

# *Sources and Beneficial Use Potential of Kahului Harbor Sediment, Maui, HI*

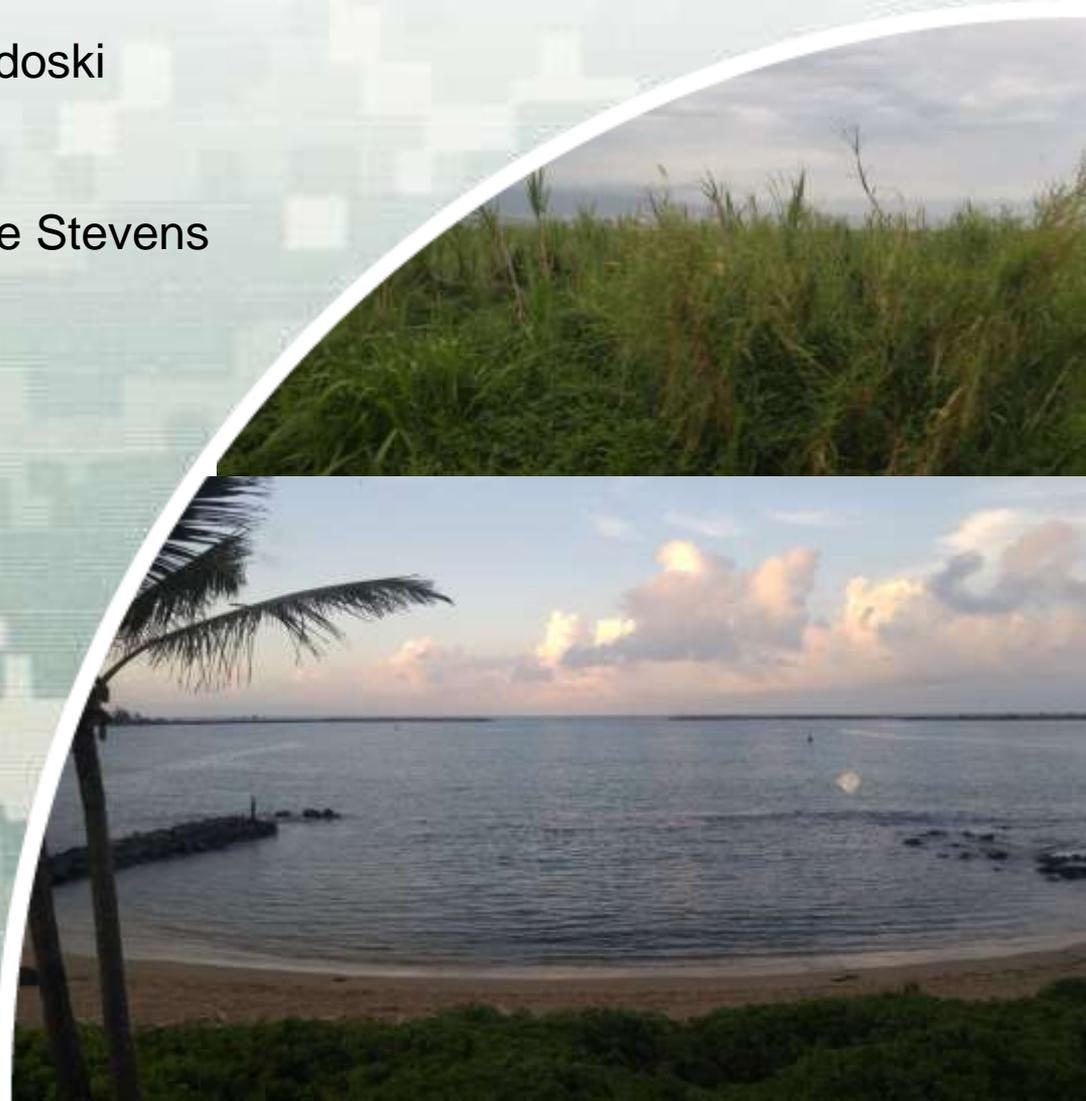
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USACE-ERDC



