Climate Change Transportation Vulnerability: Workshop Outcomes

Oahu Metropolitan Planning Organization

May 18, 2011

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

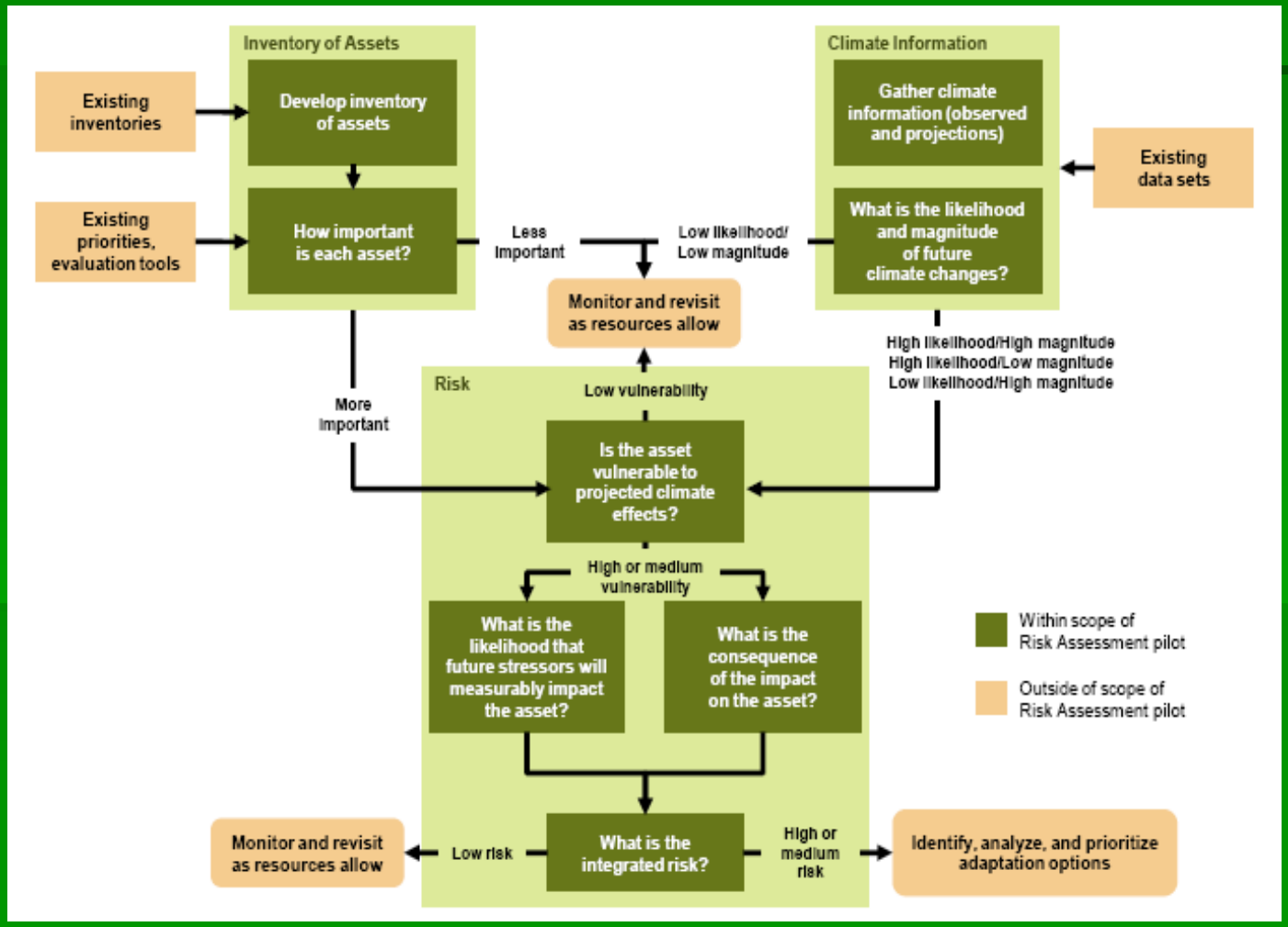
FHWA & Climate Change

- 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

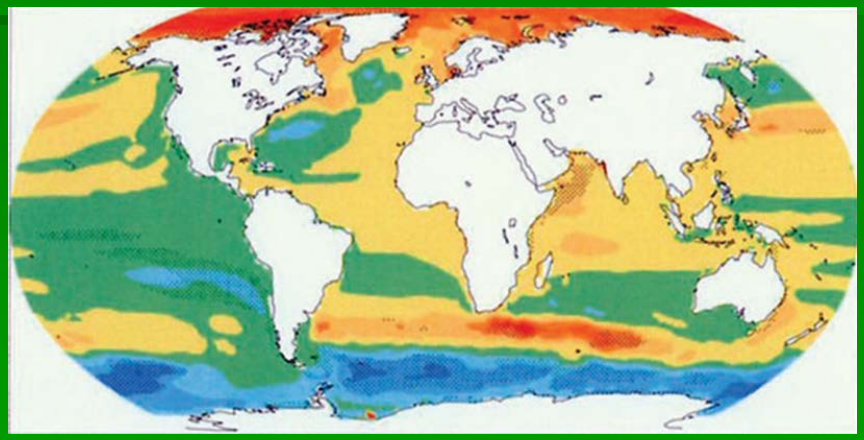
In Hawaii

- Rainfall (-15%) and stream discharge have decreased
