

Climate Change Transportation Vulnerability: Workshop Outcomes

Oahu Metropolitan Planning Organization
May 18, 2011

Welcome and Introductions

Special thanks to:

- Senator Will Espero
- Federal Highway Administration, Liz Fischer, and Jodi Chew
- LTAP Hawaii and Dr. C. S. Papacostas
- Hawaii Department of Transportation
- City and County of Honolulu
- University of Hawaii at Manoa, Dr. Chip Fletcher, and Dolan Eversole
- National Disaster Preparedness Training Center and Dr. Karl Kim
- ICF International, Harrison Rue, and Susan Asam

Topics for Review

- Overview of the FHWA climate change study grant
- What the climate scientists are saying about
 - Existing conditions
 - Future conditions
- What infrastructure the engineers and planners identified as highest priority

Project Schedule

- July 2010 – OahuMPO Submitted Grant Application
- September 2010 – OahuMPO Notified of Award
- March 2011 – Workshop for Engineers & Planners
- May 2011 – Public Input Meeting
- November 2011 – Project Completion

FHWA Model

Conceptual Model for Assessing the
Vulnerability of Transportation
Infrastructure to Climate Variability

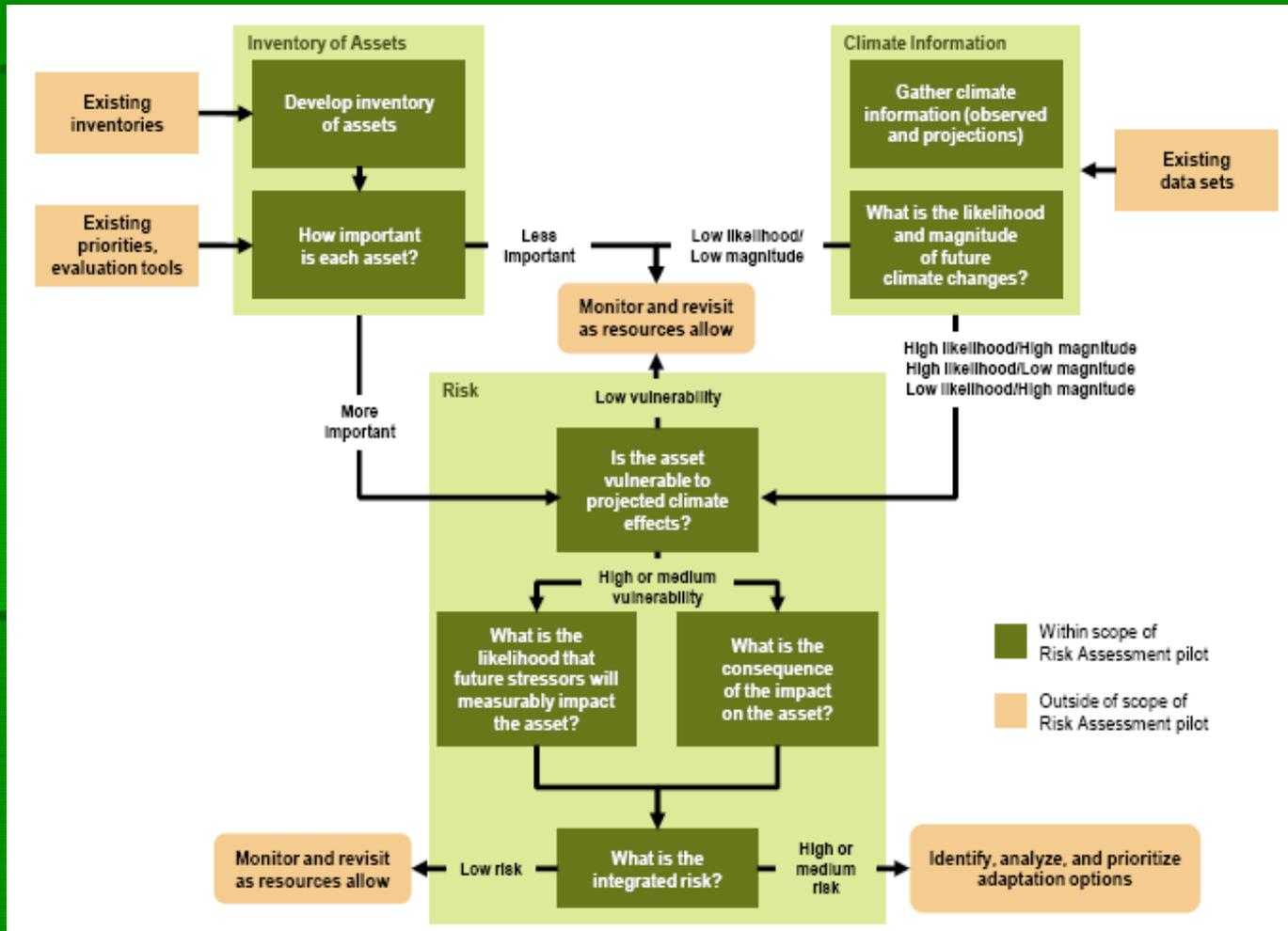
FHWA & Climate Change

- Hawaii has billions of dollars invested in existing transportation infrastructure
- Building on lessons from Hurricane Katrina and major floods throughout the United States, FHWA wants a better understanding of the vulnerability of those assets and how to plan to mitigate impacts from weather events and climate change

Only Five Awards Given

- North Jersey Transportation Planning Authority
- Oahu Metropolitan Planning Organization
- San Francisco Metropolitan Transportation Commission
- State of Virginia Department of Transportation
- State of Washington Department of Transportation

Conceptual Model



