



Resilient Shorelines Preparing For High Water, Storms, and Climate Change

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Resilient Shorelines

Dealing With the Effects of High and Low Water

- Monitoring Long Term Trends
- Shoreline Protection Strategies
- Permitting
- Construction



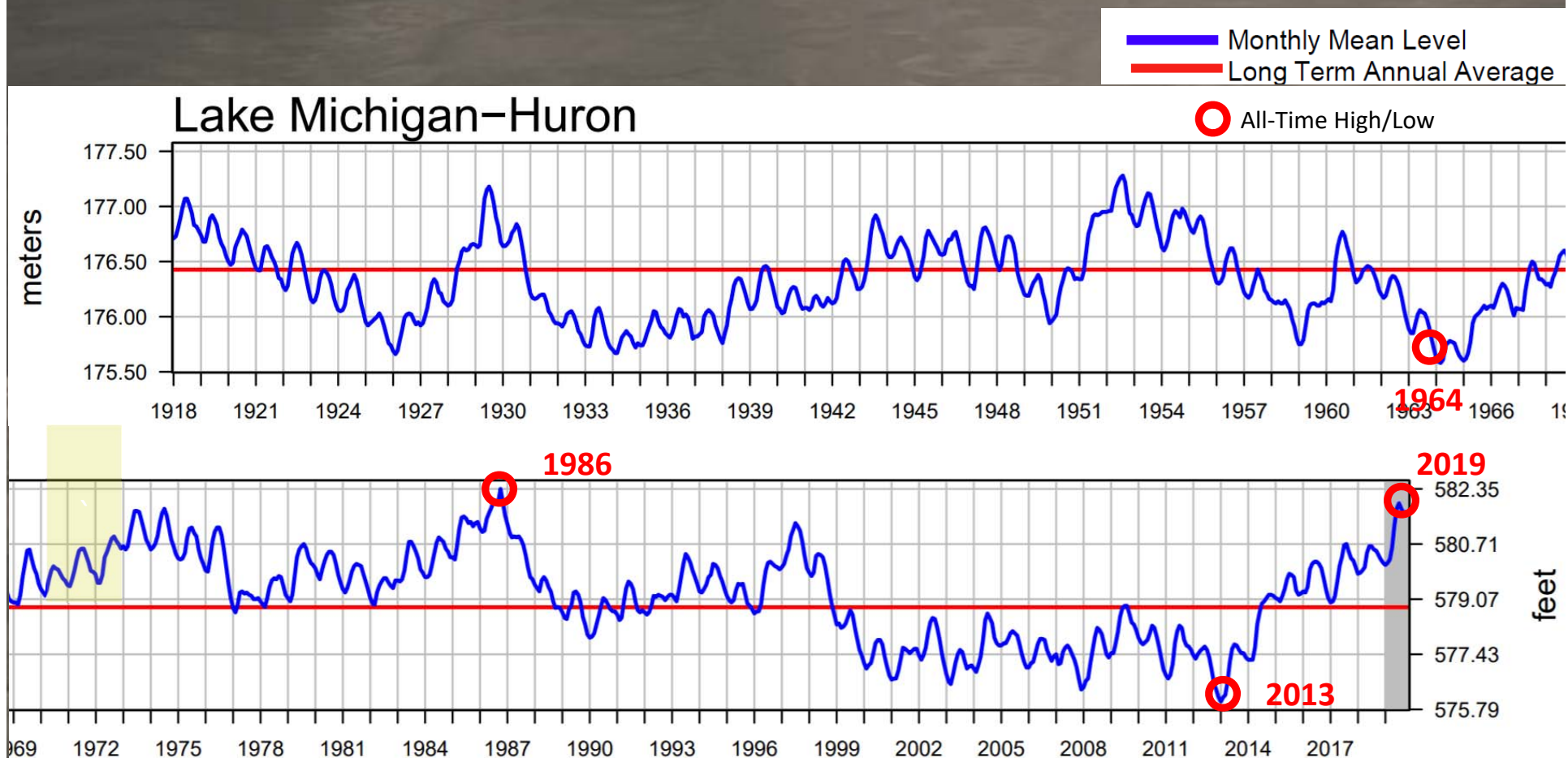
Saint Joseph, Michigan



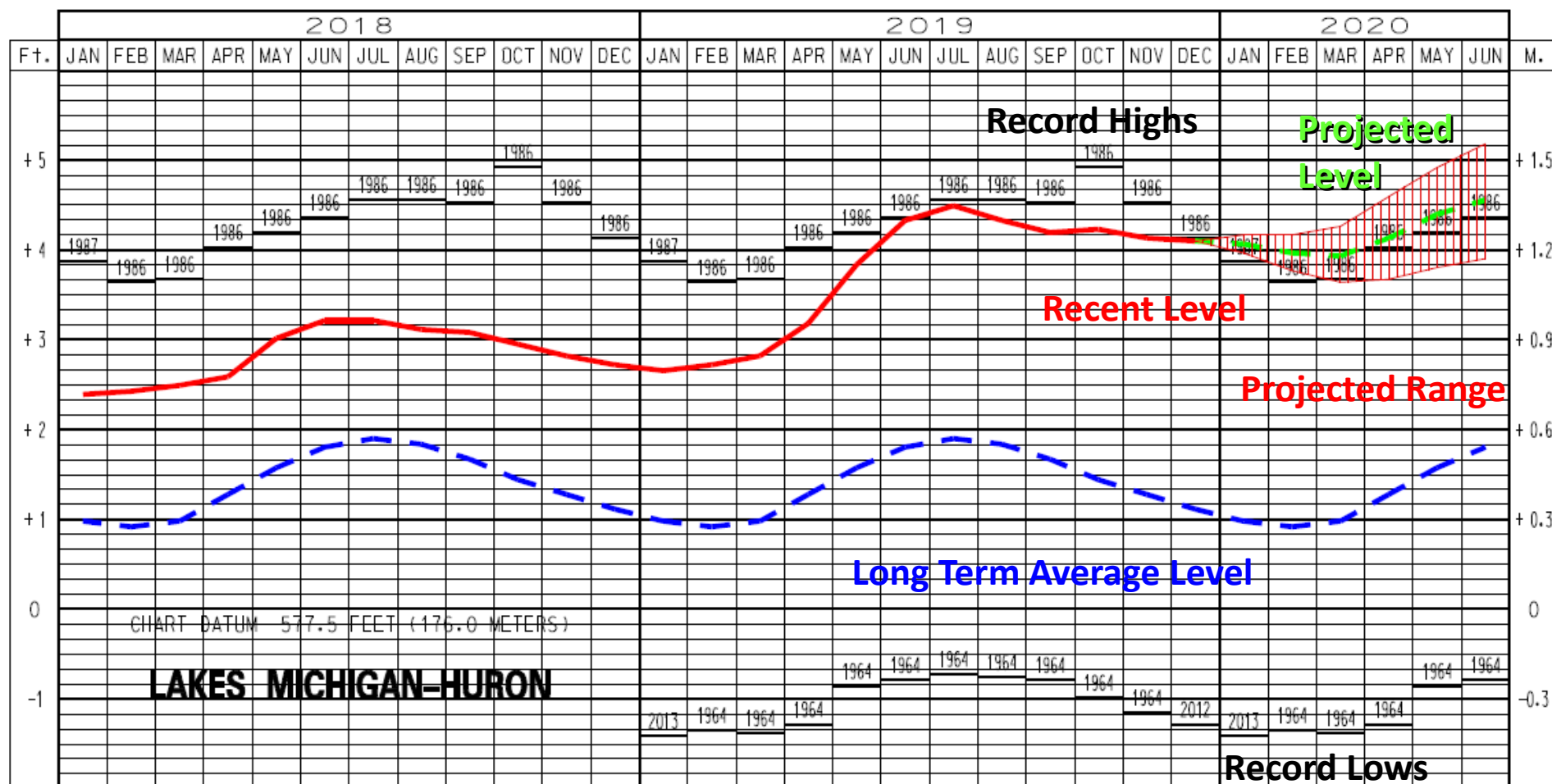
Resilient Shorelines

Lake Michigan Water Levels (Long Term Cycle)

