

# Sea Level Rise and Chemical Contamination

Identifying and labeling sites in iHEER that are at risk from sea level rise, groundwater inundation and increased flooding from climate change in Hawai'i

Martina Segura

Department of Health Hazard Evaluation and Emergency Response (HEER) Office Intern

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# Overview

## Introduction

## Background

- Sites of Chemical Contamination
- Sea Level Rise and Flooding Events

## Potential Impacts

- Contaminant Releases
- Infrastructure Safety and Functionality

## iHEER

- Island by Island Break Down

## Conclusion

## Resources

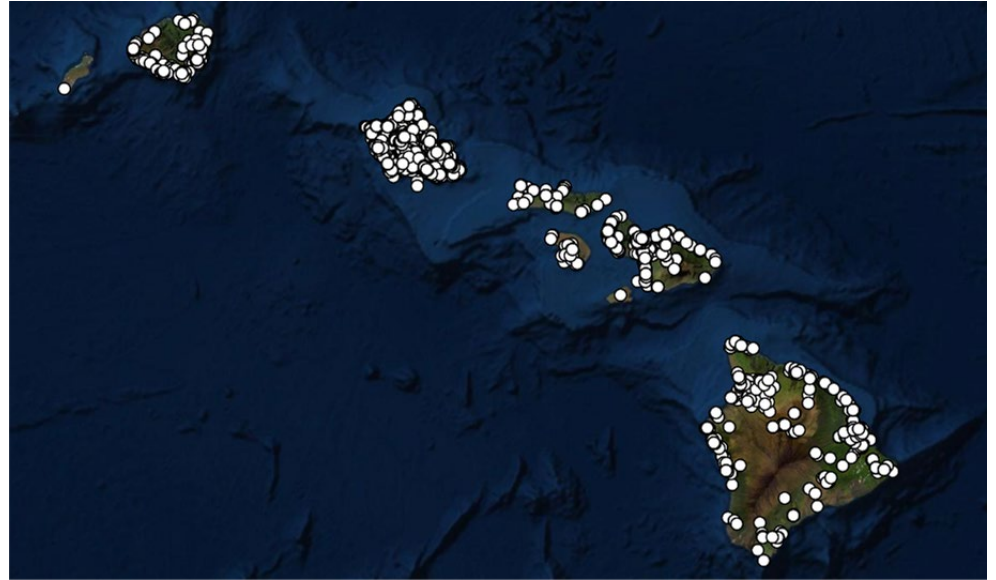
# Introduction

- Identify sites that are at risk for Sea Level Rise and its effects
  - Effects of climate change include: SLR, rising groundwater, increased flooding, increased heavy rain events and storms, and coastal erosion
    - These factors potentially affect sites of contamination and their management practices
- To help users of iHEER easily identify if a site is at risk
  - Labels include:
    - 3.2 SLR (figuring in SLR)
    - 1% Flood Plain (figuring in 1% flood)

Background

# Sites of Chemical Contamination

- Currently, the HEER Office monitors and regulates around 1,000 sites across the State
- Low lying coastal areas are at risk for being impacted by the conditions related to Sea Level Rise
- A few contaminants of shoreline sites include petroleum constituents, heavy metals, solvents, pesticides, and persistent organic pollutants (POPs)



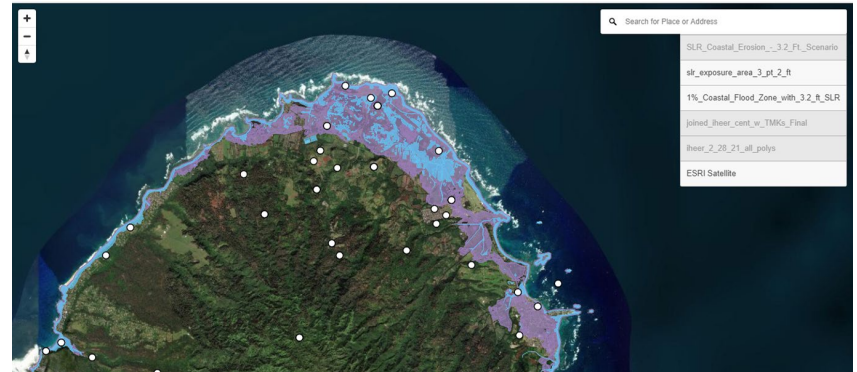
iHEER Centroids/ Sites Across the State

# Sea Level Rise and Increased Flooding Events

## Means of Identification:

- 3.2 foot Sea Level Rise exposure area as a benchmark for risk sites (conservative measurement)
  - (SLR-XA) layer from the State Sea Level Rise Viewer
    - <https://www.pacioos.hawaii.edu/shoreline/slr-hawaii/>
- 1% Flood Zone is area expected to be flooded by an extreme flooding event, that was previously defined as 100 year flood, with climate change, the chances of infrequent storm events increases