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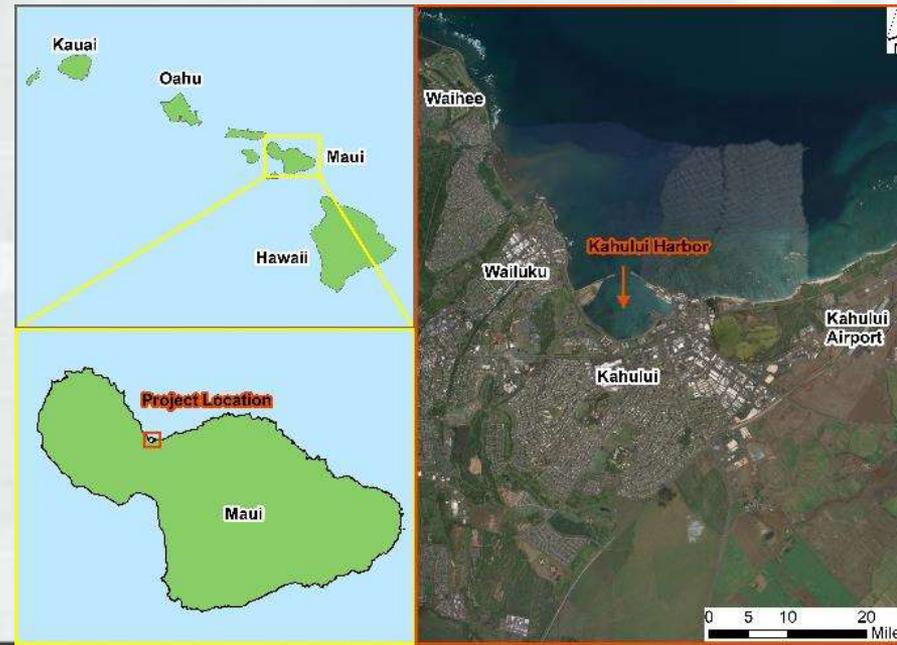


# Study Background and Objectives:

- Over 80% of goods are imported into Hawaii via five major harbors
- Kahului Harbor is a federal navigation project – dredged in 2016 with *ESSAYONS*
- Potential reduction of shoaling via erosion mitigation efforts require identifying:
  - The source(s) of accumulating sediment via geochemical fingerprinting
  - The transport pathways of the sediment
- Shoaled sediment represents a potential BU sand source for actively eroding beaches
  - Lack information on the nature and volume of these potential sources
- USACE Regional Sediment Management Program:
  - Encourages understanding and management of a coastal challenge as part of a regional system.

What are **the source(s)** and **transport pathway(s)** of sediment infilling Kahului Harbor?

What is **the nature and applicability** of the harbor shoal for future beneficial use projects?



# Objective (1): Sediment Sources:

Potential Sources Include:

1. Coastal and/or offshore sand transported into the harbor
2. Erosion of sediment from the West Maui Mountains region
3. Erosion of sediment from the Haleakala region



***Carbonate and/or mafic-rich sands: distinct size, color, & composition***



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*Ultramafic Volcano with little agriculture:  
distinct elemental and organic material compositions*



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***Mafic Volcano with abundant agriculture:  
distinct elemental and organic material compositions***



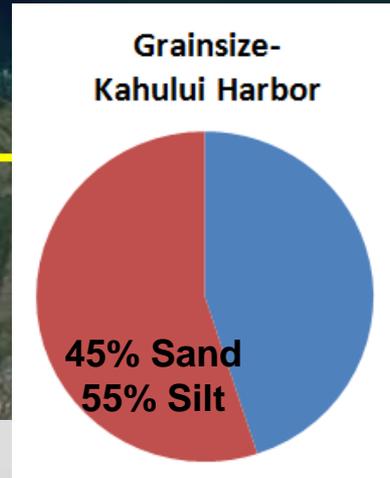
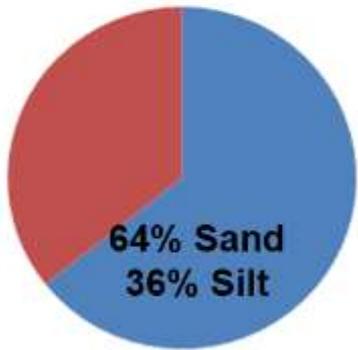
# Objective (1): Sediment Sources Example:

Coastal and/or offshore sand transported into the harbor

1. Erosion and longshore transport from the east
2. Erosion and cross-shore transport from directly offshore
3. Erosion and longshore transport from the west



