Interdepartmental Committee for Meteorological Services and Supporting Research, Working Group for Disaster Impact Assessments and Plans: Weather and Water Data
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US Post-Tsunami Survey Protocols

History, Background, Status

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POST-TSUNAMI SURVEY– NWSI 10-703 (2010)

- **Post-Tsunami Survey (PTS)**
  - Triggered by destructive tsunami
  - Observe / document tsunami effects through eyewitness reports and perishable data collection for a) learning impact; b) improve research, planning, mitigation, preparedness.
  - Data immediately available for damage assessment needs. Enable informed response decision-making
- **NWS instruction 10-703 (ITIC lead for PTS)**
  - Coordinate International w/UNESCO at country request
  - Coordinate Domestic with NTHMP Federal / State partner (or requested by NTHMP partner, e.g., Hawaii)
  - Conduct Domestic when initiated by NWS
  - Facilitate report, data sharing, archiving

TSUNAMI FIELD SURVEYS - HISTORY

- After each tsunami, data collected to quantify impacts, response/recovery, improve numerical models, engineering (International Tsunami Survey Teams, ITST)
- ITIC helps to coordinate ITST for UNESCO/IOC (UN)
  On request from Country to IOC / US State Dept
- 1st ITST – 1992 Nicaragua
  Last – El Salvador, Sept 2012 (GIT, USC/eCoast, NOAA)

DATA COLLECTED - Seismic & Tsunami

- **Seismological Information**
  - Earthquake Seismicity and Source Information
  - Shaking Intensity Maps, Felt Intensity as reported by observers
  - Earthquake Hazards, Historical Seismicity (pre-loaded)
- **Tsunami Information**
  - Arrival Eyewitness Obs
  - Mareograms
  - Run-up and Inundation
  - Damage (satellite, on-ground)
  - Tsunami Hazards
  - Historical Tsunami Activity (pre-loaded)

DATA COLLECTED – Post-Event Damage

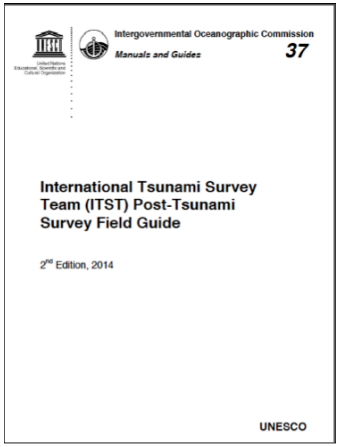
- ***Geotechnical Information***
  - Ground Deformation
  - Tilt/Uplift/Subsidence
  - Surface Fault Rupture
  - Ground failure (landslide, liquefaction, lateral spreading, ground cracking, hydrologic effects)
- ***Structural and Non-Structural Impacts***
  - Buildings, Bridges
  - Architectural
  - Nonstructural Elements

View from south of Seattle building braced and located next to the Alaskan Way Viaduct, Mar 24, 2001. Chris Jonientz-Trisler, FEMA

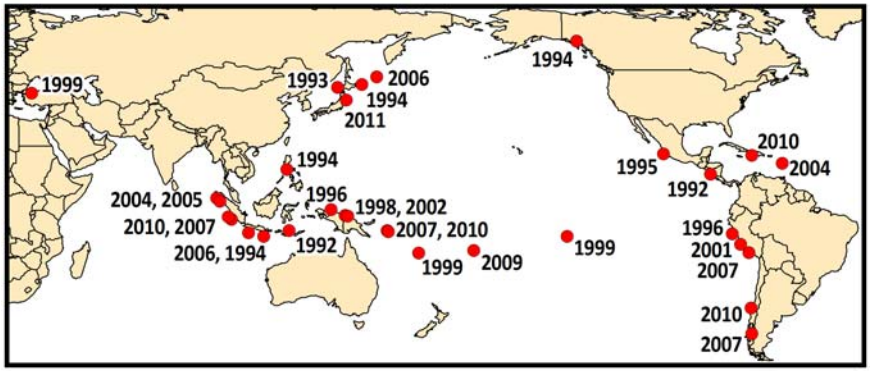
International Tsunami Survey Team

- **UNESCO IOC Field Manual (rev 2014)**

  http://www.ioc-unesco.org/index.php?option=com_oe&task=viewDocumentRecord&docID=13275



- **CHECK-IN – Situational Briefing**
- **BADGING - ITIC**
- **FIELD SURVEY – Raise Awareness**
- **CHECK-OUT – Share information**



ITST – EVOLVING SINCE 2004

Teams in field within days

1. Invited by country to help coordinate (IOC, ITIC)
2. Teams provide plan to ITIC
3. ITIC works with Country coordinator
4. IOC / ITIC, Host Country provides ITST Letter
5. ITIC provides ITST Badges for team members
6. Check-in with Country
7. Sharing on secure server (or other means)
8. Check-out with Country
9. Encourage final data ITIC, archive to NOAA NCEI