Key Questions

- What are likely changes in climate in any given region?
- What will be the magnitude and severity of those changes?
- How will climate changes affect transportation infrastructure that's currently in place?
- How vulnerable are those assets?

Climate Change Workshop

Brought together local and national climate scientists and both engineers and planners responsible for Federal, State, and City transportation infrastructure

Workshop Overview

- Two-day workshop at East-West Center
 - Received an overview of climate science at both the global and local levels
 - Developed an inventory of critical transportation infrastructure
 - Assessed the likelihood of impacts on existing resources
 - Prioritized infrastructure assets based on criticality

Climate Science and Hawaii

- UH School of Ocean and Earth Science and Technology
- UH Sea Grant College Program
- NOAA Coastal Storms Program

What is currently happening?

- Mapunapuna, areas of Campbell Industrial Park, some streets in the vicinity of Hobron, and Waikiki beaches flood at high tide
- Many communities flood during heavy rain storms
- Kamehameha Highway is frequently damaged by high surf (sand or washout)
- Pacific island nations are being inundated; many refugees are coming to Hawaii



Pacific Island Climate is Changing

In Hawaii

- Rainfall (-15%) and stream discharge have decreased
- Air temperature is increasing (0.3°F/decade)
- Rainstorm intensity has increased (+12%)
- Sea surface temperature is rising (0.22°F/decade)
- Ocean has grown more acidic
- Sea level is rising

Areas of Climate Concern

■ Flooding

- Rain in large quantities; also extended periods of drought between rain events (less rain overall)
- Possibility of wild fires and vegetation destabilization leading to increased rockfall and slope instability

