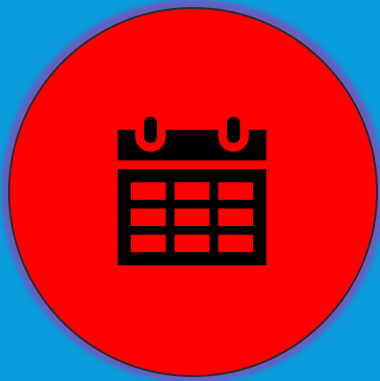


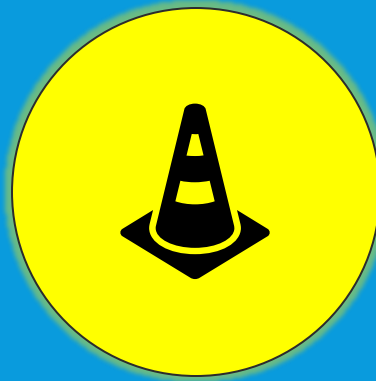
# RESILIENCE

*Ability to adapt to changing conditions and withstand, respond to, and recover rapidly from disruptions*

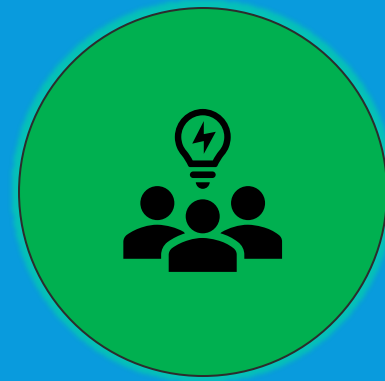
# HIGHWAYS PROGRAM



YESTERDAY



TODAY



TOMORROW

# HAWAII'S HIGHWAYS

- Approximately 2,500 lane miles across six islands
- Belt Roads
- No true "Interstate." Nearest aid is over 2,000 miles away
- Between April 2018 to February 2019, there were four natural disasters causing roughly \$125 million in damage to roads/bridges on three islands