- Long term cycle: -1.14' LWD to +4.88 LWD
- Three 10-year low water periods, separated by average/high water
- Pre-1918 research shows water reached +6.6' LWD (1.6' above 1986)



LAKES MICHIGAN-HURON WATER LEVELS – JANUARY 2020

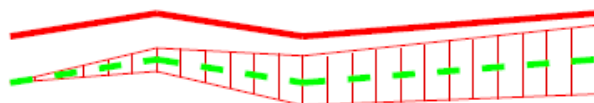


LEGEND

LAKE LEVELS

RECORDED

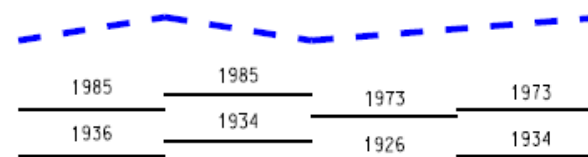
PROJECTED



AVERAGE **

MAXIMUM **

MINIMUM **



** Average, Maximum and Minimum for period 1918-2018



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Saint Joseph, MI – June, 2012



Saint Joseph, MI October 31, 2014



Saint Joseph, MI October 31, 2014



Saint Joseph, MI November 2019



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Saint Joseph, MI November 2019



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Racine, Wisconsin November 2019



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Lake Erie March 2018



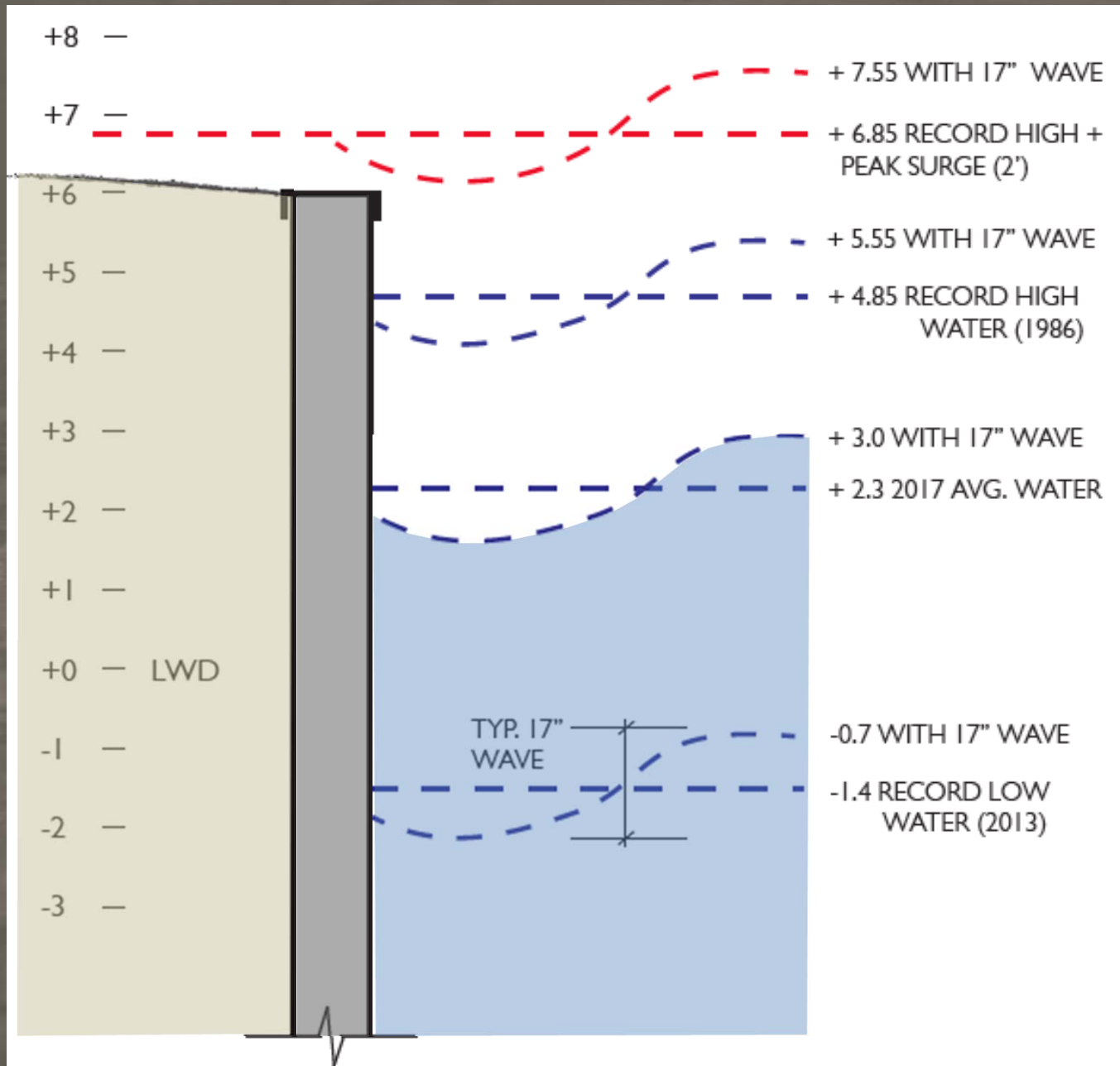
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Preparing for water level changes

