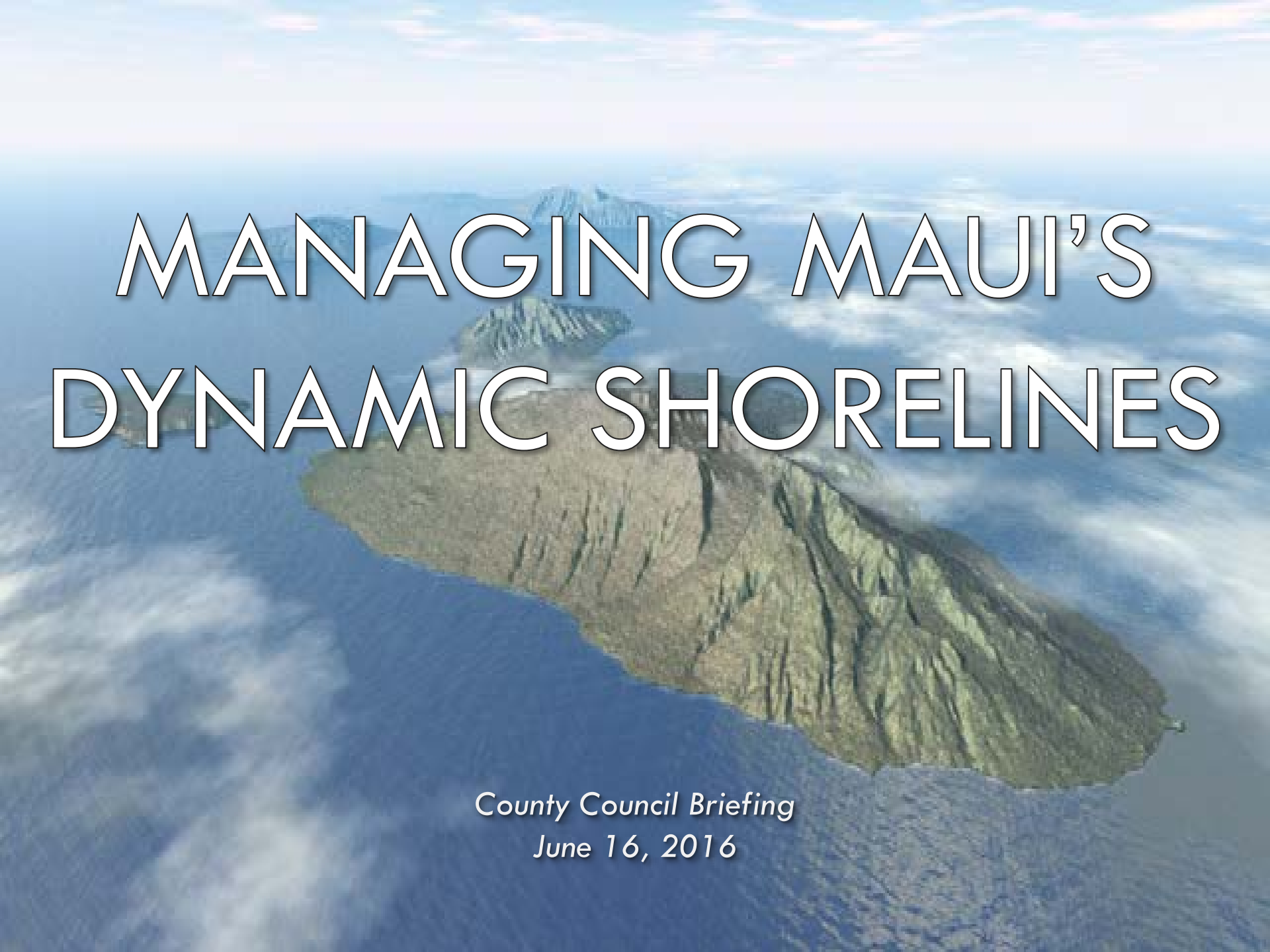

MANAGING MAUI'S DYNAMIC SHORELINES

County Council Briefing
June 16, 2016

Kahana Beach, September 2015

Kahana Beach, October 2015

Kahana Beach, April 2016

Maui has lost more than four miles of sandy beach in past century — report

University of Sydney / ANDREW D. SHO

Kaanapali Beach has shown an annual erosion rate of 3.2 over the last century, according to a U.S. Geological Survey a versity of Hawaii report. Maui has lost 4.2 miles of sandy beach last century, according to the report, which is titled "National A ment of Shoreline Change: Historical Shoreline Change in the ian Islands."

By **LEE IMADA**, News Editor

HONOLULU — Eighty-five percent of sandy beachfront has eroded and 4.2 miles has been lost on Maui in the past century, according to a U.S. Geological Survey and University of Hawaii report released this week.

Those percentages were the highest in the report covering 150 miles of sandy shoreline or "essentially every beach" on Maui, Oahu and Kauai.

"The entire Kihei coast is eroding, except for a handful of places where sand is being trapped by walls," said Charles Fletcher, associate dean of the University of Hawaii School of Ocean and Earth Science and Technology and lead author of the report "National Assessment of Shoreline Change: Historical Shoreline Change

Inside

The Maui News

Winner of 16 SPJ-Hawaii 2013 Excellence in Journalism Awards

Maui's Newspaper Since 1900 SUNDAY, March 15, 2015 $2.00

The Maui News / MATTHEW THAYER photo

Erosion threatens South Kihei Road last week near the Kihei Youth Center. Maui County officials are considering hauling sand to the area to protect the roadway.

Forces of nature threaten roadway

Hauling sand to erosion 'hot spot' on S. Kihei Road studied as option

By **BRIAN PERRY**, City Editor

While Maui County officials mull what to do about erosion to an unprotected section of South Kihei Road, they are wrestling with forces of nature — rising sea levels and El Niño.

Near the Kihei Youth Center, waves have chewed away sand dunes and risen to within feet of the roadway. Wooden sawhorses with flashing lights warn away southbound motorists from driving onto the beach.

The departments of Planning and Public Works are looking at what can be done, working with Tara Owens, a coastal geologist who works under the University of Hawaii Sea

See EROSION on the next page

WEDNESDAY 2/24/16

THE PULSE OF PARADISE

Star Advertiser

SHINING A LIGHT

Lawyers want an investigation into whether NextEra had a part in HECO's decision to kill 3 solar farm projects

MONEY / B5

Wednesday, March 30, 2016

WALLS NO MATCH FOR WAVES

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« Next-generation leaders sele... Columnist to introduce fourt...»