Pacific Ocean

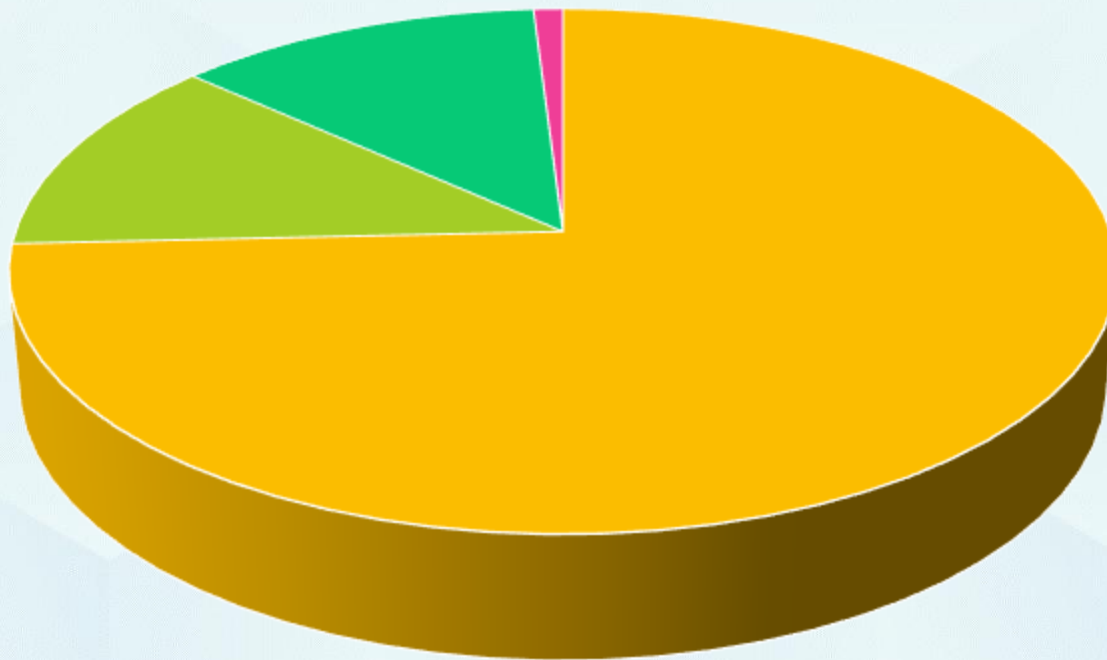
Honolulu

UNITED STATES

Hilo

Hawaii

# NEEDS OF THE SYSTEM



■ Preservation ■ Safety ■ Congestion ■ Resiliency

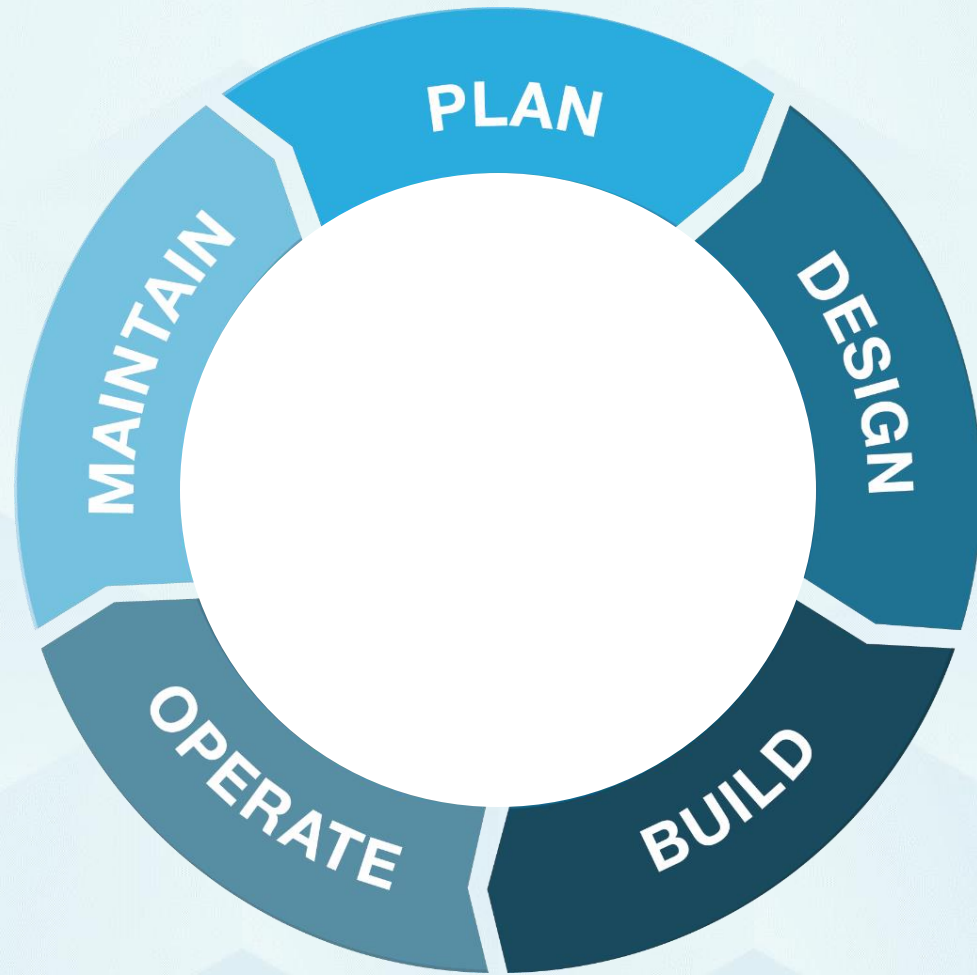
## Yesterday

- State of Repair (Preservation)
  - Pavement - \$50 mil per year
    - 25% are in "good" condition
    - 22% are "poor"
  - Bridges - \$40 mil per year
    - 23% in "good" condition
    - 2% in "poor" condition
- Safety - \$15 mil
- Congestion - \$15 mil
  - About 20% of the system over capacity
- Resiliency - \$5 mil
  - Shoreline
  - Rockfall