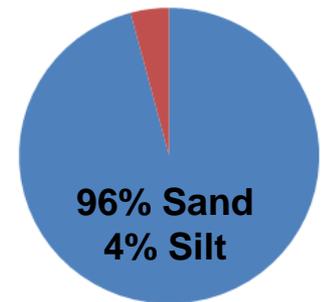
Grainsize-  
lao Stream Beach



Sugar Cove



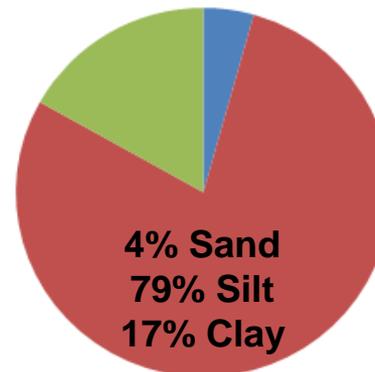
Grainsize-Sugar Cove



Outer Harbor Shoal



Harbor Turning Basin



Inner Harbor Shoal



# Objective (1): Sediment Sources Example:

Silt-sized sediment sources include:

1. Erosion of sediment from the West Maui Mountains region
2. Erosion of sediment from the Haleakala region

**Discern via Elemental Composition**



# Objective (1): Sediment Sources Example:

## Elemental Composition of the silts/clays



### West Maui Mountains

- Ultramafic volcano
- Mineral assemblage is dominated by Calcium and Chromium
- Also Cadmium, Nickel and Scandium



### Haleakala

- Mafic volcano
- Mineral assemblage is dominated by Iron, Sulfur and Titanium
- Also Potassium, Manganese, Lead, and Rubidium

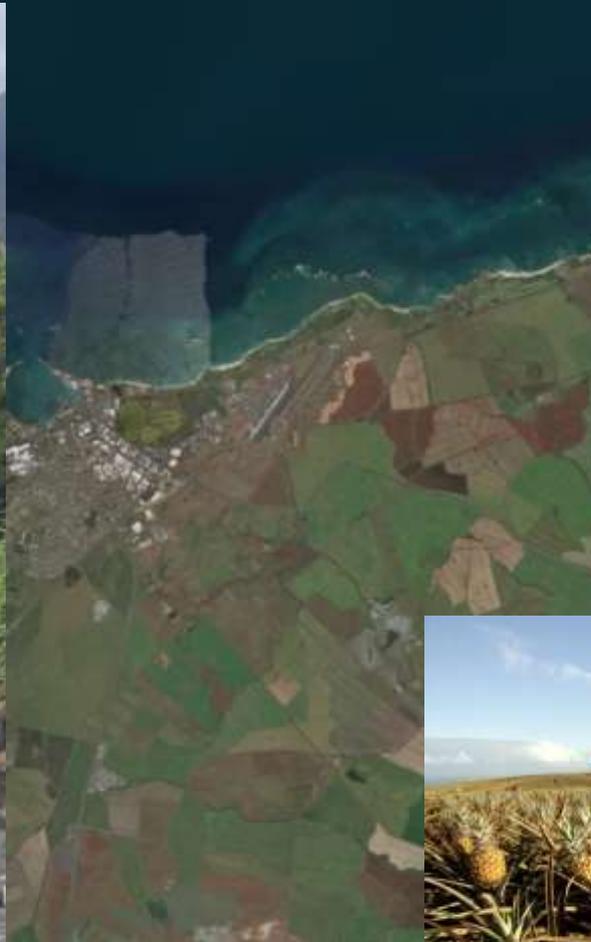


# Objective (1): Sediment Sources Example:

Silt-sized sediment sources include:

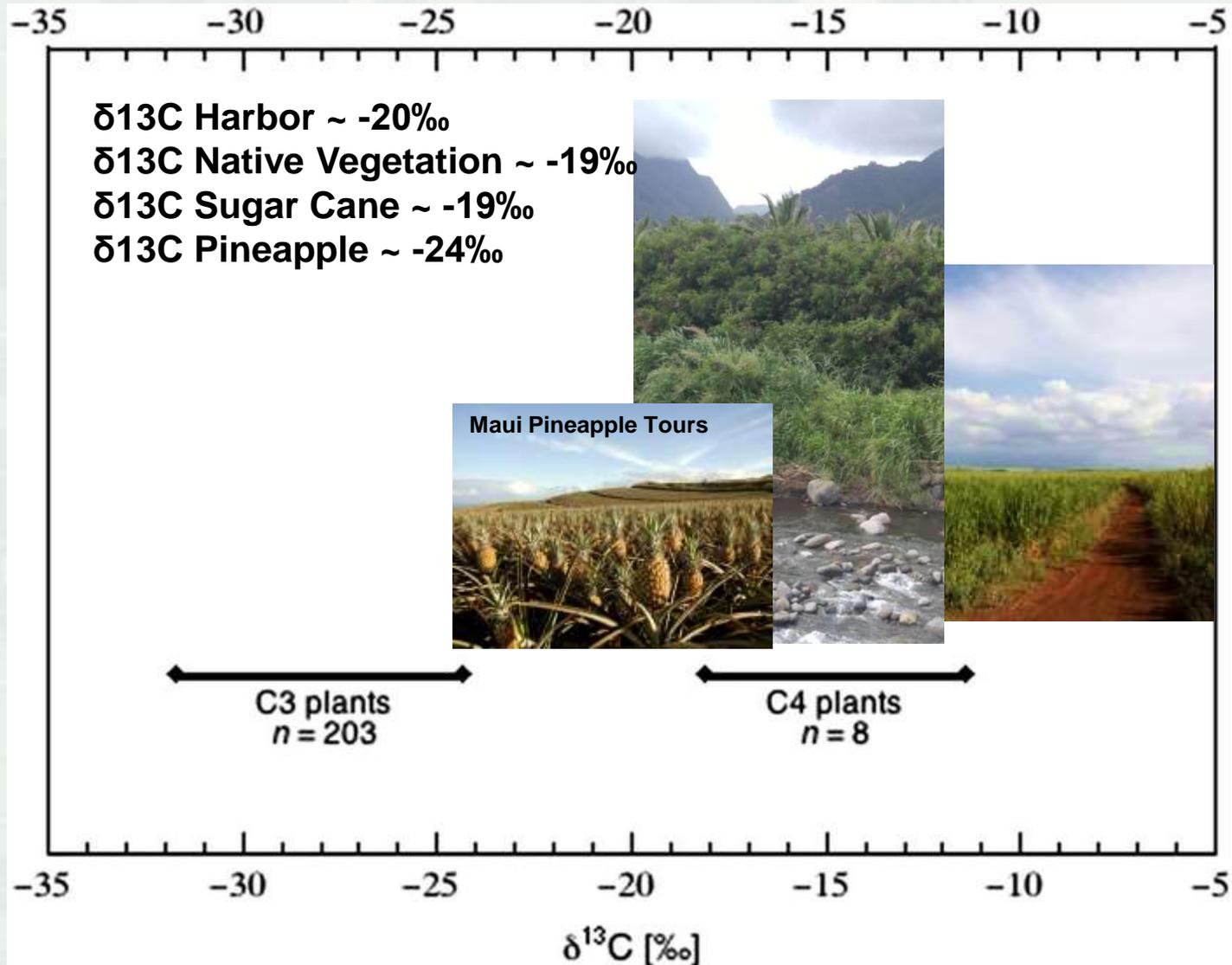
1. Erosion of sediment from the West Maui Mountains region
2. Erosion of sediment from the Haleakala region