POST-TSUNAMI SURVEYS - Reality & Coordination

For 2009 Samoa / Tonga, GoS / GoT collab; ITIC, SOPAC, UNESCO/IOC coord

- **Samoa: > 60 intl scientists (7 countries+), 1 team**
  Oct 14-23
  Summary/Prelim report to GoS on leaving (Oct 26, 3 weeks)
- Tonga: 5 intl scientists (Japan, NZ, USA), 2 teams Nov
  Nov 11-16: Prelim Data to GoT on leaving

For 2010 Chile, GoC invited UNESCO/IOC & ITIC coordinate

- **25+ teams (>70 scientists**), Mar-May
- *Secure prelim data sharing (ITIC)*

For 2011 Japan, GoJ invited UNESCO/IOC & ITIC coordinate

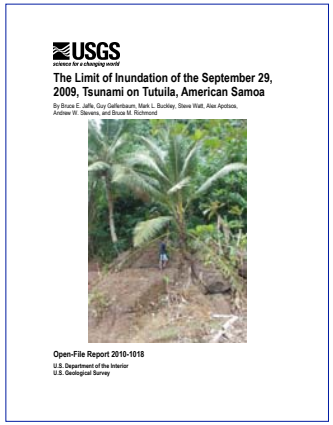
- **Japan teams** (200+ scientists) did initial; Intl afterward building upon

SEPT 29, 2009 – AMERICAN SAMOA

- **> 40 intl scientists, > 7 teams from Oct 4**

- **Characteristics: Independent, self-fund**
  - **Arrange locally, e.g., stretch limited logistics (lodging, transport)**
  - **Science/research focus**
  - **Difficult coord. Publish 1st**

- ***Did not collect complete primary data ASDHS wanted (inundation, runup)***
  - ***USGS rtn Nov 5-12 to gap-fill, Jan 2012 rpt***
  - ***NSF team findings to GoAS Dec 14 (2.5 months later)***


USGS
science for a changing world

The Limit of Inundation of the September 29, 2009, Tsunami on Tutuila, American Samoa

By Bruce E. Jaffe, Guy Gelfenbaum, Mark L. Buckley, Steve Watt, Alex Apotsos, Andrew W. Stevens, and Bruce M. Richmond

Open-File Report 2010-1018

U.S. Department of the Interior
U.S. Geological Survey

- **2011-2012: PRiMO – Post-Tsunami Survey Protocol**

US PROTOCOL PROGRESS

Post-Sept 2009 - Poorly-coord surveys, Incompl data share

1. **US POST-TSUNAMI PROTOCOL** - Working Group formed, American Samoa, PRiMO mtg, Mar 2011
2. **SCIENTIST FEEDBACK** – positive, Fall AGU Dec 2011
3. **AMER SAMOA GOVERNOR** – listened, welcomed, Jan 2012
4. **NTHMP COORDINATION COMM -** endorsed Feb 2012
5. **COASTAL / RISK MGMT FEEDBACK** – positive, PRiMO, Mar 2012
6. **FEDERAL WG ON DISASTER IMPACT ASSESSMENT PLANS** – *incl tsunami annex, OFCM, WG/DIAP, Mar 2012 continuing*
7. **NSF RAPID RESPONSE WORKSHOP** - All-hazards scientist recommendations to NSF, Jun 2012
8. **NSF NEES PROGRAM MGRS, NIST** – funds research DCL, Jun 2012
9. **FEMA HQ RESPONSE** - *NRF, pre-cleared missions, Jun 2012 cont*
10. **NTHMP MES / RISK WS** – MES, NTHMP Strategic Plan, Jan 2013
11. **US PROTOCOL PLAN** – journal article, Nat Hazards, 2014
12. **STATE PLANS, TECHNICAL CLEARINGHOUSE** – *2015 continuing*

U.S. Post-Tsunami Science Survey Protocol Proposal

Laura Kong (NOAA), Michael Shulters (USGS), Rick Wilson (CA GS), Kevin Richards (HI CD),
Gen Tamura (FEMA), Edward Young (NOAA), Adam Stein (NOAA), Chris Chiesa (PDC), Paula Dunbar (NOAA), Jesie Huart (NOAA)

PRiMO
PACIFIC RISK MANAGEMENT 'OHANA

NTHMP

WHY IS A PROTOCOL NEEDED?