West Side beaches and properties face erosion from large surf

February 25, 2016

BY LOUISE ROCKETT , Lahaina News

Save | Post a comment |

KAHANA - On deadline, it's early Monday morning (Feb. 22), a full moon is setting and another high surf warning has been issued by the National Weather Service for the north shore of Maui and north and west shores of Molokai until Tuesday at 6 a.m.

"A combination of strong northwest winds associated with a fast moving cold front and a very large wintertime northwest swell will generate life-threatening surf along most north and west facing shores through early Tuesday morning. Ocean water may periodically surge and sweep over beaches and coastal roadways, especially from midnight tonight through daybreak Monday morning around the time of high tide." It's been an all-to-familiar Civil Defense message posted this winter by the County of Maui.

Surf along the north-facing shores of Maui and Molokai is projected to reach 45 to 55 feet.

Article Photos

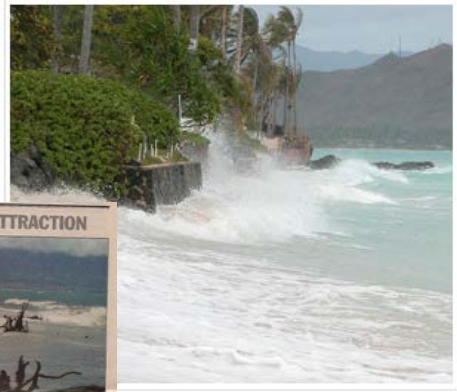
New research predicts a doubling of coastal erosion by mid-century in Hawai'i

March 23, 2015 | Marcie Grabowski | Comments

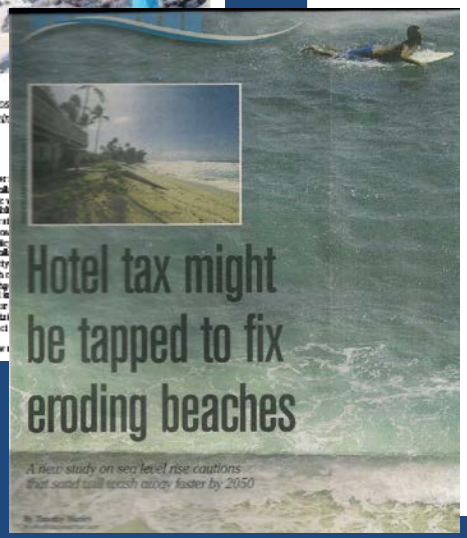
Print

New research from scientists at the University of Hawai'i at Mānoa and the Hawai'i Department of Land and Natural Resources brings into clearer focus just how dramatically Hawai'i beaches might change as sea level rises in the future.

Chronic erosion dominates the sandy beaches of Hawai'i, causing beach loss as it damages homes.



sea level rise may cause a doubling of beach erosion by 2050. Fletcher)



Hotel tax might be tapped to fix eroding beaches

A new study on sea level rise cautions that sand will wash away faster by 2050

HANDIWORK OF GRAVITATIONAL ATTRACTION

Erosion likely result of supermoon tidal increases rather than storms

June 5, 2016

Winner of 14 SPJ-Hawaii 2014 Excellence in Journalism Awards

e Maui News

SUNDAY, June 5, 2016 $2.00

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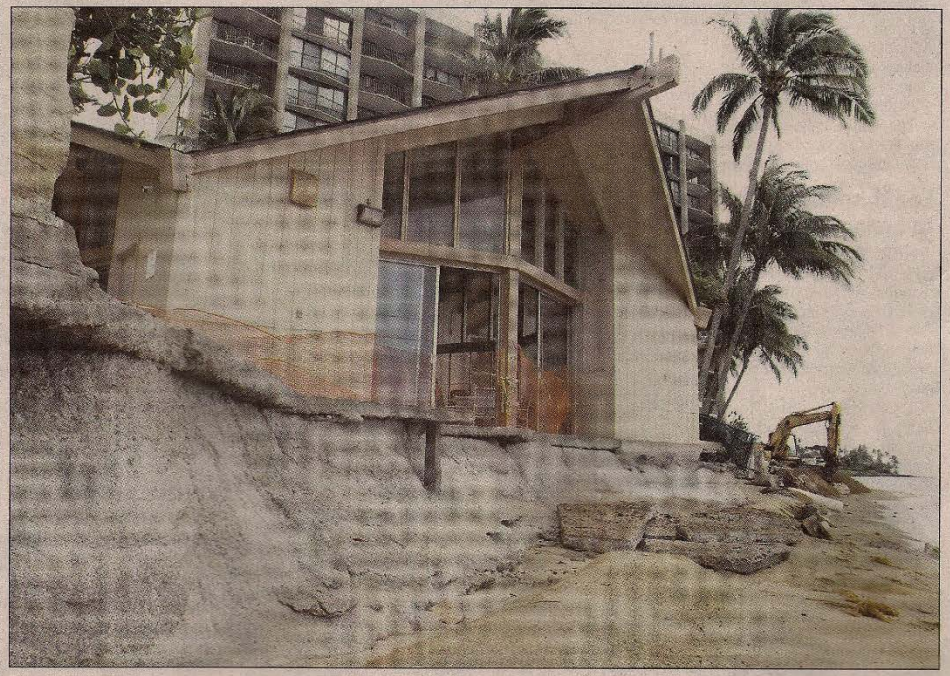


The Maui News / CHRIS SUGIDONO photos

Rising tides and strong waves eroded part of the Royal Kahana Resort's pool deck, allowing water to pour into its cabana building in April.