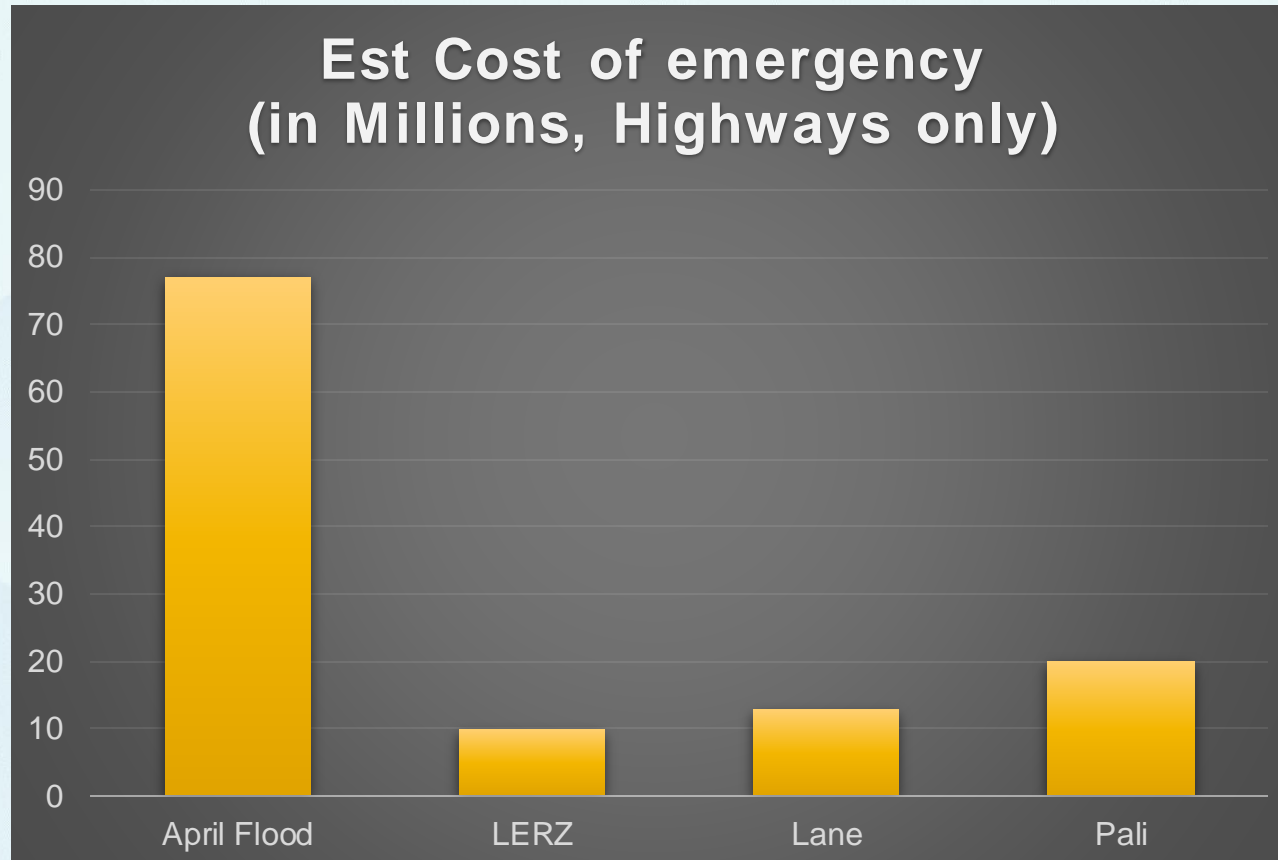
## Today

- Preservation - \$270 mil
- Safety - \$50 mil
- Congestion - \$50 mil
- Resiliency – \$??? Need to build processes and information infrastructure for tomorrow