**Discern via Stable Isotopes**



# Objective (1): Sediment Sources Example:

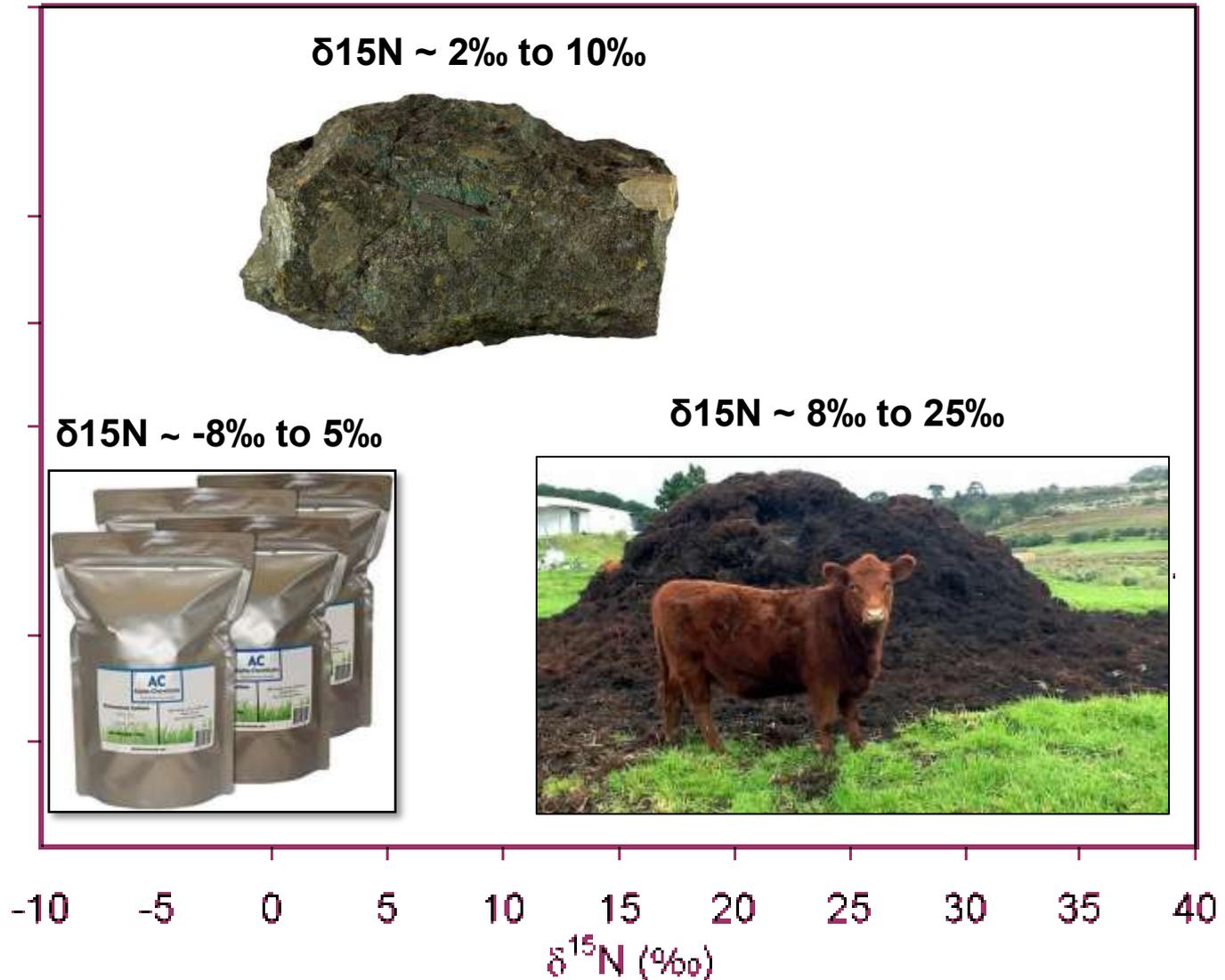
Stable Isotopes:  $\delta^{13}\text{C}$



# Objective (1): Sediment Sources Example:

Stable Isotopes:  $\delta^{15}\text{N}$

From Kendall and McDonnell, 1998



# Objective (1): Sediment Sources Summary:



## Sand-sized material:

- **Harbor Size:**
  - Beach adjacent to the lao Stream
- **Harbor Color**
  - Beach adjacent to the lao Stream
- **Harbor Composition:**
  - Beach adjacent to the lao Stream & offshore reef deposits

**Tentatively suggest the West Maui Mountains region is the primary source of sediment to Kahului Harbor – likely during flood events.**

## Pending Analyses:

1. **Mineralogy of harbor (bulk and mud)**
2. **Re-run  $\delta^{15}\text{N}$  (values were very low on first run)**
3. **Hydrodynamics**

## Silt & clay-sized material:

- **Harbor Mineralogy:**
  - TBD
- **$\delta^{13}\text{C}$** 
  - Values similar to that of native vegetation and sugar cane
  - No obvious pineapple field runoff
- **$\delta^{15}\text{N}$ :**
  - Values similar to that of native sediment (no obvious fertilizer)