'Beach-quality sand' discovered as erosion reaches 'crisis' level

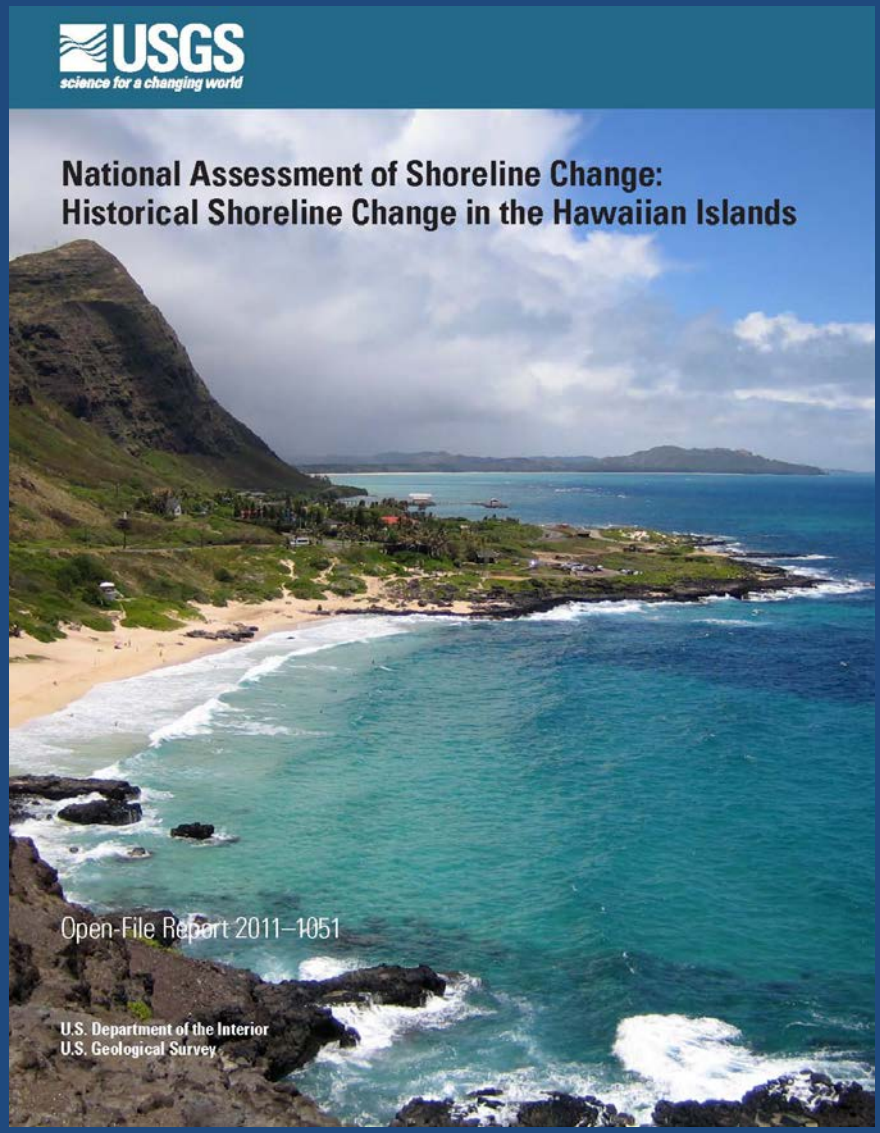
Mayor says county not responsible for threat to West Maui condos

By CHRIS SUGIDONO, Staff Writer

KAHANA BAY – Maui County shoreline planners are "elated" after discovering more than 300,000 cubic yards of "beach-quality sand" off Kahana Bay, which could replenish the beachfronts of numerous condominiums that have been

EROSION IS WIDESPREAD ON MAUI

- 85% of Maui shorelines are experiencing long-term erosion.
- Maui's beaches are experiencing the highest rates of erosion for the Hawaiian islands.
- Maui has the highest percentage of beach loss (11%).



COASTAL EROSION

Combination of Causes:

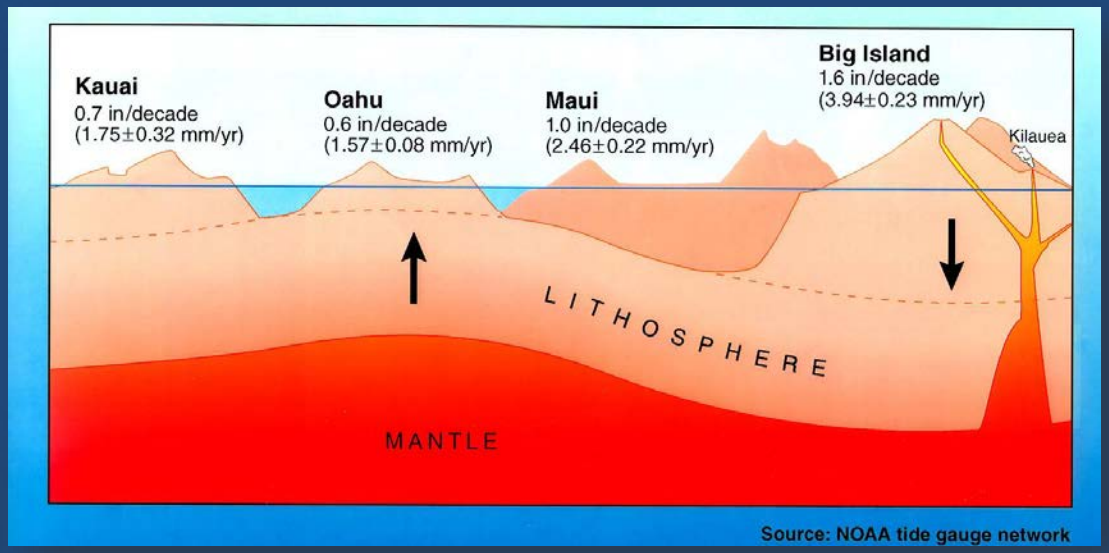
1. Sea-Level Rise (*chronic erosion*)
2. Seasonal Wave Conditions & Storms that Move Sand (*episodic erosion*)
3. Human Impacts to Sand Supply (*chronic erosion*)