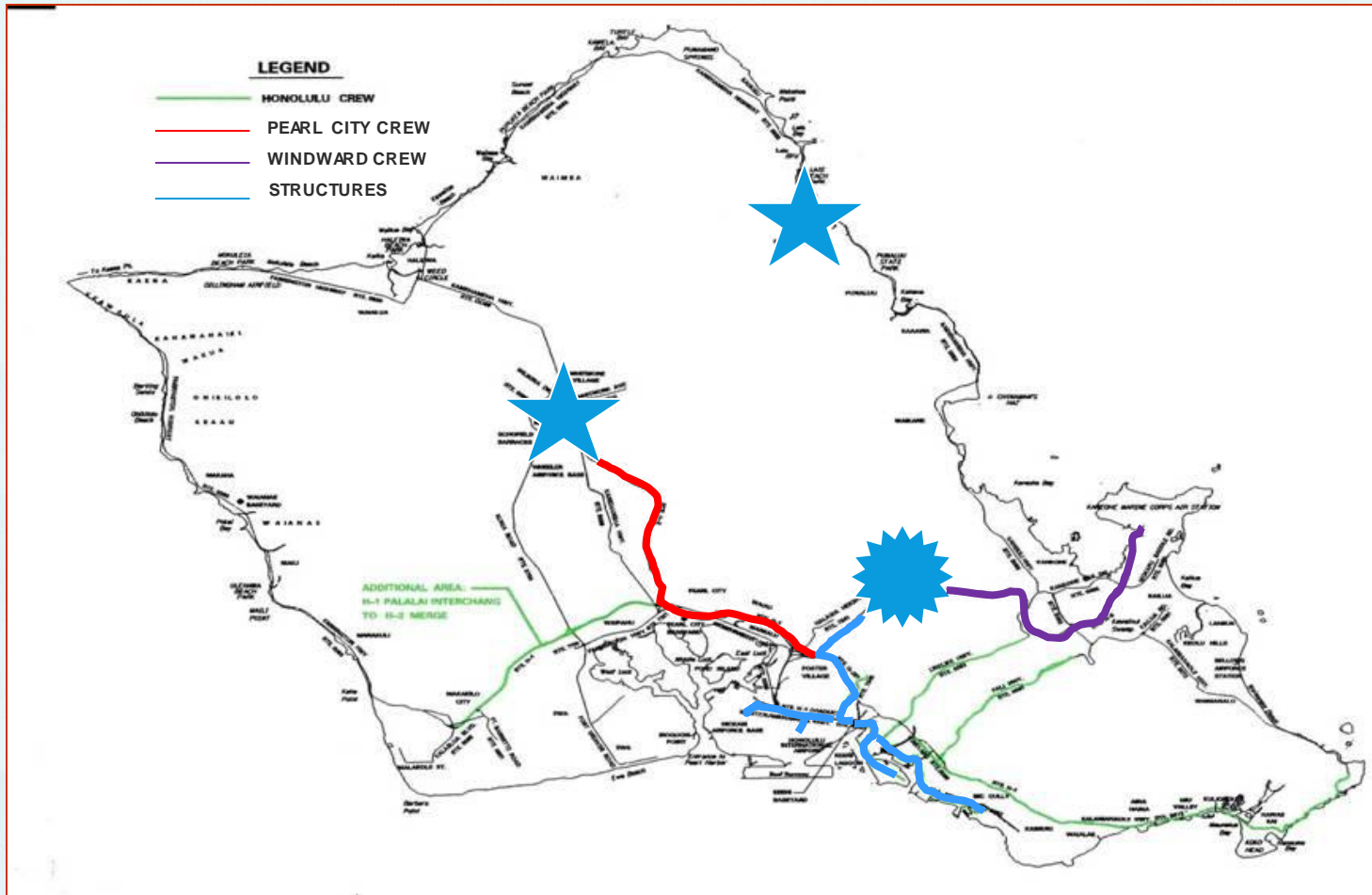


# 2018-2019 NATURAL DISASTERS



- April Floods – Kauai & Oahu
- East Rift Zone Eruption - Hawaii Island
- Hurricane Lane - Hawaii Island, Maui, Oahu, Kauai
- Tropical Storm Olivia - Maui, Molokai, Oahu (No DDIRs submitted)
- Pali Highway and Honoapiilani Highway landslide/rockfall

# CURRENT RESILIENCE



Before landfall:

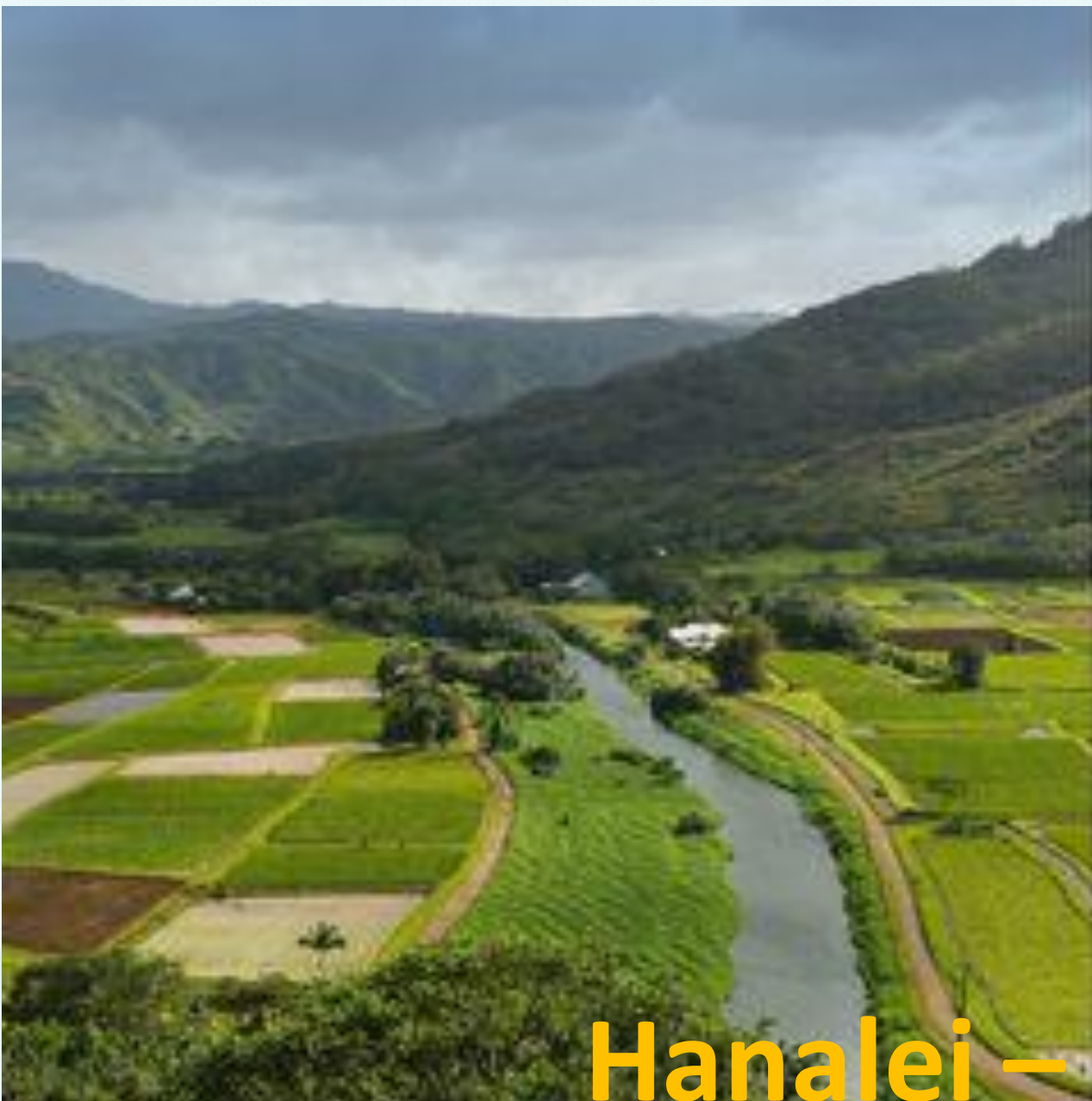
Crews deploy to H-3 Tunnels, shelter-in-place at Hauula and Wahiawa baseyards.

First 72 hours:

Goal is to connect Honolulu Harbor, HNL, Waikiki, JBPHH, Wheeler Army Airfield, Schofield Barracks, MCBH.

Then as crews become free, phased clean up of the rest of the island occurs.