- Air temperature is increasing (0.3ºF/decade)
- Rainstorm intensity has increased (+12%)
- Sea surface temperature is rising (0.22ºF/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
NA HOKU II


E MOANALUA FWY
E H1 FWY
N NIMITZ HWY
KAM HWY
E H1 FWY
W H1 FWY
E H1 FWY
N NIMITZ HWY
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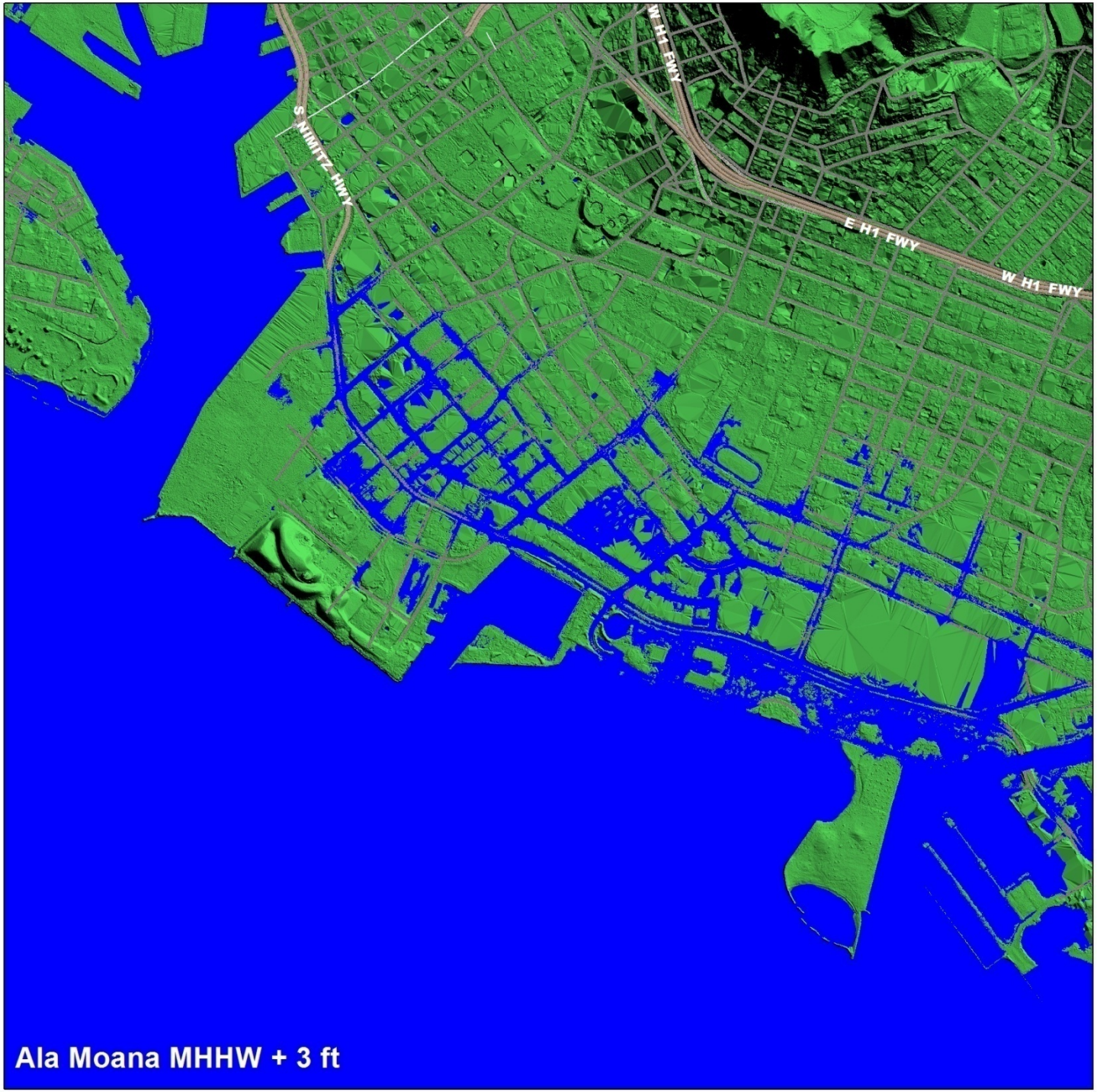
Mapunapuna MHHW