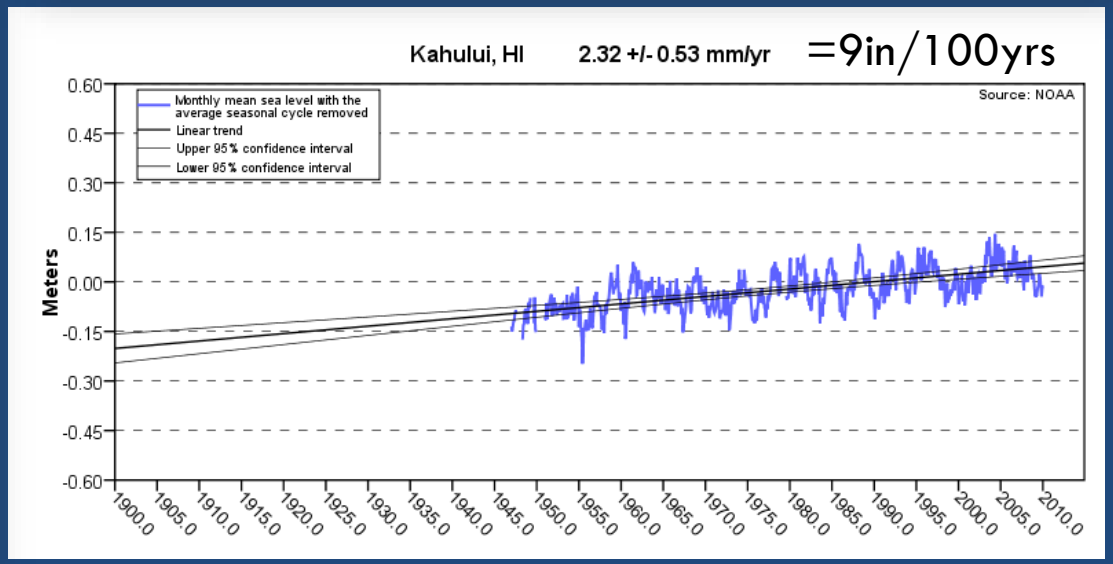
Pohailani Condominium

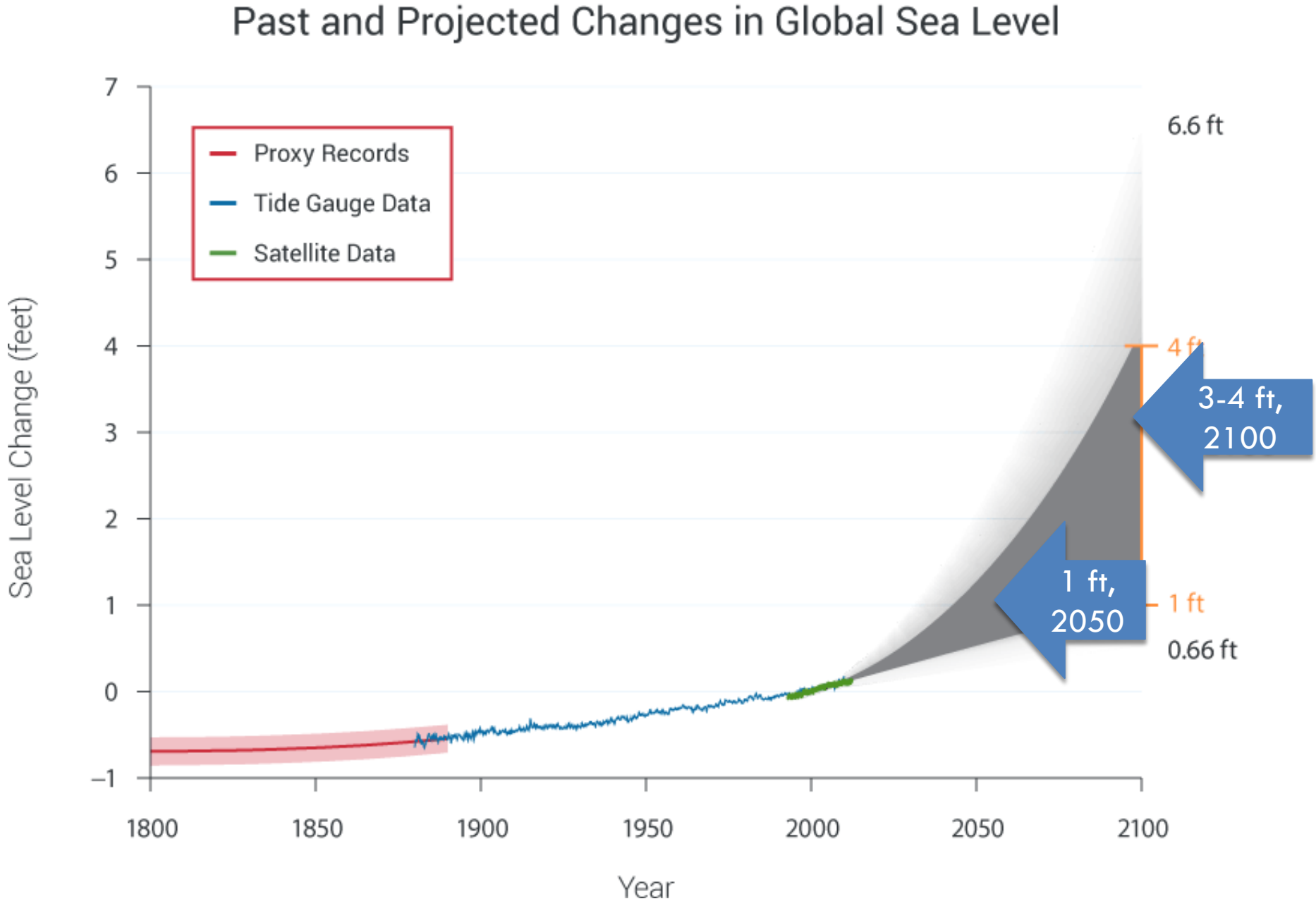
MAUI SEA LEVEL CHANGE

- Maui sea level has risen 9+ inches over the past century.


