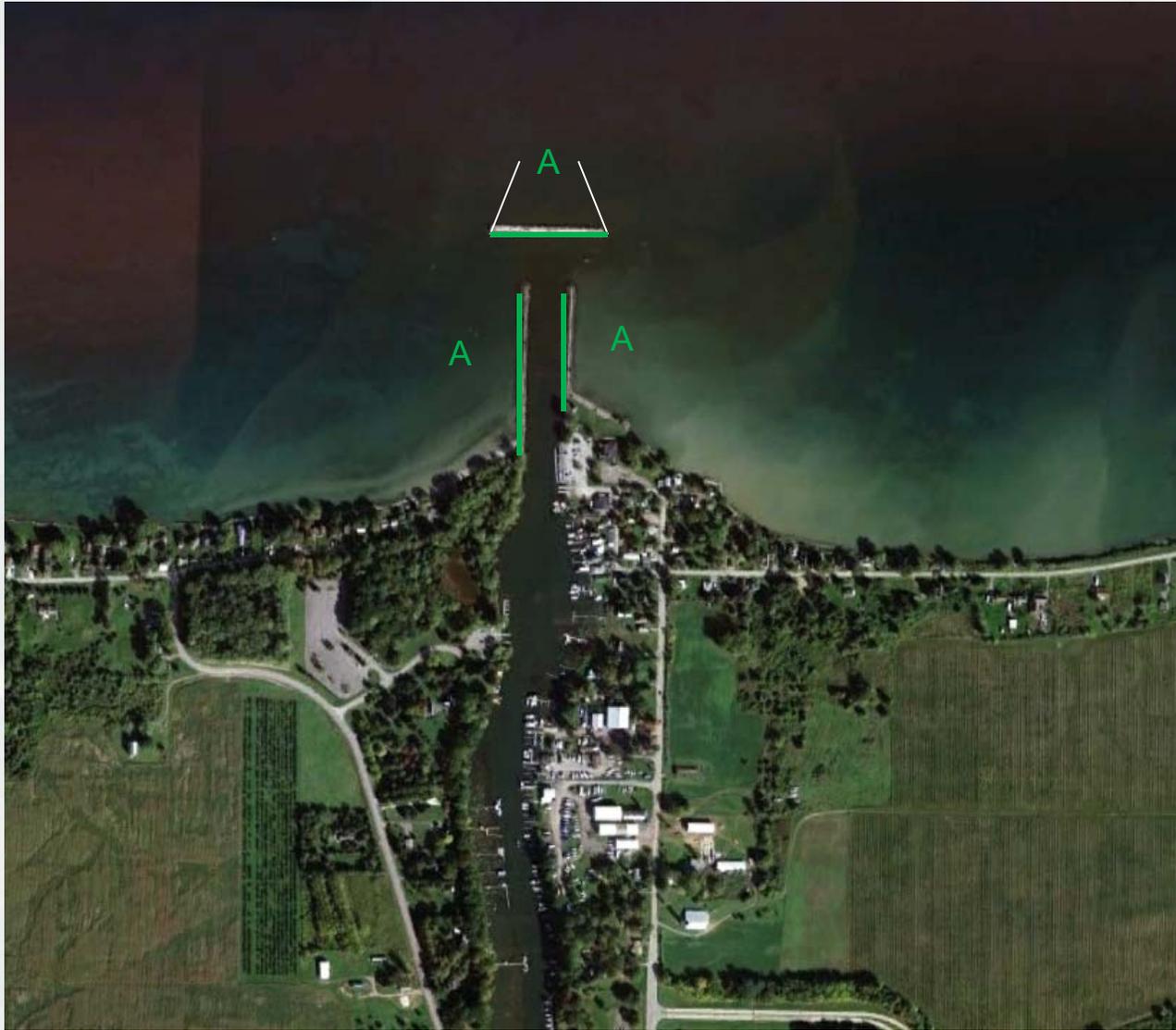


Olcott Harbor: Potential Impact Areas

Buffer Feet	Land Value	Improvements Value	Total Value
1,000	\$1.7M	\$6.6M	\$8.3M
1,500	\$1.9M	\$7.4M	\$9.3M
2,000	\$2M	\$7.8M	\$9.8M



Oak Orchard Harbor



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Oak Orchard Harbor:

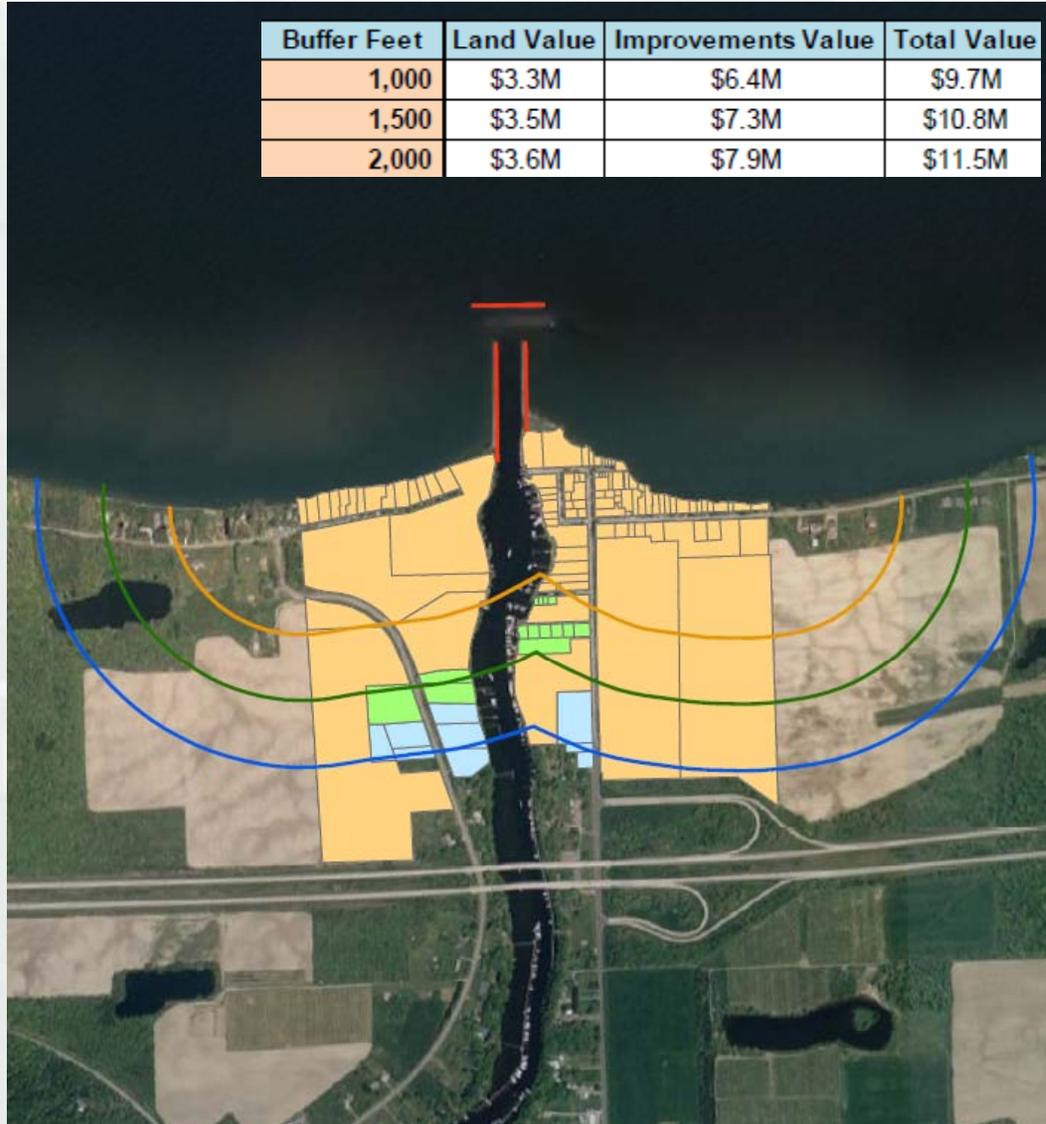
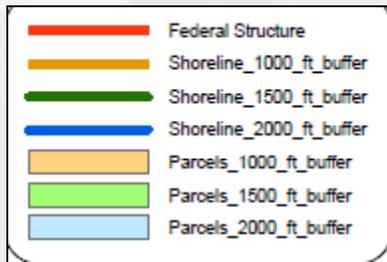


- 1. Oak Orchard State Marine Park
- 2. Orleans County Marine Park
- 3. Lake Breeze Marina
- 4. Four C's Marina
- 5. Orleans County Marine Park – Point Breeze
- 6. Private Building
- 7. Oak Orchard Lighthouse



Oak Orchard Harbor: Potential Impact Areas

Buffer Feet	Land Value	Improvements Value	Total Value
1,000	\$3.3M	\$6.4M	\$9.7M
1,500	\$3.5M	\$7.3M	\$10.8M
2,000	\$3.6M	\$7.9M	\$11.5M



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



Great Lakes Repair Fleet

- Three repair fleets – one in LRB and two in LRE conduct all of the most urgent repair needs on navigation structures in the five Great Lakes.
- Place stone in weakened sections of structures and CDFs, conduct welding repairs on steel sheeting to retain encapsulation of fill stone; repair safety ladders, signs, and railings; remove obstructions from harbor navigation channels; and are available for a wide variety of “emergency” work including debris removal, lock repair, and other unanticipated repair needs.



Water Safety

- Navigation structures at Corps harbors along Lakes Erie and Ontario present a water hazard to the public. There is an ongoing effort to install yellow “Warning” signs and red “Danger” signs on these structures to alert the public of potential hazards. To date, signs have been installed at 7 of the 28 harbors with navigation structures in the Buffalo District.



- Water safety programming and educational outreach is also done at regional events within the District.



Questions?



Coastal Structure Risk Outreach Meetings

Purpose: Communicate the risk of breakwater and structure conditions to local stakeholders and navigation system users.

Target Audience: Stakeholders (port authorities, city/county officials, harbor masters, and other navigation interest groups) within selected region

Products: PowerPoint presentation, general overview brochure, and harbor specific infrastructure inventory summary

Potential Dates: 1st Meeting August 16, 2011 (Milwaukee, WI) plans for two addition meetings in FY11.

