Hawaii End-to-End Tsunami Warning:
Emergency Alert System (EAS)

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Major Natural Disaster Fatalities
in Hawaii during the 20th Century

- 14 Pacific-wide tsunamis hit the Hawaiian Islands.
- The four most destructive tsunamis caused a combined total of 222 deaths and hundreds of injuries:
  - April 1, 1946 (Aleutian Islands)
  - May 23, 1960 (Chile)
  - November 29, 1975 (Kalapana)
  - March 11, 2011 (Japan) - $30 M
### Hawaii's Hazard Profile

Threat ranking incl likelihood / effect of population & property

| Hazards                  | Low Threat |  |  |  |  |  | High Threat |
|--------------------------|------------|----|----|----|----|---------------------------------
| Hurricane                |  |  |  |  |  | 10 | Water Related |
| Flash Flood              |  |  |  |  |  | 8  |  |
| Tsunami                  |  |  |  |  |  | 6  |  |
| Earthquake               |  |  |  |  |  | 4  |  |
| Volcano                  |  |  |  |  |  | 2  |  |
| Landslide/Rock fall      |  |  |  |  |  |  |  |
| Drought                  |  |  |  |  |  |  |  |
| Wild Fire                |  |  |  |  |  |  |  |
| Power Failure            |  |  |  |  |  |  |  |
| HAZMAT (trans/oil spill) |  |  |  |  |  |  |  |
| Cyber Attack             |  |  |  |  |  |  |  |
| Urban Fire               |  |  |  |  |  |  |  |
| Aircraft Incident        |  |  |  |  |  |  |  |
| HAZMAT (fixed)           |  |  |  |  |  |  |  |
| Tornado/Water Spout      |  |  |  |  |  |  |  |
| Dam Failure              |  |  |  |  |  |  |  |
| Radiological             |  |  |  |  |  |  |  |
| Terrorism                |  |  |  |  |  |  |  |
| Pandemic Influenza       |  |  |  |  |  |  |  |

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### Hilo, April 1946

[Image of a historical scene related to the event]
Hilo, May 1960

GOAL: COORDINATION RESPONSE EFFORTS

Hawaii Hotel and Visitor Industry Security Association (HHVISA)

O‘ahu Visitors Bureau

Federal

State

C & C

Private

Industry/Corporate

Hawaiian Electric Company, Inc.
Tsunami Warning System
3 Main Components

- The Tsunami Warning Centers
  - Detect Earthquakes. Evaluate tsunami potential.

- Emergency Management System
  - Develop evacuation plan, communication system.
  - Receive warning center message products.
  - Take action for public safety

- Educate Citizenry in Hazard Risk Areas
  - Public should know what to do in tsunami emergency.
  - Public should move quickly inland in if strong ground shaking or ocean draw-down.

PTWC, ITIC, HAWAII
EXAMPLE OF END-TO-END SYSTEM

- HAZARD ASSESSMENTS DONE 1970’s and UPDATED
- EVACUATION ZONES IN TELEPHONE BOOKS IN 1990
- PUBLIC EDUCATION PROGRAMS - ANNUAL “TSUNAMI AWARENESS MONTH”
- STATE AND COUNTIES RECEIVE PTWC BULLETINS BY MULTIPLE MEANS
- PUBLIC BY MULTIPLE MEANS: SIRENS, RADIO, TELEVISION, AIRPLANES
PTWC, ITIC, HAWAII
EXAMPLE OF END-TO-END SYSTEM

• GOVT CONDUCT SEMI-ANNUAL TSUNAMI EXERCISES

• PRE-ESTABLISHED PROCEDURES (SOPS) FOR TSUNAMI EVACUATION AND RESPONSE WITH POLICE, FIRE, AND OTHER DEPARTMENTS

• STAKEHOLDERS MEETINGS - TSUNAMI TECHNICAL REVIEW COMMITTEE INCLUDES PTWC, ITIC, EMERGENCY MANAGERS / RESPONDERS, SCIENTISTS

• STATE OF HAWAII / COUNTIES - TSUNAMI ADVISOR EXPERTS (STATE – LAURA KONG)

Tsunami Evacuation Maps
located in the front of Telephone White Pages

Map 1: Waikiki

Note 1
When evacuation boundaries are shown using white and grey lines, they are considered to be safe from water action

Note 2
Steel and/or concrete structures of six or more stories in height should provide shelter. Structures of 4-6 stories high should be the third floor or above.

Note
The maximum rise of water in tsunami is about 10 feet. However, all evidence should be removed, or put to use due to the possibility of earning points and value addition.
NOAA Tsunami Evacuation Zone Tools
Where am I?  Online GIS tool

Pink shaded area = Tsunami Evacuation Zone. If you live or work in pink area, you should have an evacuation plan in case of a tsunami event.