tide gage

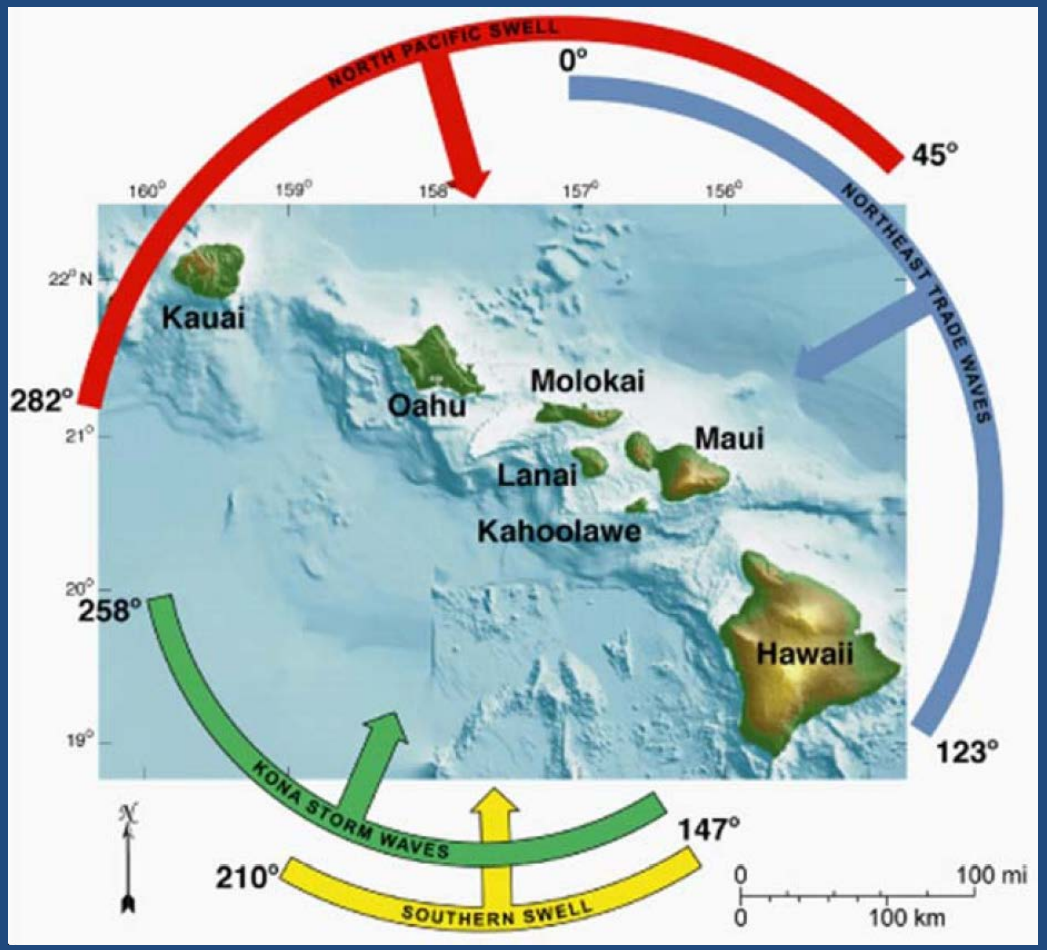


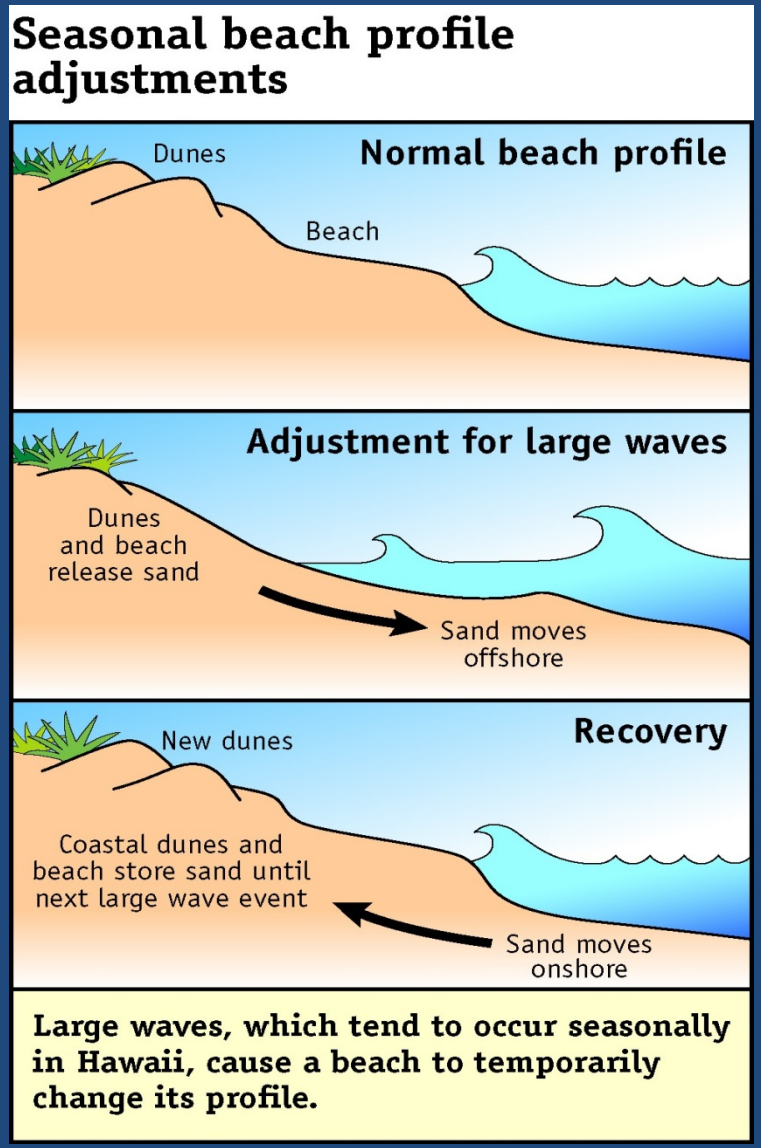




Melillo, Jerry M., Terese (T.C.) Richmond, and Gary W. Yohe, Eds., 2014: Climate Change Impacts in the United States: The Third National Climate Assessment. U.S. Global Change Research Program, 841 pp. doi:10.7930/J0Z31WJ2.