**Hanalei – April 2018**





**Kuhio Highway - Before**





**Kuhio Highway - After**

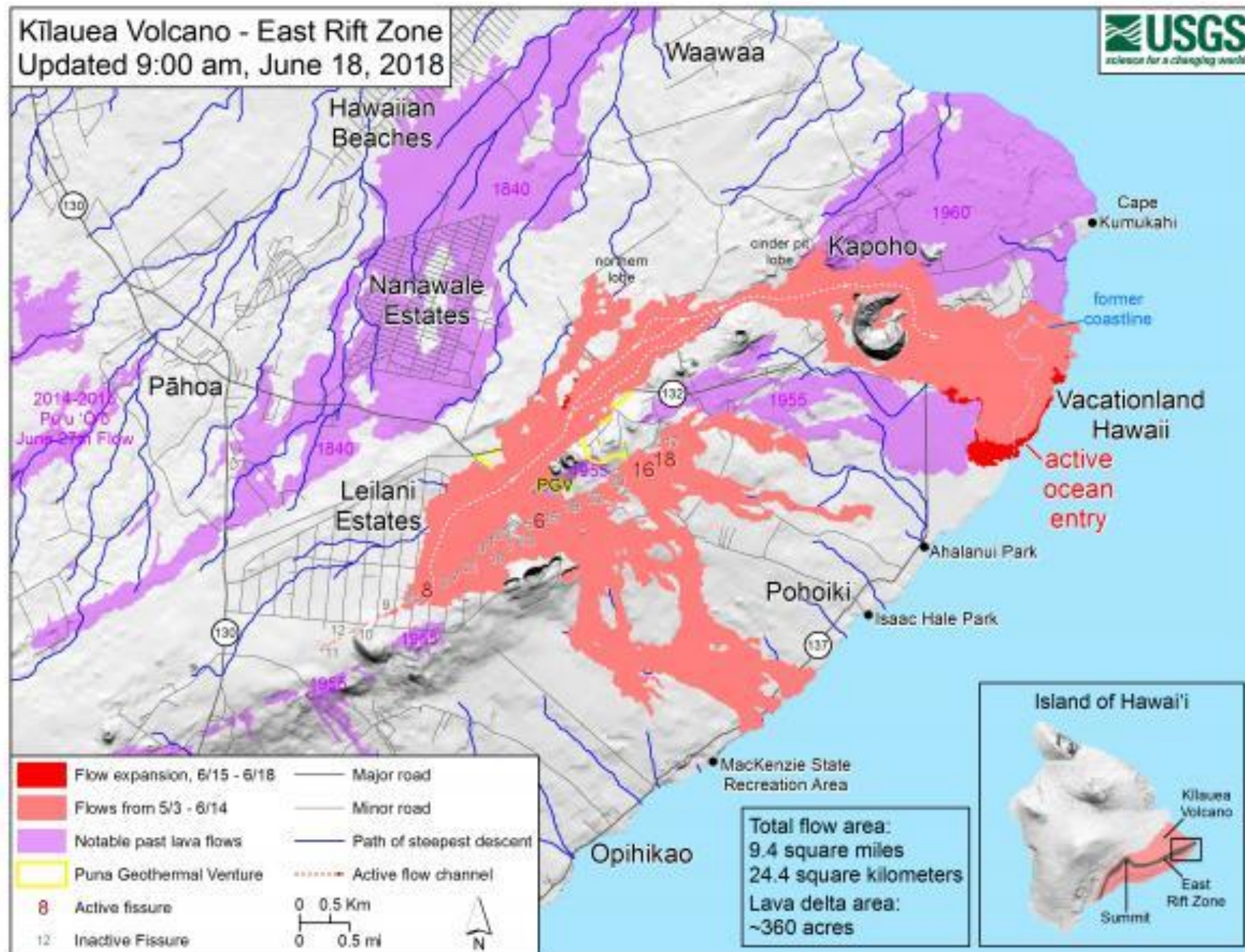




**Lower East Rift Zone**



Kīlauea Volcano - East Rift Zone  
Updated 9:00 am, June 18, 2018



















**Pali Highway - Before**

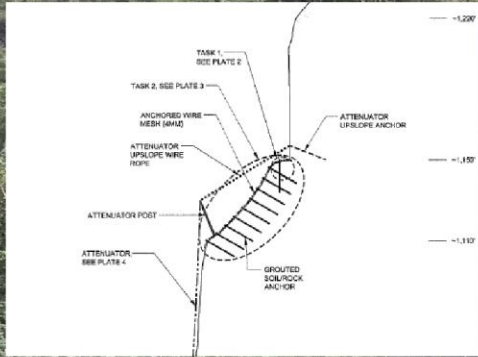












Reinforce slope under Old Pali Road through installation of soil nail, shot-crete, and mesh attenuators to catch loose material.



Secure rockface above existing tunnel with soil nail and mesh. (Example shown from Kuhio Highway Emergency Work).



Extend Pali Tunnel #2 1B to provide rockfall protection for the Honolulu bound roadway between tunnels.