Statewide Siren Warning System

356 total sirens Statewide:

- Kauai        47
- Oahu         210
  County, Military, Simulators
- Maui         66
- Big Island   67

Radio controlled
New sirens solar powered
Range: up to 2000 km
Use: Emergency, 3 min
Test Monthly, 1st work day, 1145am, 45-sec
How it Works
(Emergency Alert System, EAS):

- **LOCATION(S)**
- **EVENT**
- **PRACTICE**
- **AIR RELAY**
- **SEND**
- **DEMO**
- **PRACTICE**
- **CONFIRM**
- **HAWAII**
- **HONOLULU**
- **SUBDIVISION**
- **FEDERAL SIGNAL CORPORATION**
- **FEDERAL WARNING SYSTEMS**

Activated by:
National Weather Service
State Civil Defense
County Civil Defense

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Emergency Alert System (EAS)

- **KSSK 590 AM / 92.3 FM**
- **KRTR 96.3 FM**
- **KMVI 550 AM**
- **KKBG 97.9 FM**
- **C & C Honolulu, DEM**
- **Maui Civil Def**
- **Hawai‘i Civil Def**

Additional network partners
- Time Warner Cable
- KZOO 1210 AM - Japanese
- KREA 1520 AM - Korean
- KNDI 1270 AM - Chinese, Chuukese, Filipino, Laotian, Marshallese, Pohnpeian, Samoan, Spanish, Tongan and Vietnamese
Emergency Alert System (EAS)
- SCD EOC coordinates 1st Siren sounding, initiates public message,
- Transmits immediately by dedicated microwave link
- Designated radio stations - neighbor islands
- TV broadcasts (crawlers) originate from Honolulu

Statewide EAS Activations Originate from Diamond Head
Local Tsunami Threat: 30 minutes to Waikiki, Oahu
**Local Tsunami Warning & Evacuation**

- PTWC issues an urgent tsunami warning for local earthquakes magnitude 6.9 or greater.
- **County Warning Points** sound sirens in designated Counties (e.g. Hawaii and Maui Counties).
- **National Weather Service** broadcasts warning and evacuation through the EAS.
- EOC activate and prepare for disaster response operations.

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**LOCAL TSUNAMI WARNING – RADIO BROADCAST SCRIPT**

- “The Pacific Tsunami Warning Center has issued a Tsunami Warning for the Islands of (select islands or geographical location).
- A local tsunami has been generated. Immediately evacuate all beaches and all low lying coastal areas. Move inland to higher ground or move to the 3rd floor and above in reinforced concrete buildings.
- I Repeat, …..
PTWC issues Tsunami Watch and Warning Bulletins to the State of Hawaii for distant earthquakes magnitude 7.9 or greater.

Emergency Operation Centers (EOC) activate and alert emergency response agencies.

EOC coordinate siren sounding statewide at least 3 hours before 1st wave arrival in conjunction with radio and television Emergency Alert System (EAS) broadcasts.

EOC coordinate school closures and release of government workforce within tsunami evacuation zones.

EOC prepare for disaster response operations.
Oahu Evacuation - Bus Routes, Roadblocks, Waikiki

- City buses along shoreline will alter routes and shuttle people to nearest inland shelter.
- Police establish roadblocks until 45 minutes prior to first wave arrival.
- All emergency response personnel cease operations and move inland to safety 30 minutes prior to first wave arrival.
- Special concern in Hawaii is education of surfers – tsunamis are not surfing waves!
- Waikiki - Vertical Evacuation (for 6-story steel, reinforced concrete bldg, go to > 3rd floor)

Public Safety Notification “ALL CLEAR”

- PTWC will cancel the tsunami warning when destructive waves have ceased.
- Search & Rescue operations commence.
- County Civil Defense agencies announce “All Clear” over radio and television. No sirens will sound.
- Public may return to coastlines after “All Clear” is announced.
ISSUES: Disaster Reality - Evacuation

- Hawaii has unique evacuation issues
- Hurricane/tsunami evacuation is extremely difficult
- Approximately 50,000 people reside in our evacuation zones
- On the mainland United States you can drive inland 100-miles and wait out the storm
- Here in Hawaii we do not have that option

ISSUES: Disaster Reality - Sheltering

- Oahu is short on shelter space
- Roughly 160 State DOE Schools double as emergency shelters
- Provide for about 1/3 of Oahu population
- July 2008 – 905,000 Oahu residents
- April 2009 – 330,000 Oahu visitors
- More than 1.2 Million people with no place to evacuate to
ISSUES: MEDIA REPORTS
1986, 1994 Tsunami Warnings