SEASONAL BEACH ADJUSTMENTS

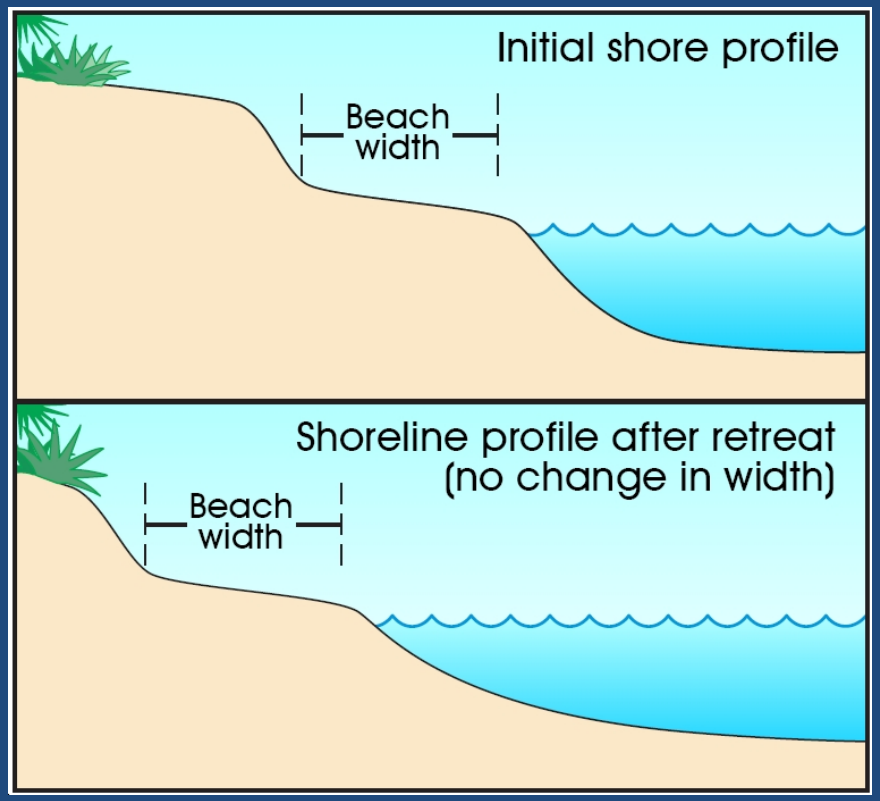




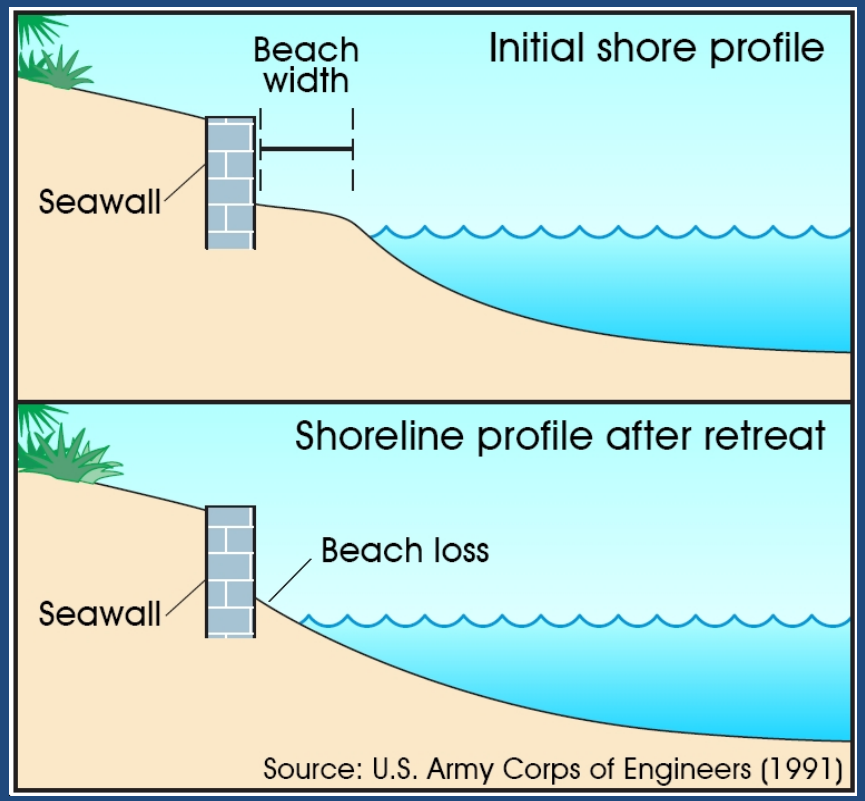
Kaanapali (Sheraton) – Typical Beach Conditions

Kaanapali (Sheraton) - March 2016

HUMAN IMPACTS: ARMORING



Beaches on chronically eroding shores can maintain their natural width as they slowly retreat landward.



Beach loss eventually occurs in front of a seawall where there is chronic erosion.

Often Causes a Domino Effect


Unstabilized -
land lost
beach preserved
Stabilized -
beach lost
land preserved

EROSION RESPONSE OPTIONS

preferred strategies

- Do nothing
- Managed retreat *(setbacks)*
- Adaptation *(elevate, reconfigure)*
- Beach nourishment and/or Dune Restoration
- Temporary or permanent erosion control *(sand pushing, geobags, groins)*
- Armoring *(permanent rock revetment or seawall)*

Do Nothing

Adaptation

Armor / "Hold the Line"

RECENT CASE EXAMPLES: IMPACTS & RESPONSES

INFRASTRUCTURE: WASTEWATER FACILITY

Wailuku-Kahului Wastewater Facility, circa 2011

Wailuku-Kahului Wastewater Facility, 2015

Wailuku-Kahului Wastewater Facility, 2016

INFRASTRUCTURE: HIGHWAYS

Honoapiilani Highway, August 2012

Honoapiilani Highway, January 2013

SINGLE FAMILY HOMES

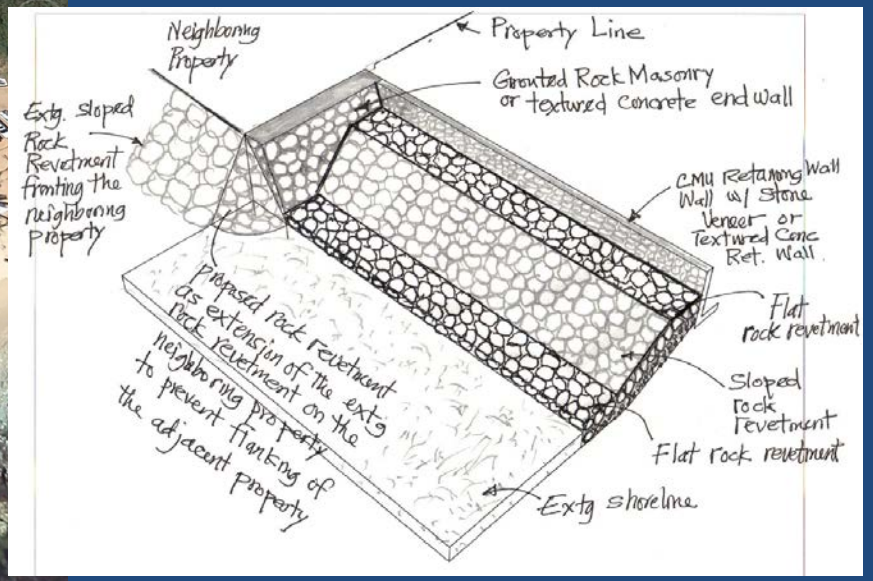
Beach and Land Erosion at Project Beach Looking East, 22 August 2006 - before geotube groins.