- *Monitor monthly water level reports/projections*
- *Inspect shoreline protection systems*
- *Identify and remove interferences*
- *Be aware of record ranges*
- *Be aware of wind setup and surge conditions*
- *Be aware of possible seiche conditions*



- Base Water Level
- Plus Wave
- Plus Storm Surge
- Consider Historic High and Low Water Levels



Saint Joseph, MI – October 2013



Saint Joseph, MI October 31, 2014



Climate and Regulatory Factors - 2013

- *“It is still unclear how much of the recent trend in lake levels may be attributed to climate change.”*
- *“Future projections of lake levels for the Great Lakes vary, though most indicate a greater decline...with increasing greenhouse gasses.”*

GLISA – Great Lakes Integrated Sciences & Assessments Center



Climate and Regulatory Factors - 2019

- *It is now clear that a pattern of wetter spring weather has more than offset increased evaporation*
- *Future projections for the Great Lakes now suggest greater volatility in water levels from historic highs to lows, with less suggestion of significantly higher highs or lower lows*

NOAA and USACE June 2019



Dredging Issues

- Low Waters Impact Property Values Negatively
- State of Michigan Invested \$30M in Emergency Dredging in 2012
- State of Michigan Anticipates Major Flood Damage Efforts in 2020





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St Joseph
03

May 2011
water line 1062



St Joseph
03



1996

April 1985

May 1960

June 1938



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How was this site approved?

- Inland from MDEQ OHWM (+3LWD) – No jurisdiction
- Inland from USACE OHWM (+4LWD) – No jurisdiction
- Inland from Base Flood Elevation (+7LWD)
- Inland from Base Flood Elevation +5' (Berrien county Flood Insurance for Wave Runup)





Come sail away

Buffeted St. Joseph beach house could be relocated

By **JOHN MATUSZAK**

HP Staff Writer

ST. JOSEPH — A lakeside house in St. Joseph, menaced by rising water levels, could be sailing away, but not out to sea.

Bruce Jones and Carol Luzzi, owners of the home at 396 Ridgeway, had appealed an order from the city of St. Joseph to remove sand bags they said were needed to protect their res-

idence from waves coming off Lake Michigan.

That case was to have been heard Thursday by the Board of Zoning Appeals, but was withdrawn the day before, according to a letter from Sara Lachman, the property owners' attorney.

"Mr. Jones and Ms. Luzzi have made the difficult decision to move their home landward," Lachman wrote in a letter to Assistant City Manager John

Hodgson. "This obviously involves a good deal of planning and preparation and is contingent upon it being physically possible for the home to be relocated."

Lachman explained in the letter that her clients maintain that they had not violated the city ordinance against shore protection structures, but had decided to put their energy into moving the house, instead of an appeal.

The house, north of Tiscornia Beach, has been a point of contention between the owners, neighbors and the city since at least 2012, when Jones and Luzzi applied to build a 145-foot long seawall to keep out encroaching waters. The house is closer to the lake than nearby dwellings. They own a house directly behind it.