■ More Severe Storm Events

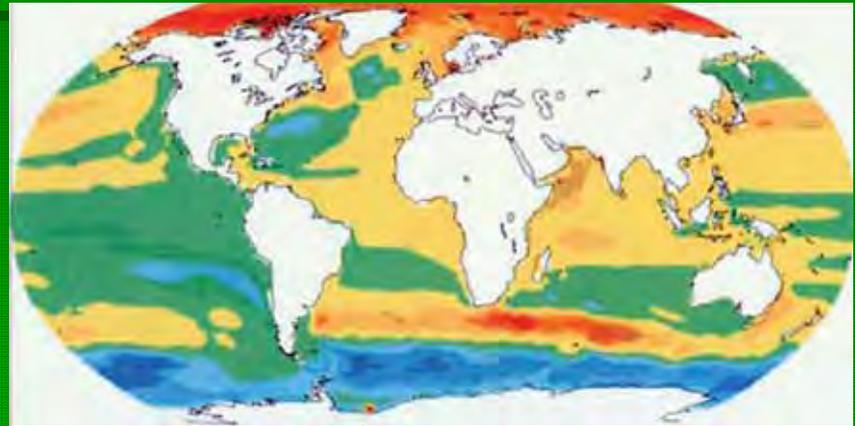
- Increased frequency and intensity of tropical storms and hurricanes; damage from storm surge and wind

■ Rising Sea Level

- Likely rise of one foot by 2050; +3 feet by 2100
- Water table will also rise, potentially affecting roadway foundations and aquifer integrity
- Inland, as well as coastal impacts

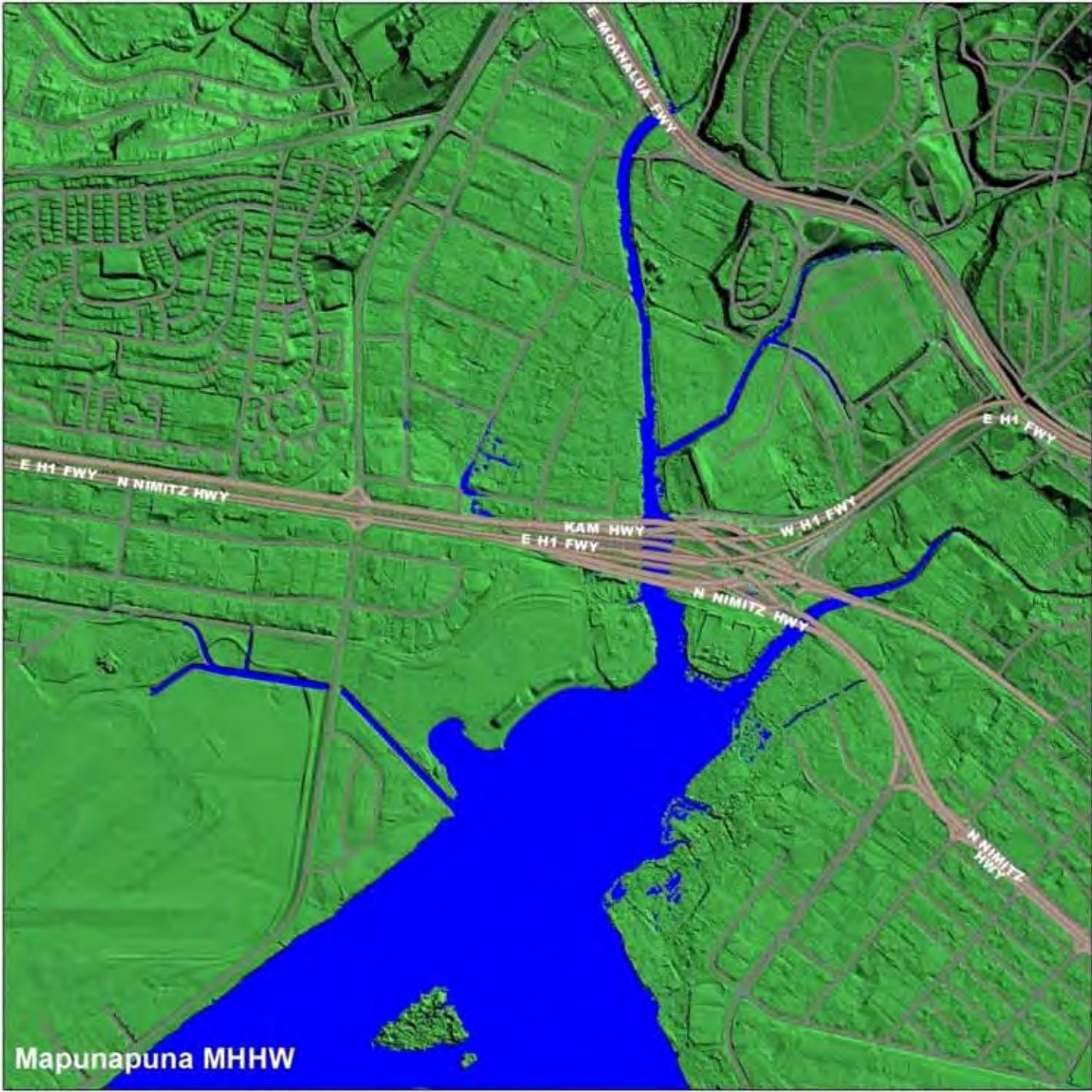
Hawaii Sea Level?