Beach and Land Erosion Causing Pollution at Project Beach, 4 August 2009 – before geotube groins

Stable Road, North Shore, 2006-2009 (Before Restoration)

Stable Road, May 2016 (After Restoration)

SINGLE FAMILY HOMES



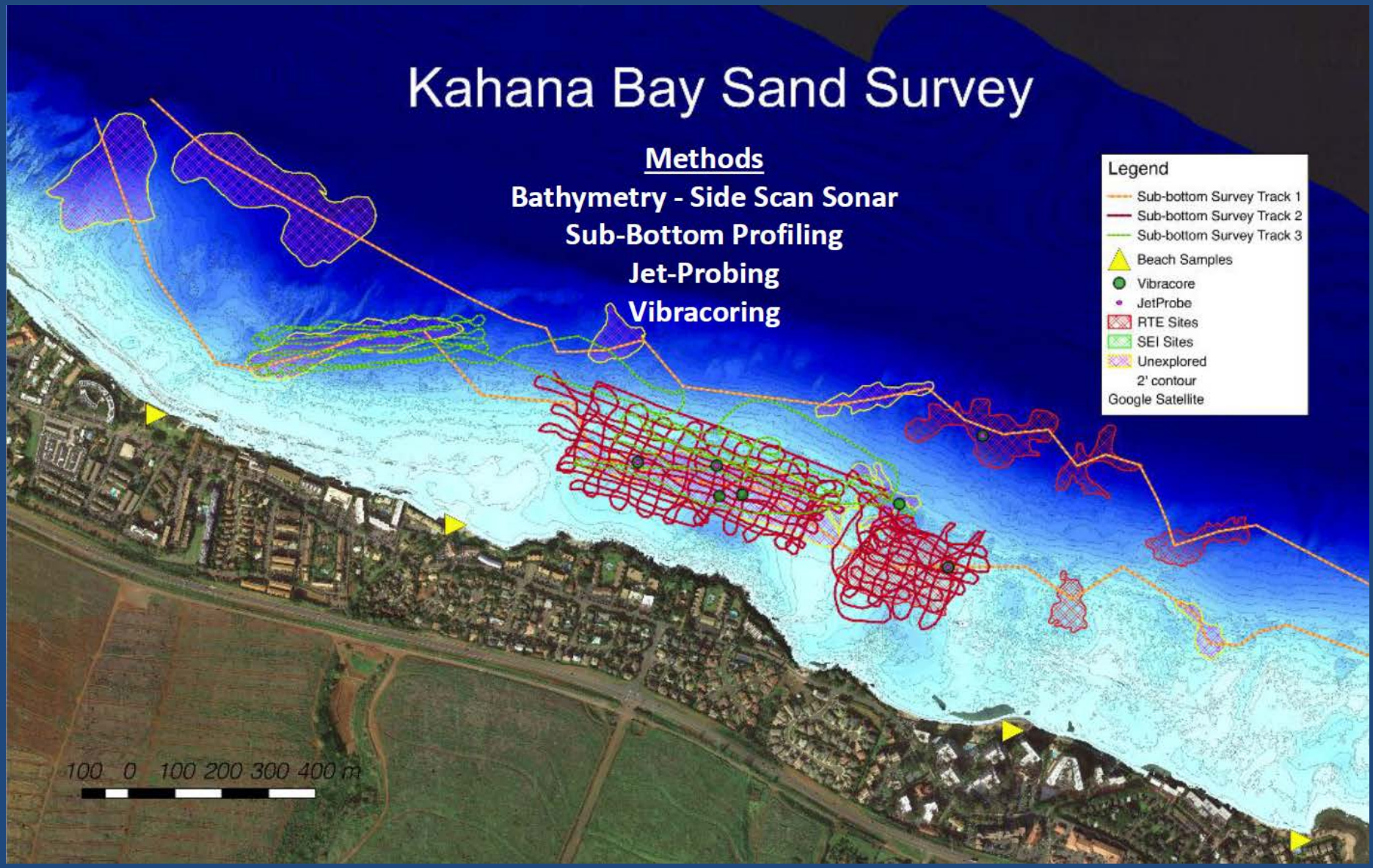
conceptual sketch of County approved rock revetment