Post-tsunami scientific field surveys are critical for improving the understanding of tsunamis and developing tools and programs to mitigate their effects. After a destructive tsunami, international, national, and local tsunami scientists need to gather information, much of which is perishable or degrades significantly with time. An influx of researchers can put stress on State and Local Governments already overwhelmed by humanitarian response to the disaster and by the demands of emergency management and other support agencies

A Protocol that is known about and respected by all stakeholders will ensure that a coordinated and comprehensive damage assessment is conducted in a responsible, respectful, and efficient manner to support emergency response, short-term recovery, long-term planning, and importantly, the fundamental tsunami research still needed to improve risk assessments and implement more effective mitigation measures. Our collective, collaborative efforts will then reach our customers, the affected population, in more meaningful and timely ways.

The US Protocol will follow from the principles and guidance provided by the international UNESCO IOC Post Tsunami Field Survey Guide (2nd edition) to be published in 2012.

Photo: Associated Press

WHAT IS PRiMO?

PRiMO, Pacific Risk Management O'hana, is a network of partners committed to enhancing the resilience of Pacific Islands through risk management. PRiMO recognizes the

PROTOCOL FOR POST-TSUNAMI FIELD SURVEYS

PROTOCOL COMPONENTS:

1. Contact designated event coordinator for situational awareness
2. Obtain Official survey badge
3. Coordinate with others
4. Include local experts/officials on your team
5. Check-in onsite
6. Heed all safety regulations
7. Be prepared to answer questions by locals
8. Prepare and provide survey/data collection plan to include regular field reports
9. Check-out, and provide out-briefing to response officials
10. Provide final data immediately to support response and recovery (3-12 months)

QUESTIONS FOR PARTICIPANTS

Would you readily share post-disaster, field data with impacted communities?

What would you want to see added/changed to field Protocol (provided above)?

Is an international/national organization needed to oversee field Protocol? Who would you suggest?

Would you like to be involved with developing formal field Protocol? If so, please provide contact info.

NTHMP POST-TSUNAMI INVOLVEMENT

The National Tsunami Hazard Mitigation Programs (NTHMP) is a partnership sponsored by the National Oceanic and Atmospheric Administration (NOAA) involving relevant Federal agencies and coastal States/Territories. The NTHMP develops and coordinates effective tsunami hazard reduction efforts in the United States over the long term.

The NTHMP will appoint a representative to carry out their post-event response plan, which could incorporate support for this Protocol. Activities of the NTHMP and its representative will include:

1. Provide support to the International Tsunami Information Center (ITIC) and the impacted states/territories to help facilitate coordinated and efficient response activities.
2. Provide support to impacted states to ensure their needs are met by the field response teams, specifically sharing data that are acquired. This field data may include collection of physical evidence of the tsunami, impacts to structures, information about response effectiveness, and sociological observations about public response. Other data collected, such as post-event modeling, will also be collected by the NTHMP representative and provided to the impacted state(s) and NTHMP member.
3. Work closely with the ITIC, PRiMO, FEMA, field response teams, and other participating organizations (National Science Foundation, Earthquake Engineering Research Institute, etc.) to address NTHMP needs, evaluate gaps in data collection exist, and help advise how to fill these gaps.

KEY PARTNERS

PHYSICAL SCIENTISTS/ENGINEERS: need quick access to collect ephemeral data
SOCIAL SCIENTISTS: interviews with public and officials essential to assessing lessons
EFFECTED COMMUNITIES/POPULATION: relying on help to assure a quick recovery
EMERGENCY RESPONDERS: need immediate info to assist in response /recovery

Photos: Rick Wilson (top and bottom left), Vasily Titov (top right), PMEL (bottom right)

PARTNER/COMMUNITY BENEFITS

EFFICIENT LOGISTICS: a speedy, coordinated response
BETTER QUALITY DATA: helping each other
SAFETY: protecting the community and the responders
RESPECT: understanding everyone's role and responsibility
COORDINATION: maximizing resources
COMMUNICATION: staying in touch with all of the partners
SITUATIONAL AWARENESS: what, when, where?
ACCOUNTABILITY: everyone is responsible for their actions
RECOVERY: recognition of and assistance with specific needs of community
RESILIENCY: preparing communities to reduce impact from future disasters

Photo: Lori Dengler

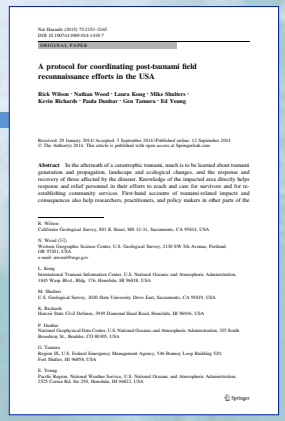
Science Stakeholders Fall AGU meeting, 2011