- Rising now
- Likely to accelerate
- Global SLR
 - >1 ft by 2050
 - 2.5 to 6.2 ft by 2100
- Hawaii near or slightly below (5%) global SLR, 2100



Sea level rise will be a significant problem where people live on the coast

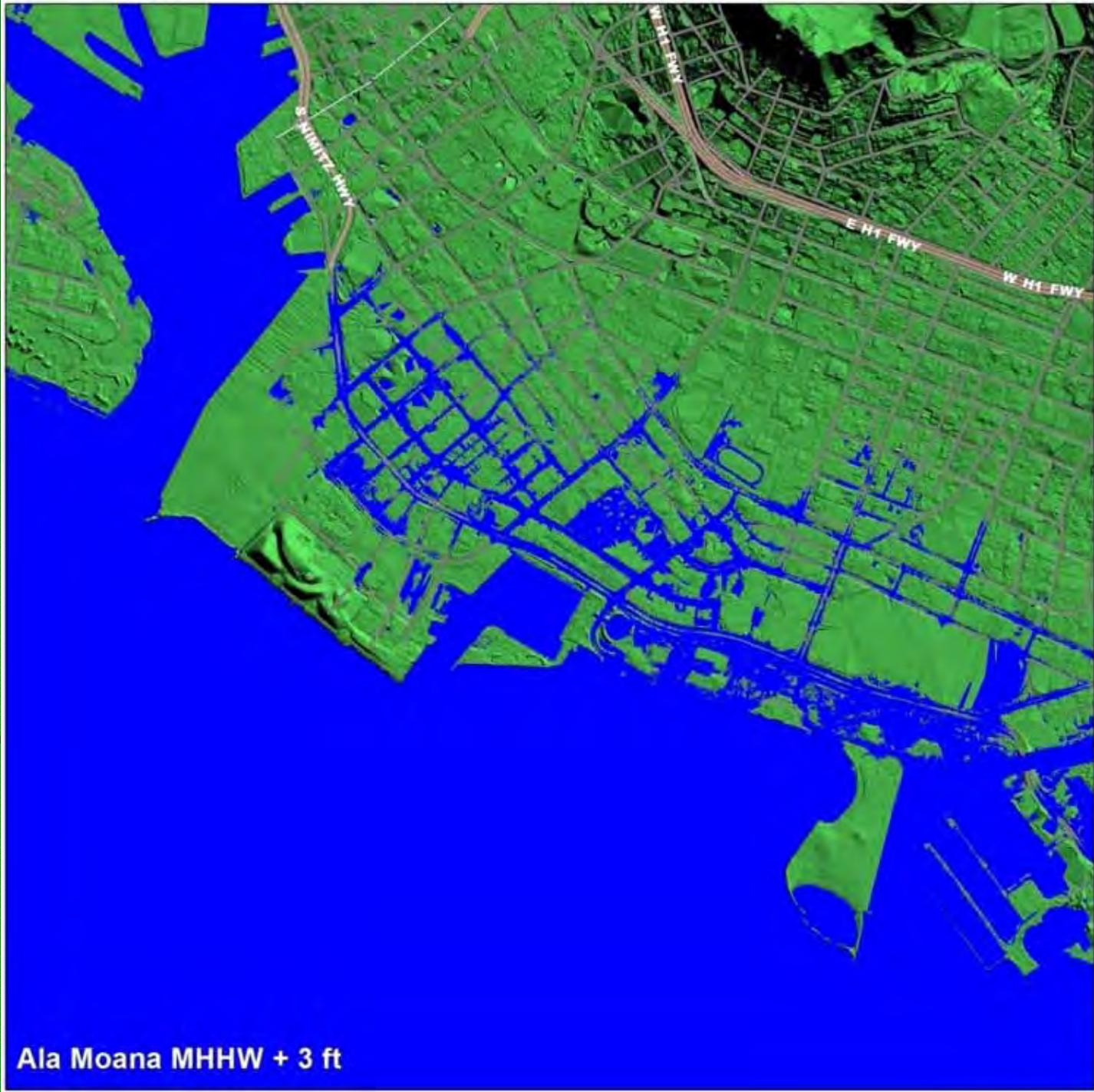




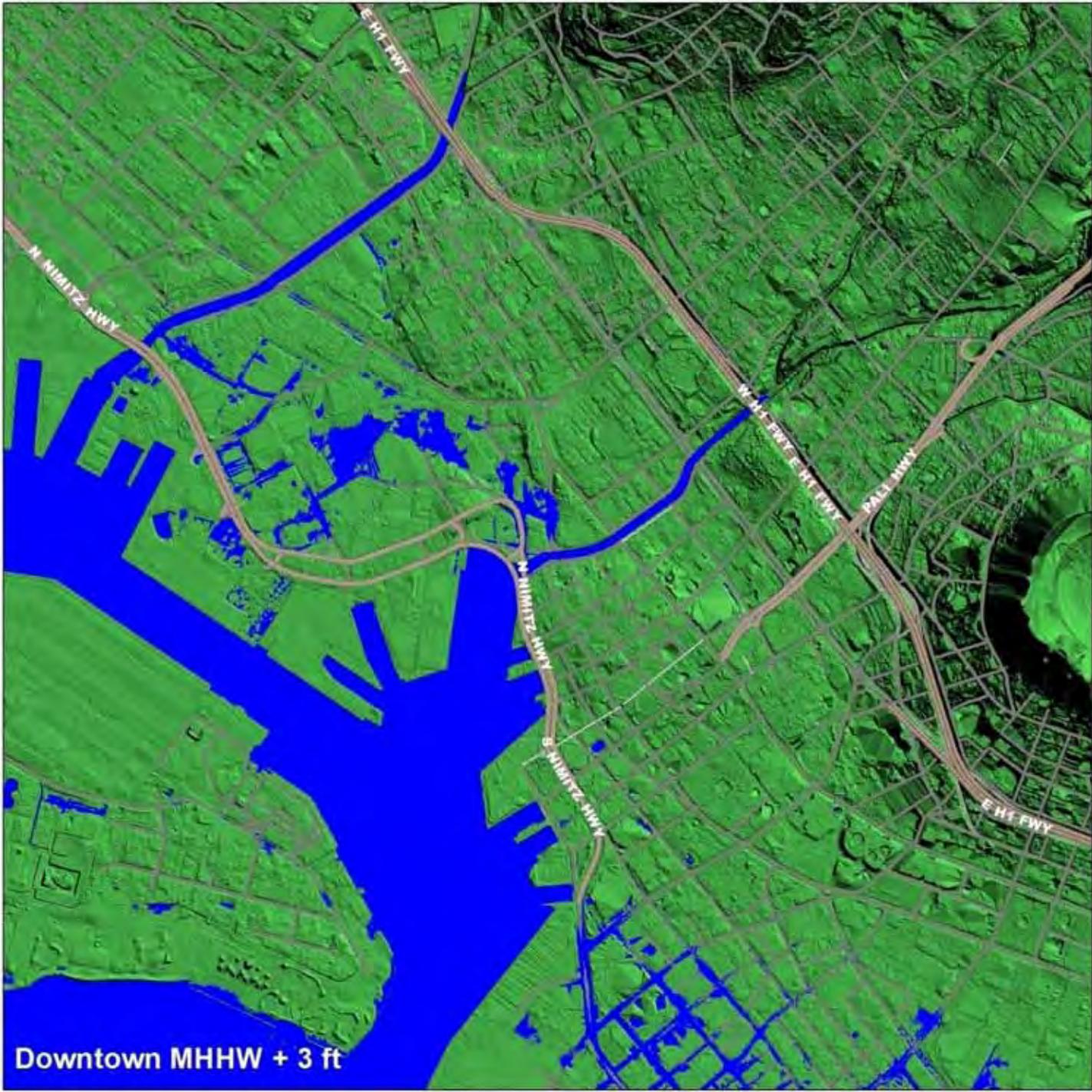
Mapunapuna MHHW



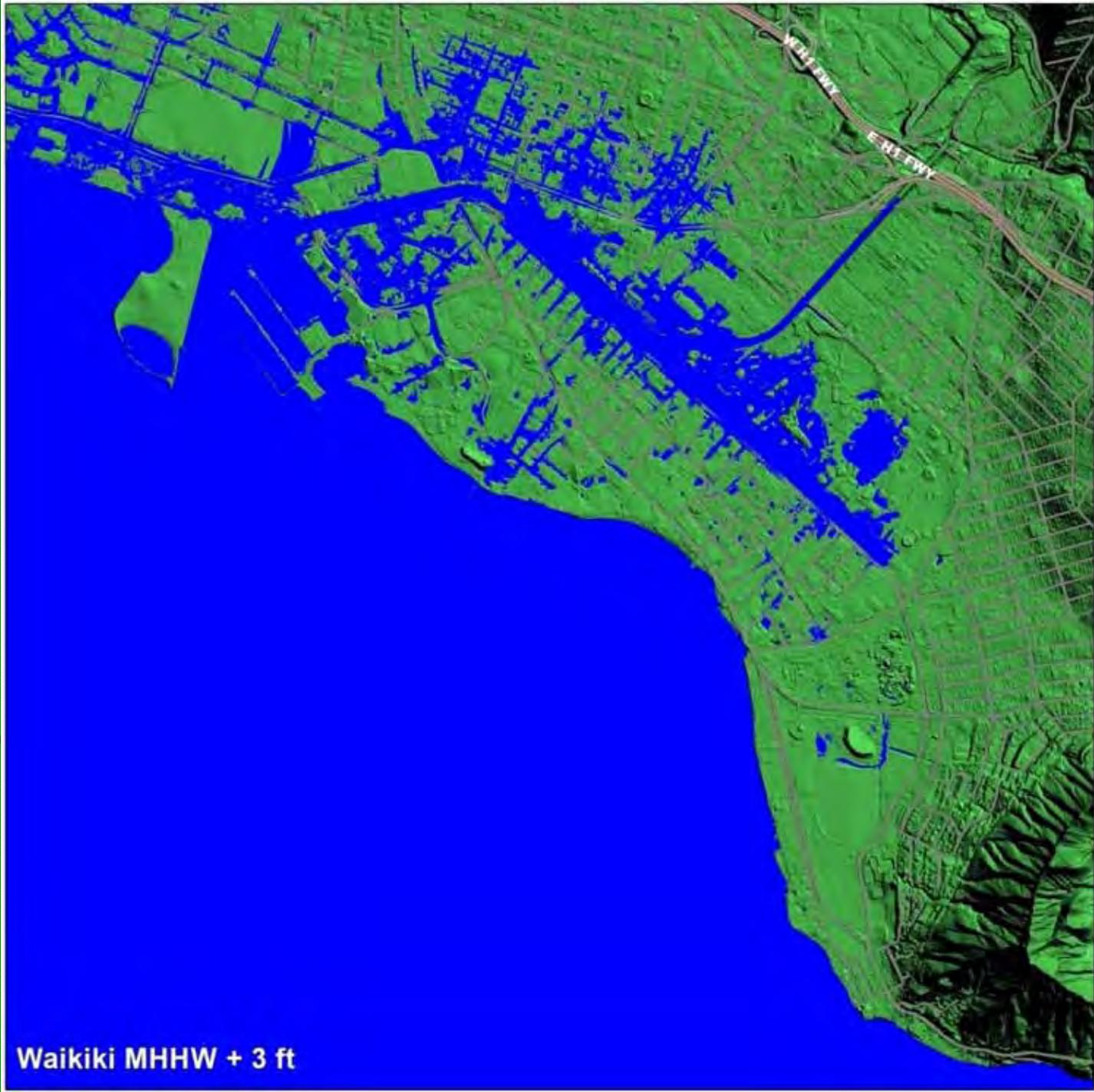
Airport Area MHHW + 3 ft



Ala Moana MHHW + 3 ft



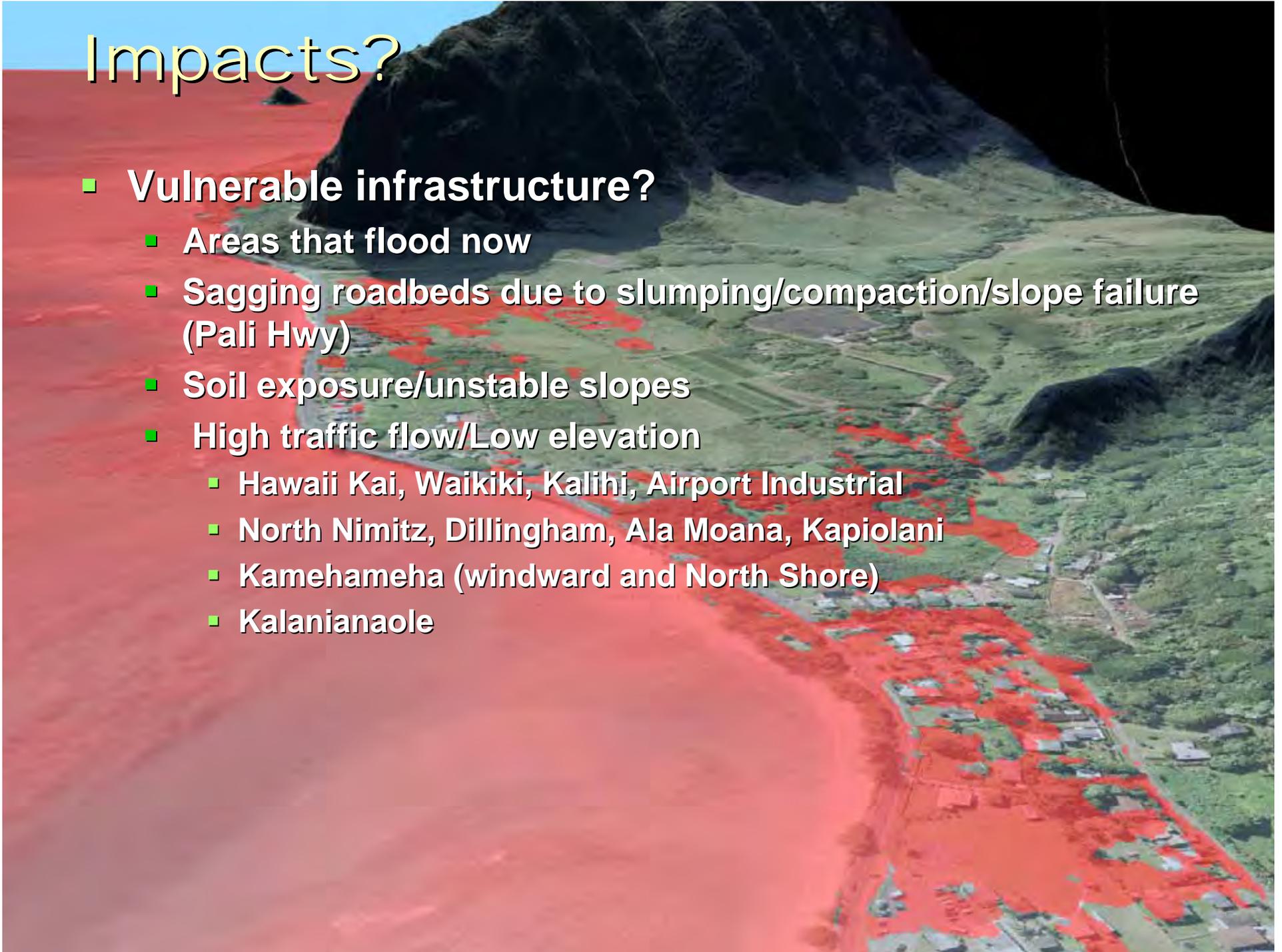
Downtown MHHW + 3 ft



Waikiki MHHW + 3 ft

Impacts?

- **Vulnerable infrastructure?**
 - Areas that flood now
 - Sagging roadbeds due to slumping/compaction/slope failure (Pali Hwy)