Kuau, North Shore, circa 2015

CONDOMINIUMS/RESORT AREAS

Kahana Beach, May 2016

KAHANA BAY SAND SEARCH



KAHANA BAY: SAND SEARCH RESULTS

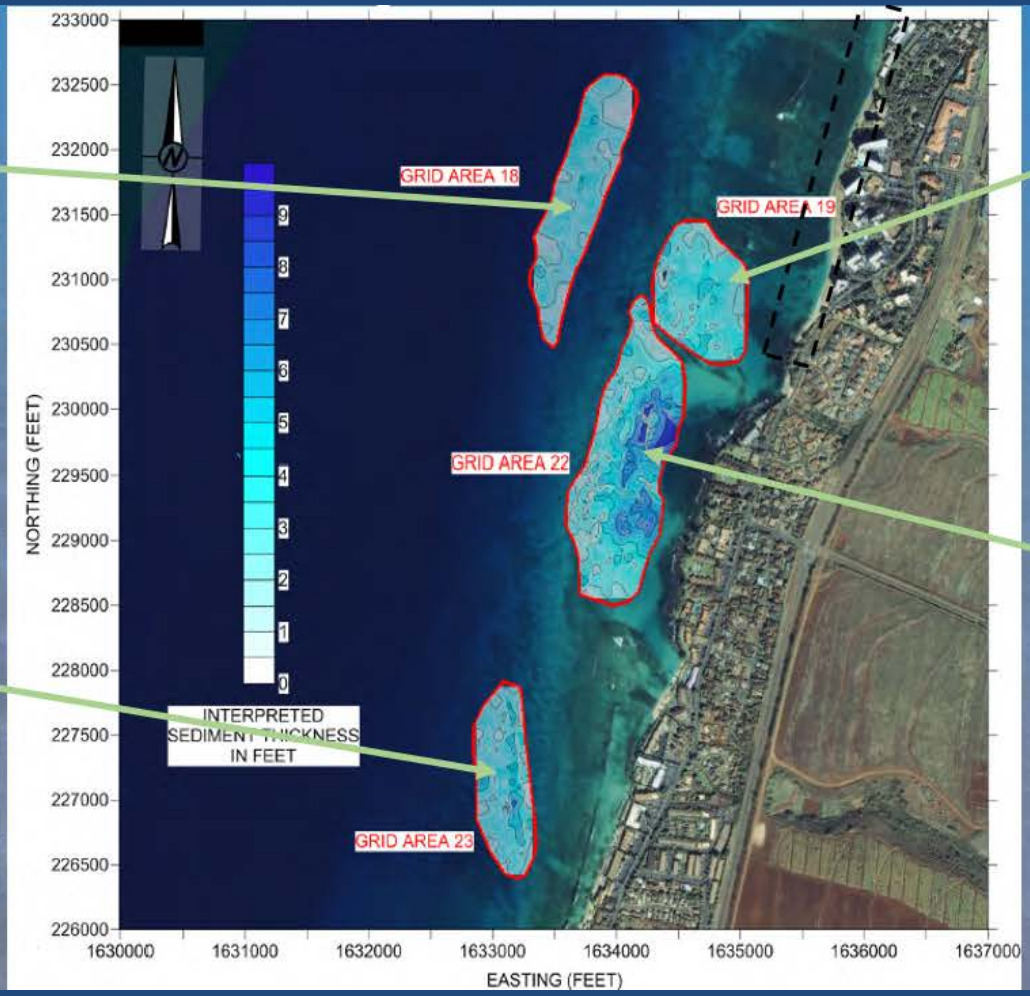
Estimated Sand Volume: 405,000 cubic yards!

Sand Deposit 18
- 69,000 cy
- 16.4 acres
- 2.6’ avg thickness
- 45’ deep

Sand Deposit 19
- 71,000 cy
- 14.1 acres
- 3.1’ avg thickness
- 15’ deep

Sand Deposit 22
- 205,000 cy
- 28.5 acres
- 4.5’ avg thickness
- 12’ deep

Sand Deposit 23
- 60,000 cy
- 12.0 acres
- 3.1’ avg thickness
- 24’ deep



KAHANA BAY: RESTORATION CONCEPTS

50,000 cy
50 feet of beach
Groins at every property

100,000 cy
100 feet of beach
Groins at every other property

RECENT ADAPTATION INITIATIVE: SHORELINE SETBACKS

MAUI'S CURRENT SETBACK CALCULATIONS

- Setback is the greater of A or B:

A. Erosion-based Setback

Current Calculation:

50 yrs x AEHR + 25 feet

Example if AEHR = 1.4 ft/yr:
(50 yrs x 1.4 ft/yr) + 25 ft =
95 ft setback

B. Lot Depth-based Setback

Current Calculation:

If lot depth is:	*Setback is:*
100 ft or less	25 feet
100 to 160 ft	40 feet
160 ft or more	25% of avg. lot depth (150 ft max.)

NOTE: Minimum of 25 ft setback for all shoreline lots.

EROSION SETBACK DEFICIENCIES

(50 yrs x AEHR) + 25 feet

1. life expectancy of structure

2. historical erosion

3. minimum setback

At Risk Properties = Opportunity For Refinement:

1. 50 year multiplier too low: average life expectancy of structures = 70 years (American Society of Coastal Engineers, 2002)
2. Historic erosion rate may not adequately account for episodic events
3. Minimum setback allows structures to exist within 5 feet of "Imminent Threat" classification
4. Sea level rise not a factor in formula

RECOMMENDATION

Update Erosion Setback Formula & Accept New Maps

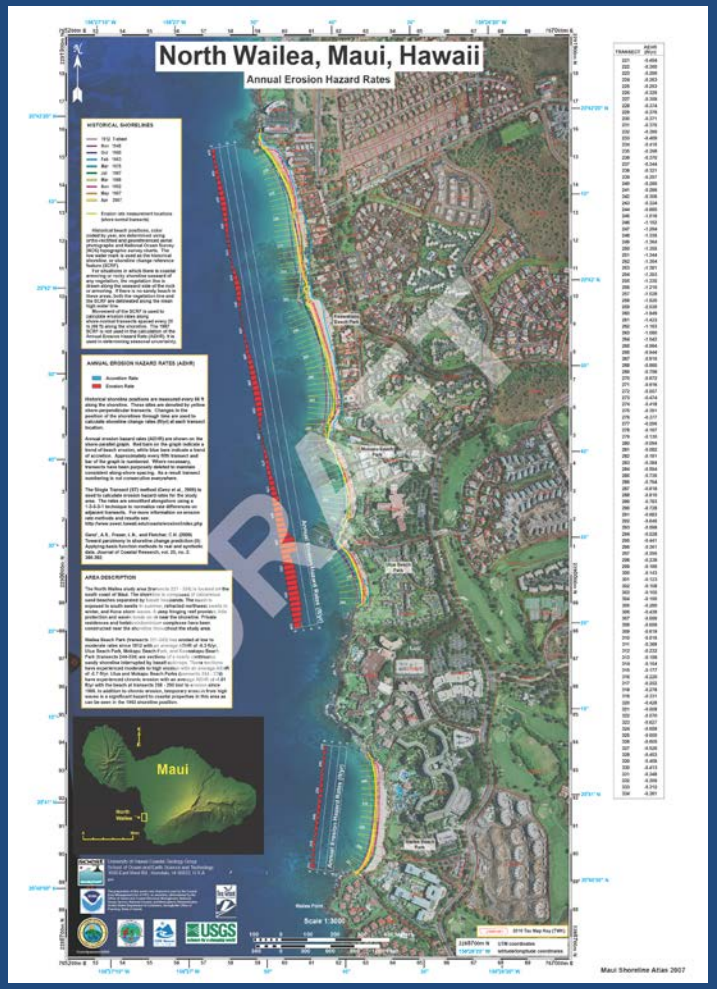
Existing Formula:

(50 yrs x AEHR) + 25 feet

Proposed Formula:

(70 yrs x AEHR) + 40 feet + SLR(3ft)

AEHR = Annual Erosion Hazard Rate



Mahalo Nui Loa

Tara Miller Owens

Coastal Processes & Hazards Specialist

University of Hawaii Sea Grant College Program
County of Maui Planning Department

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