# Pali Highway - Concept

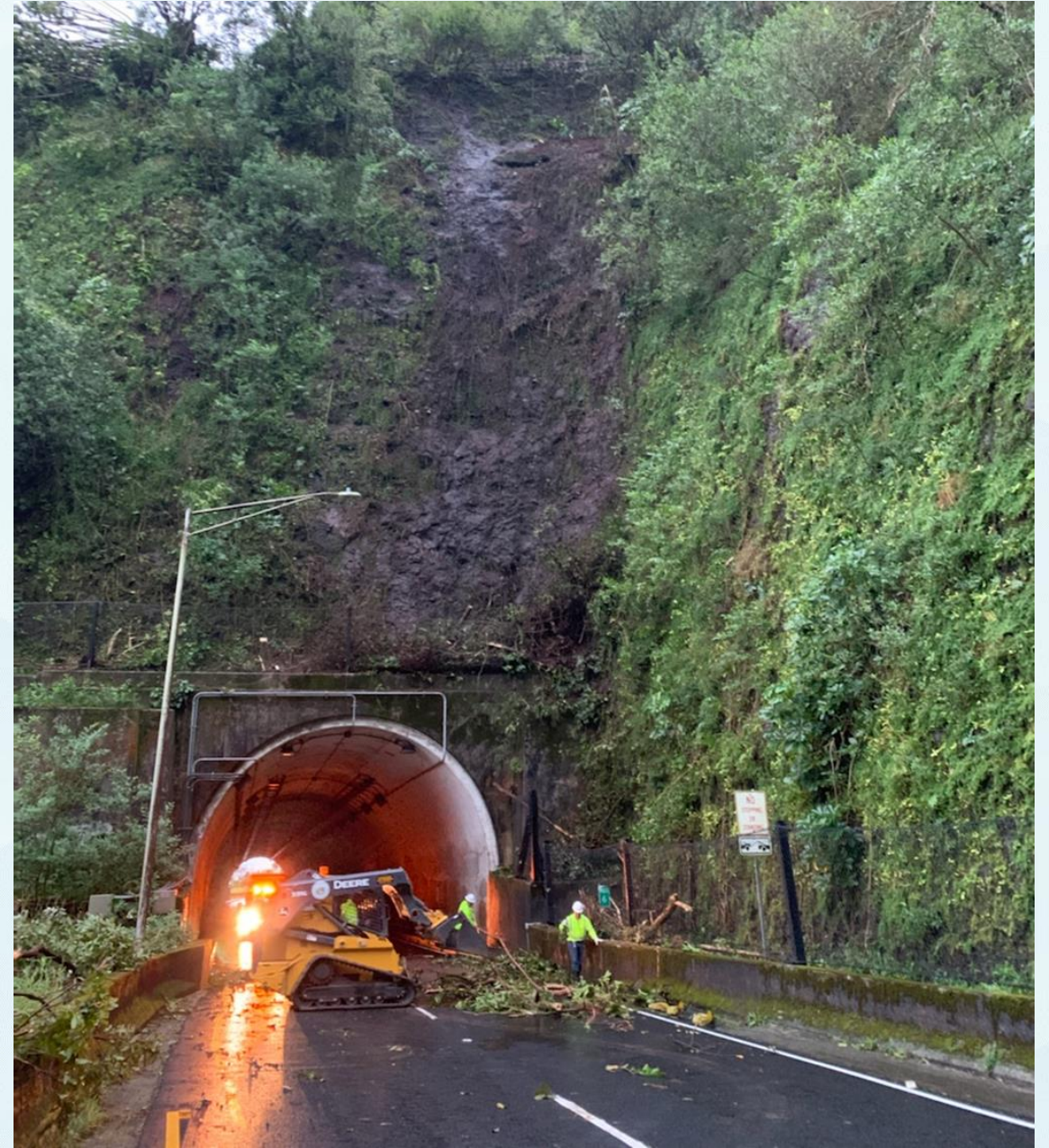






















# WHAT CAN WE DO?



Create policies for adaptation, protection or managed retreat that take communities and funding into account.



Work with experts to prioritize sites and design mitigation measures.