 - Soil exposure/unstable slopes
 - High traffic flow/Low elevation
 - Hawaii Kai, Waikiki, Kalihi, Airport Industrial
 - North Nimitz, Dillingham, Ala Moana, Kapiolani
 - Kamehameha (windward and North Shore)
 - Kalaniana'ole



Transportation Infrastructure

Airports, harbors, and highways will face different effects from various climate events

Priority Infrastructure

- Honolulu Harbor
- Honolulu International Airport/Hickam AFB complex
- Access to Campbell Industrial Park & Barbers Point
- Communities with only one means of egress, e.g., Waianae

Honolulu & Kalaeloa Harbors

- Vulnerable to storm intensity and sea-level rise; currently being affected
- Key components of Hawaii's economic engine
- Includes probable flooding of Ala Moana Blvd, Nimitz Hwy, and Sand Island Access Rd
- 80% of Hawaii's goods arrive via ship; gantries highly vulnerable to wind; loose containers floating
- Two oil refineries and underground storage tanks; power corridor
- Wastewater treatment facility; Waimanalo landfill
- Critical to post-disaster recovery

Hickam/HNL Airport Complex

- Vulnerable to flooding, storm intensity, and sea-level rise; currently being affected
- Flooding of runways and tarmac as well as roadways immediately adjacent to the airport could also affect
 - Mapunapuna Dispatch for emergency services
 - Middle Street transit storage facility
 - DOT Oahu District Office
- Critical to post-disaster recovery
 - Visitor departures; car rental companies
 - Incoming supplies and emergency relief
 - Serves Pearl Harbor

Highway Infrastructure

- Vulnerable to storm intensity and sea-level rise; already being impacted
- Increased coastal erosion and loss of shoreline
- Drainage culverts may be insufficient to handle run-off
- Sea-level rise may undermine roadway stability
- Slopes may become unstable if vegetation is stressed

Safe Paths Out

- Susceptible to flooding, rockfall and landslides, storm intensity
- Transportation system redundancy lacking in some areas
- Need to ensure access to communities that may become isolated
 - Waianae-Farrington
 - Kamehameha Hwy (especially North Shore)
 - Kalanianaʻole Hwy (especially Hawaii Kai and Waimanalo)
- Low-lying coastal roads and bridges
- Kahe Point and Waiau power plants

Other Areas of Concern

Much of Oahu's existing, critical infrastructure is also vulnerable, including refineries, power generation, and wastewater treatment

Questions & Discussion



Mahalo!

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