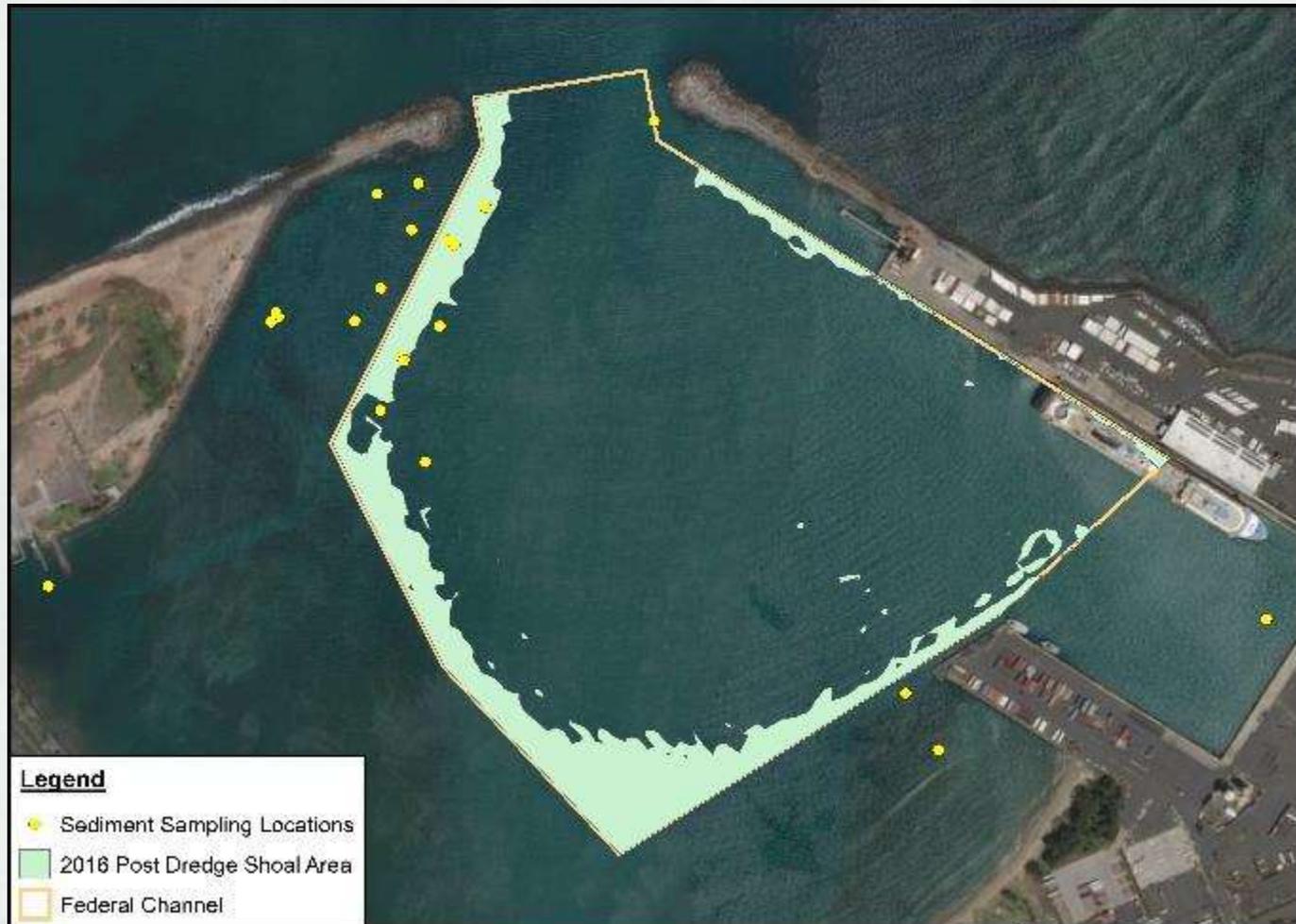
# Objective (2): Beneficial Use Applications:

## Shoaled Material



# Objective (2): Beneficial Use Applications:

## Sediment Sampling



# Objective (2): Beneficial Use Applications:

## Sand Shoal



# Objective (2): Beneficial Use Applications:

## Sand Shoal



# Objective (2): Beneficial Use Applications:

## Potential Beneficial Use Locations



# Conclusions and Ongoing Work:

- Preliminary data suggest sediments primarily sourced from the West Maui Mountains region, likely via flooding from the Iao Stream and/or erosion of the adjacent shoreline.
  - Ongoing: Complete mineralogical and hydrodynamic analyses; re-run  $\delta^{15}\text{N}$  analyses.
  - Next Steps: Identify opportunities for erosion mitigation.
- A large sandy deposit is preserved along the western edge of Kahului Harbor.
  - Silt composition varies and is possibly an ephemeral surface layer.
  - Next steps: Geophysical survey and cores to determine volumes and stratigraphy of shoal
- Potential BU applications along northeast coast of Maui
  - Next steps: Continued coordination with stakeholders to develop beneficial use project - funding, permitting, placement locations