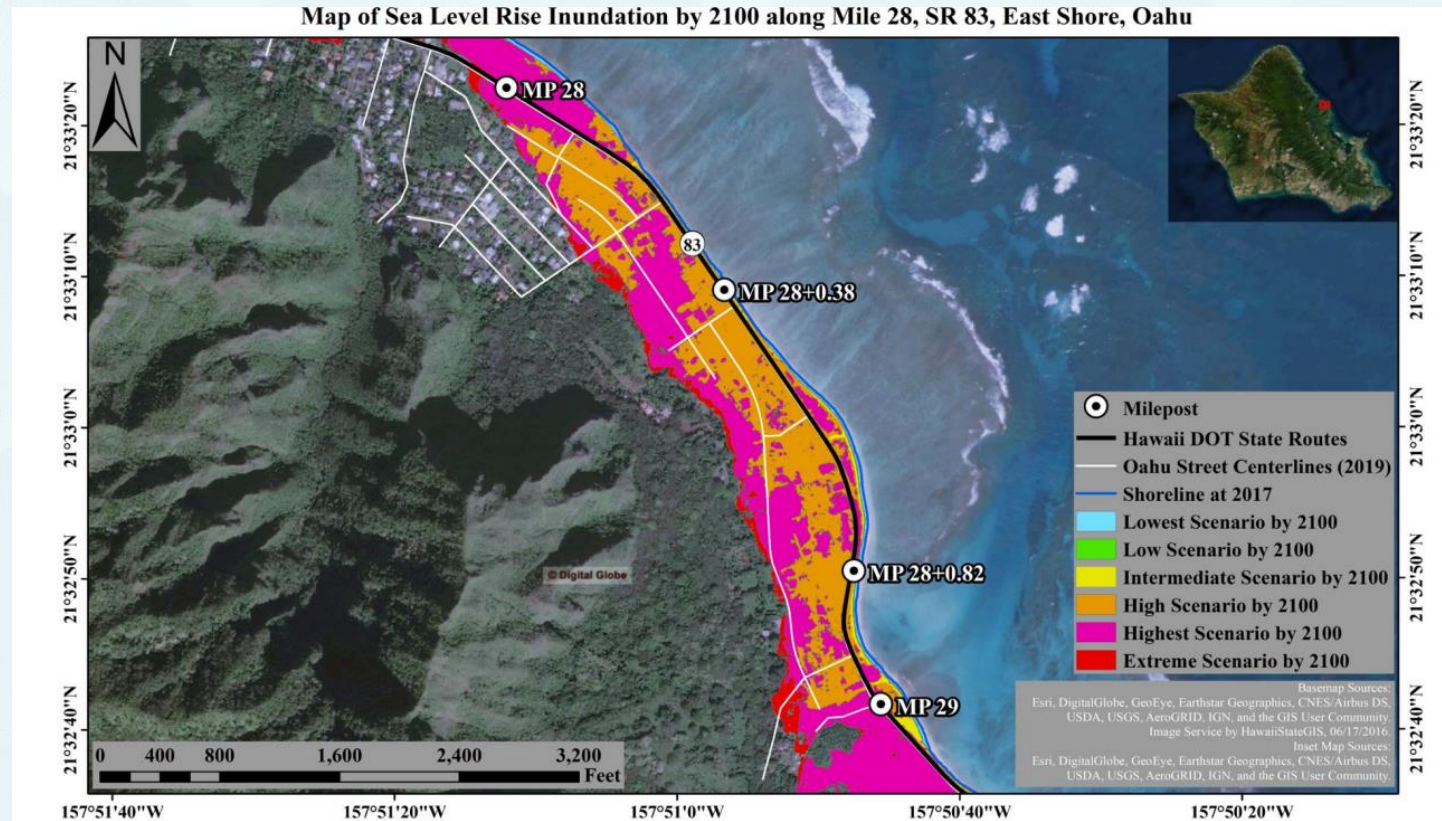
Work with stakeholders on land use, access, and other considerations.



Future decisions for roads require more than just DOT buy-in. Need alignment with State, County and Fed agencies and community.



## COASTAL HIGHWAY PROTECTION



- Published Statewide Coastal Highway Program Report in August 2019
- Report identifies and prioritises state roads in need of immediate and short-term erosion control/shoreline remediation based on CRESI



# ROCKFALL MITIGATION



- |     |   |                |
|-----|---|----------------|
| 1.  | Kamehameha Highway (Route 83), MM 5.4-5.52      | \$20 Million   |
| 2.  | Hawaii Belt Road (Route 19), MM 21.04-21.49     | \$11.7 Million |
| 3.  | Hawaii Belt Road (Route 19), MM 25.77-26.06     | \$7.19 Million |
| 4.  | Kuhio Highway (Route 56), MM 24.79-25.01        | \$8.21 Million |
| 5.  | Hawaii Belt Road (Route 19), MM 21.6-21.85      | \$1.03 Million |
| 6.  | Kuhio Highway (Route 560), MM 0.66-1.17         | \$20.1 Million |
| 7.  | Honoapiilani Highway (Route 30), MM 10.33-10.44 | \$2.57 Million |
| 8.  | Pali Highway (Route 61), MM 5.95-6.04           | \$2.52 Million |
| 9.  | Pali Highway (Route 61), MM 5.69-5.9            | \$20.3 Million |
| 10. | Pali Highway (Route 61), MM 6.04-6.55           | \$10.7 Million |



# STATEWIDE ROCKFALL PRIORITIZATION



Cost to implement rockfall protection at top 10 sites is roughly \$104 million.

Five of the sites on Kuhio Highway and Pali Highway have been addressed following emergency events.





# RESILIENCY PROCESS

- Kicked-off vulnerability study in December 2019 to develop a comprehensive inventory of potential extreme weather and climate change system impacts to our Highway system.
- The study is to identify:
  - locations where risks/impacts are most pressing to focus resources,
  - methods by which to incorporate climate change risks and related uncertainty into agency practice, and
  - the information/data needed to inform long-range and capital decisions
- When complete, the study will provide recommendations on how HDOT can best plan, design, operate, and maintain our infrastructure to be more resilient to current and long-term risks.















# RESILIENCE

*Today*— Ability to plan for and operationalize adaptations to changing conditions to minimize resources necessary to withstand, respond to, and recover rapidly from disruptions.



# COVID-19 ROADMAP



Resilient Economy





# MAHALO

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