- Identification included submersion, impact from flooding, and annual-chance coastal flooding events



The blue layer symbolizes SLR 3.2

The purple layer represents the 1% flood

# Potential Impacts

Human health, ecosystems, economy, and infrastructure

# Contaminant Movement and Releases

## Contaminant Movement

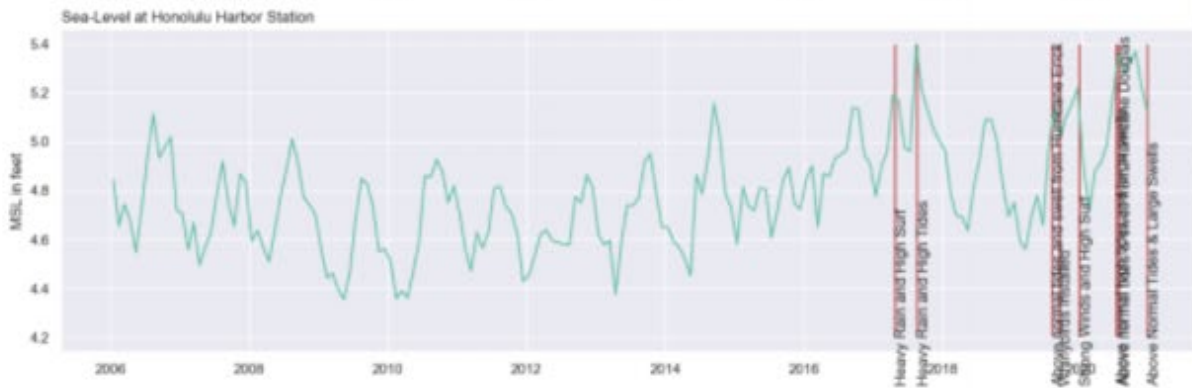
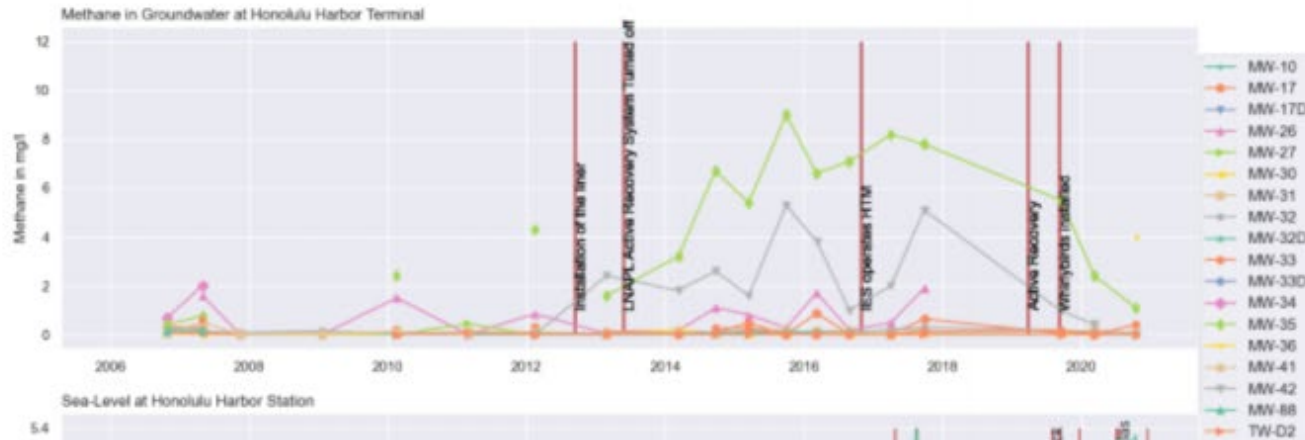
- Some sites are managing contaminants in place
- Sea Level Rise and its effects will likely transport contaminants
  - Increasing risk of human exposure
  - Threatens nearby ecosystems like coral reefs and other nearshore ecosystems