See SJ beach house, page A10

BERRIEN SPRINGS



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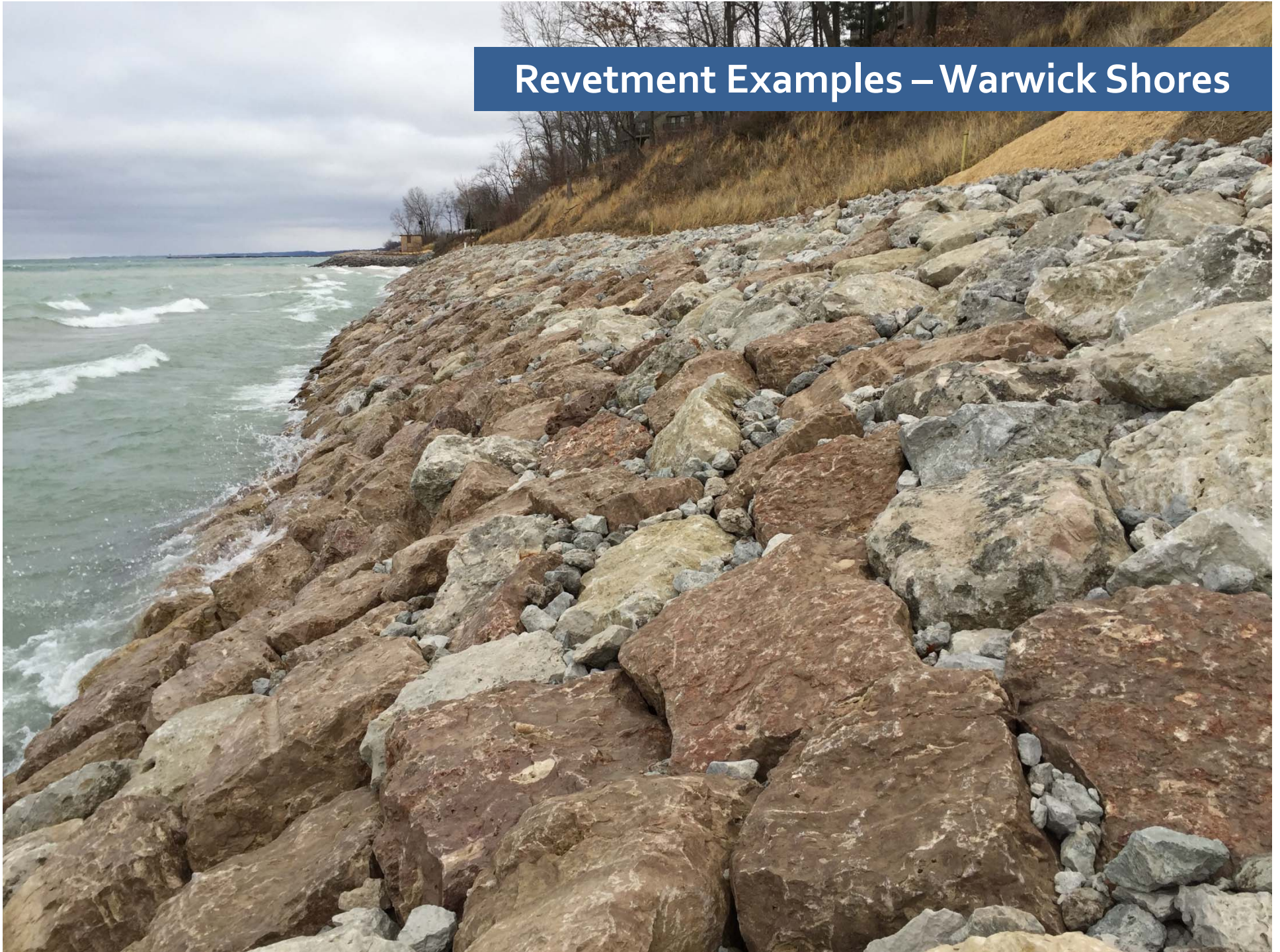


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Revetment Examples – Warwick Shores



Revetment Examples – Warwick Shores



Revetment Examples – Warwick Shores



Revetment Examples - Dunewood



Revetment Examples - Dunewood



Revetment Examples





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Thank you

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