Airport Area MHHW + 3 ft


S NIMITZ HWY
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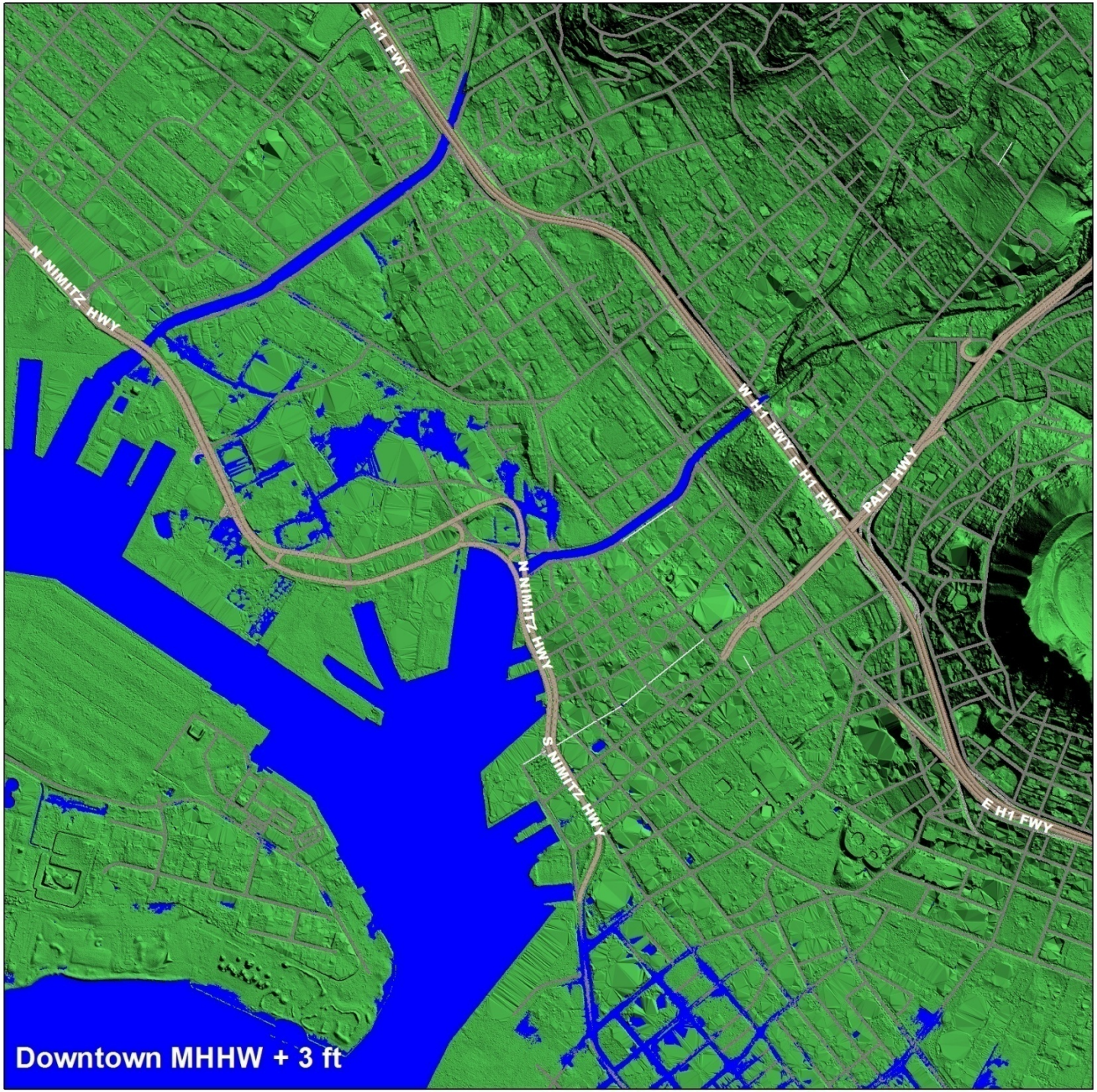
Ala Moana MHHW + 3 ft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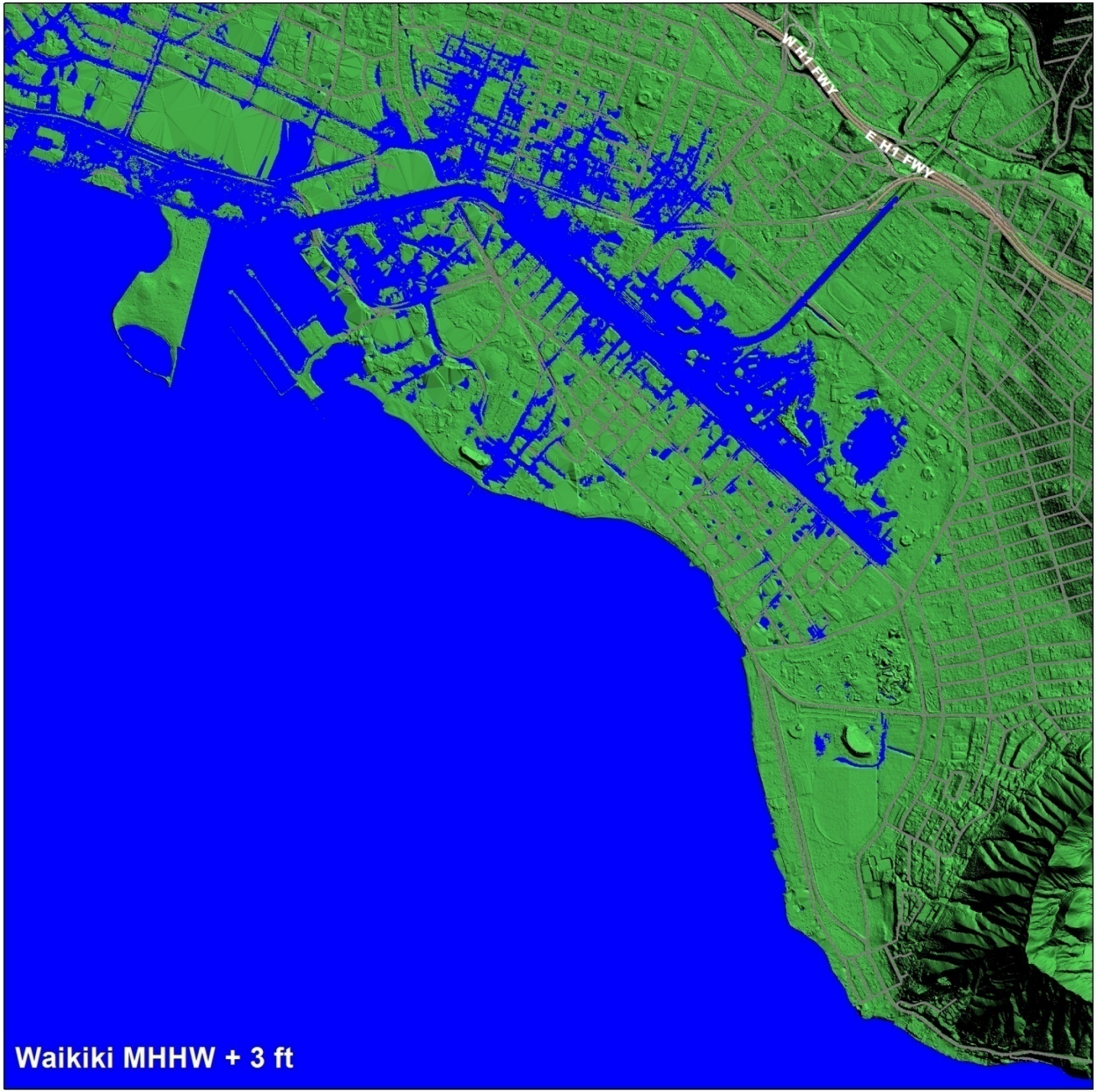
Downtown MHHW + 3 ft


W H1 FWY
E H1 FWY
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)
    - Kalanianaole

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)
  - Kalanianaole 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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