## Methane (CH<sub>4</sub>) Production

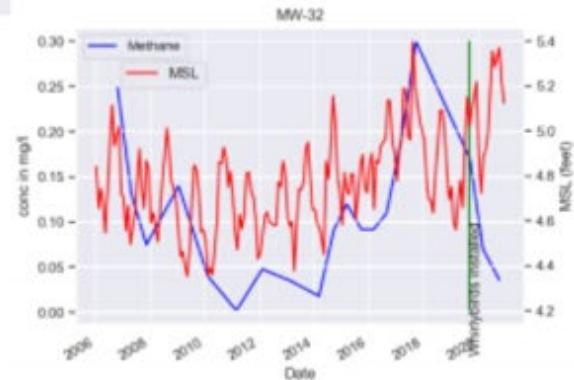
- Submersion by sea water of residual petroleum products in the ground results in conditions where methane and hydrogen sulfide are produced



# Indicators of Increased Methane in Honolulu Harbor



Monthly Mean of Sea-Level Set to the 15th Each Month



Graphs and Data from Dr. Iris van der Zander, PhD, Hazard Evaluation and Emergency Response

# Infrastructure Safety and Functionality

## Methane continued

- Build up in utility corridors and under pavement, and move along utility corridors
  - Pavement as a cap to mitigate contaminant exposure, but has an unwanted side effect
- Creates an increased risk of explosions

## Hydrogen Sulfide (H<sub>2</sub>S) Gas

- Product of petroleum and saltwater interaction
- Potential to migrate vertically and laterally possibly intruding into buildings
- Creating reduced indoor air quality and potential for increased Hydrogen Sulfide exposure

# iHEER

Identification and Across the State of Hawai'i

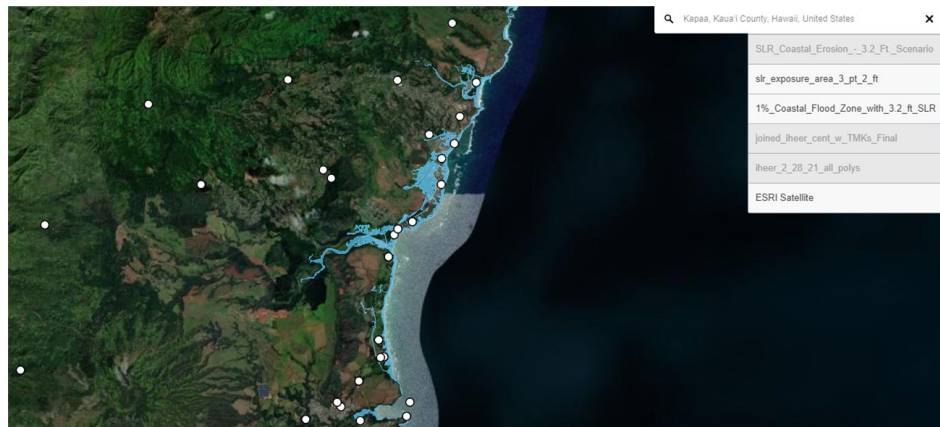
# Kaua'i



# Kaua'i

SLR 3.2:

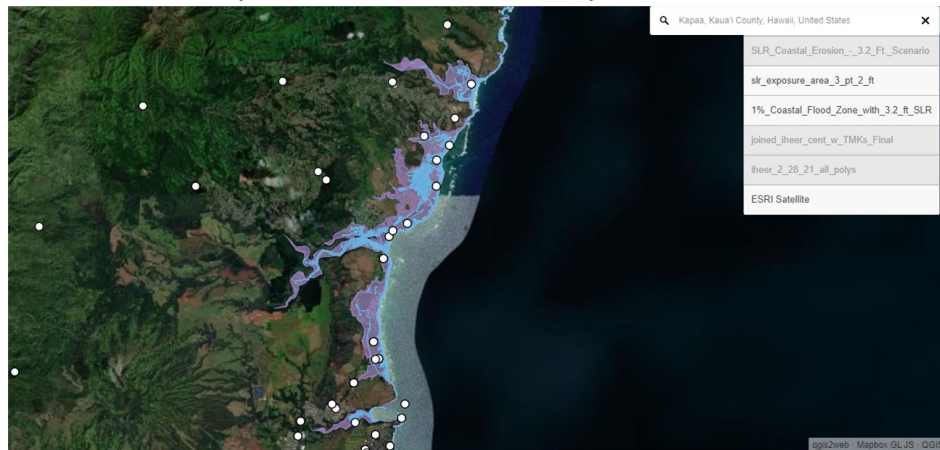
~ 21 labeled sites



Kapa'a and Wailua SLR Exposure Area

1% Coastal Flooding :