Pacific-wide Tsunami Warnings Issued
Sirens sounded, Statewide evacuations
Small, non-destructive tsunamis

- 1986 - mid-afternoon to pm rush hour
- 1994 - early morning to am rush hour

Losses
- 1994 (DBEDT Study) => $50M
- 1986 (extrapolated) => $30M
- 2003 (extrapolated) => $68M

Media reports shape public opinion

Thank You

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PTWC MISSION

Hawaii Regional Center - Provide warnings to Hawaii for local & regional tsunamis generated in Hawaiian waters

US National Center - Provide warnings to all US interests in the Pacific and Caribbean outside the WC/ATWC AOR for regional & distant tsunamis

International Center - Provide warnings to all countries around the rim and in the interior of the Pacific and Caribbean for regional & distant tsunamis

EMERGENCY PREPAREDNESS: Conducting Exercises

HAWAII DISTANT TSUNAMI EXERCISE

April 1, 2005
The statewide distant tsunami exercise will focus on Hawaii’s ability to respond to a distant tsunami from the Aleutian Islands in Alaska.

The exercise provides an opportunity for participants to review their distant tsunami response procedures and to promote emergency preparedness.

The exercise is planned by SCD with PTWC, who plays by issuing prescripted voice messages on the HAWAS and sending other electronic and hard copy messages.

Validate:
- Warning and Communications Procedures for a distant generated tsunami.
- Organizational Procedures in emergency.

Review:
- Organization Procedures for Evacuation:
  - Inland Evacuations
  - Vertical Evacuations
  - Public Transportation

Kick off “April Tsunami Awareness Month” Public Awareness Campaign.
EXERCISE SCENARIO

10:15 a.m. An earthquake greater than 8.0 magnitude occurs in the vicinity of the Alaska Aleutian Islands.

10:25 a.m. Pacific Tsunami Warning Center (PTWC) issues a Tsunami Watch Bulletin for the State of Hawaii. First wave arrival to Hawaii is 4 hrs 30 mins after earthquake origin time.

11:45 a.m. Hawaii placed in a Tsunami Warning (3 hours before first wave arrival at 2:45 p.m.) Statewide siren sounding (monthly Siren System test).

2:45 p.m. First wave arrival.

3:30 p.m. End of Exercise.

STAKEHOLDER COORDINATION

Civil Society:
Community organizations: (social, gender, cultural, age, language, religious…)
Disaster Response & Relief Trade, commerce, workers

Govt Agencies:
Regional Planning
Social Infrastructure Works
Agriculture & Forestry
Health & Sanitation
Environment, Tourism
Transportation, etc.

Govt Emergency Operations
First Responders (police, fire)

Local Communities, Mass Media, NGOs, Energy/Telecomm

People

National Coordinating Committee

Scientific & Engineering Research

Warning Center

ITIC, Cabinet Office Japan
EXAMPLE, HAWAII:

STAKEHOLDER COORDINATION MECHANISM

IMPLEMENTATION, POLICY, EMERGENCY RESPONSE, PUBLIC AFFAIRS AND MEDIA, OUTREACH, EDUCATION

HAWAII TSUNAMI TECHNICAL REVIEW COMMITTEE (TTRC)

• Reduce risk of tsunamis to State of Hawaii
  Founded 1998, meets 2x/year
  Funded by State & NOAA (NTHMP)

• Scientists, engineers, planners, Emergency managers, public affairs personnel
  NOAA, FEMA, USACE, USCG, DOD, FEB, Univ. Hawai`i, Pacific Disaster Center, Red Cross, Pacific Tsunami Museum, State & Local Agencies (DOE, DBEDT, DOT, DLNR, CZM, Warning Points, Civil Defense, Tsunami advisors)
• Activities
  Hazard ID, Risk Assessment, Warning Guidance
  Awareness and Mitigation

• Recent TTRC Agenda Topics
  PTWC Operations Report
  Runup and Inundation Modelling – Evacuation Maps
  Tsunami Observer Program, Post-Tsunami Survey Plan
  Multi-Level Regional Warning and Coastal Evacuation
  Statewide Exercise - Local Tsunami
  Public Affairs Working Group Activities (Awareness Month)
  Social Science Perspectives on Tsunami Warnings
  Maritime operations during tsunami events –
    Ocean Currents in Harbors, Shipping ports, boating safety
  Civil Air Patrol Capabilities
  Working Groups: Emergency Mgmt, Scientific, Public Affairs