About 70 sites at risk



# Ni'ihau

0 labeled sites for both SLR 3.2 and 1% Coastal Flooding

Kapa'a and Wailua SLR Exposure Area and 1% Coastal Flood Zone

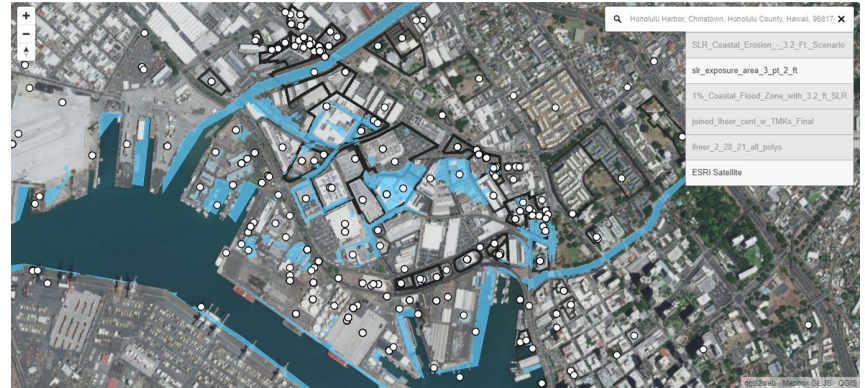
# O'ahu



# O'ahu

SLR 3.2:

~ 307 labeled sites



Honolulu Harbor SLR Exposure Area

1% Coastal Flooding :

About 814 sites at risk

Use of Tax Map Key (TMK) when available

- Centroids became misleading in site rich places like Honolulu Harbor



Honolulu Harbor SLR Exposure Area and 1% Coastal Flood Zone

# Moloka'i





# Moloka'i

SLR 3.2:

~ 23 labeled sites



Kaunakakai SLR Exposure Area

1% Coastal Flooding :

About 34 sites at risk



Kaunakakai SLR Exposure Area and 1% Coastal Flood Zone

# Lānaʻi



# Lānaʻi

SLR 3.2:

1 labeled site

1% Coastal Flooding :

About 5 sites at risk



Manele Bay SLR Exposure Area and 1% Coastal Flood Zone

# Maui and Kaho'olawe



# Maui

SLR 3.2:

~ 54 labeled sites

1% Coastal Flooding :

About 79 sites at risk

## Kahoʻolawe

There are no specifically labeled sites that pose risk to human health, but the health of the island and surrounding ecosystems are at risk from contamination changes due to climate change



Kahului SLR Exposure Area



Kahului SLR Exposure Area and 1% Coastal Flood Zone

# Island of Hawai'i



# Island of Hawai'i

SLR 3.2:

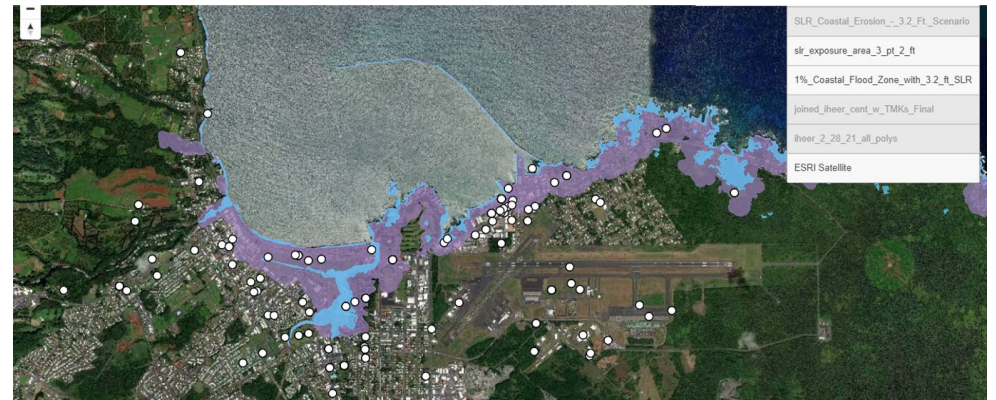
~ 42 labeled sites



Kona SLR Exposure Area

1% Coastal Flooding :

About 70 sites at risk



Kona SLR Exposure Area and 1% Coastal Flood Zone

# Conclusion



# Conclusion

- Contaminated areas that are exposed to Sea Level Rise and its effects create concern for increased risk to human health and the health of the environment
- When SLR exposure and flooding are considered, the number of chemically contaminated sites at risk rises
- This assessment and analysis does not incorporate rising groundwater, coastal erosion, and other potential impacts from climate change

# References

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