NTHMP Strategic Plan 2013-2017

Performance Measures

Outcome	Strategy	Measure	Milestone	Execution
Successful execution of NTHMP tsunami mapping, modeling, mitigation, and education efforts.	Establish an accessible web-based repository for NTHMP-related products commensurate with current and expected budget limitations.	Percentage of NTHMP- related products available through web-based repository from 0% in 2013 to 90% by 2017.	Develop plan to implement repository by end of 2013.	NTHMP Chair
			Web-based repository operational by end of 2015.	
	Strengthen NTHMP subcommittees to execute this Strategic Plan	90% of action items from subcommittee meetings will be completed within one year of being assigned.	Conduct at least one in-person meeting per year for each subcommittee.	NTHMP Chair/All subcommittees
			Update NTHMP Rules of Procedure and subcommittee Terms of Reference by end of 2013 and bi-annually thereafter.	
	Conduct periodic external review of the NTHMP.		Conduct external review of program in 2017.	NTHMP Chair
	Support a research effort to develop U.S. tsunami risk assessment methodologies		Provide expertise to the FEMA HAZUS tsunami module development as requested.	NTHMP Chair/All subcommittees
	Support and implement post-tsunami event protocol for U.S. states and territories.		Develop plans for implementing post-tsunami protocols for field teams.	MES/MMS

US Protocols



A protocol for coordinating post-tsunami field reconnaissance efforts in the United States

1-NOAA, 2-USGS, 3-California, 4-Hawaii, 5-FEMA

Rick Wilson3, Nathan Wood2, Laura Kong1, Mike Shulters2, Kevin Richards4, Paula Dunbar1, Gen Tamura5, Ed Young1

Protocol components to guide post-tsunami science surveys

Pre-field planning

1) Contact event coordinator
2) Prepare and share field plan
3) Obtain official survey badge
4) Include local experts on your team
5) Coordinate and communicate with others

Field procedures

6) Follow check in procedures
7) Heed all safety regulations
8) Be prepared to answer questions of response personnel, officials, and survivors

Exiting the field

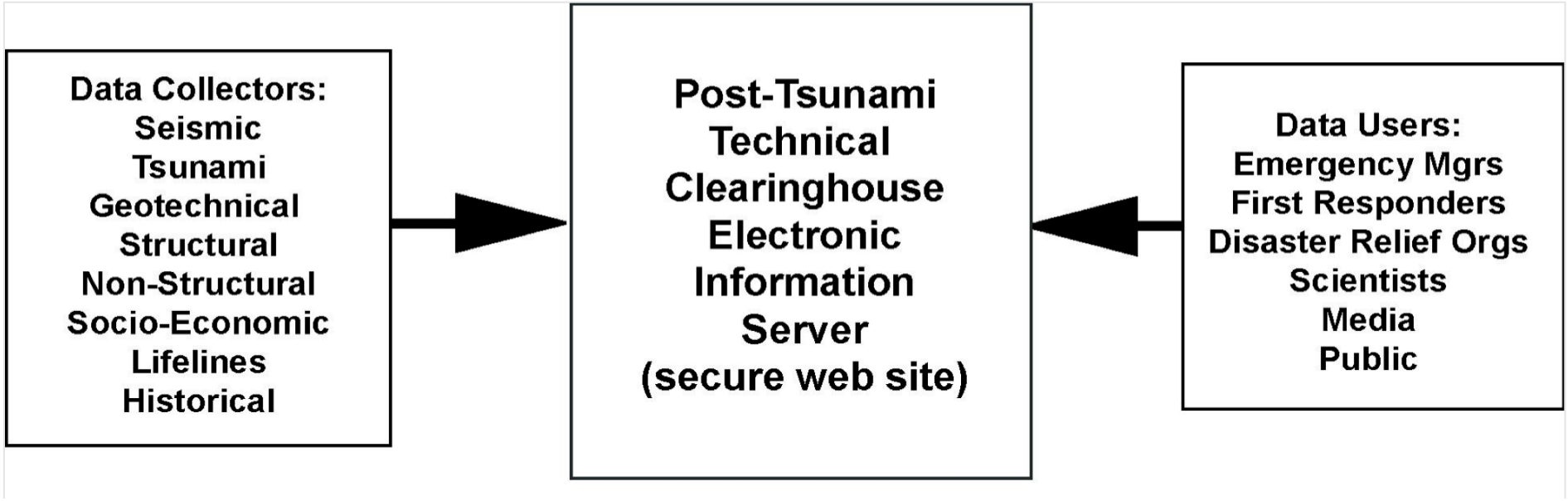
9) Follow check-out procedures and provide out-briefings
10) Provide final data to the appropriate users in a timely fashion

Fig. 1 Schematic of the primary components in a US protocol for post-tsunami science surveys. Additional details on similar elements from an international and field-researcher perspective are noted in UNESCO (2014)

http://download.springer.com/static/pdf/991/art%253A1 0.1007%252Fs11069-014-1418-7.pdf?auth66=1423752672_2c03e796a43b7df41df9fe364c1321c2&ext=.pdf

INFORMATION DATA SHARING - GIS

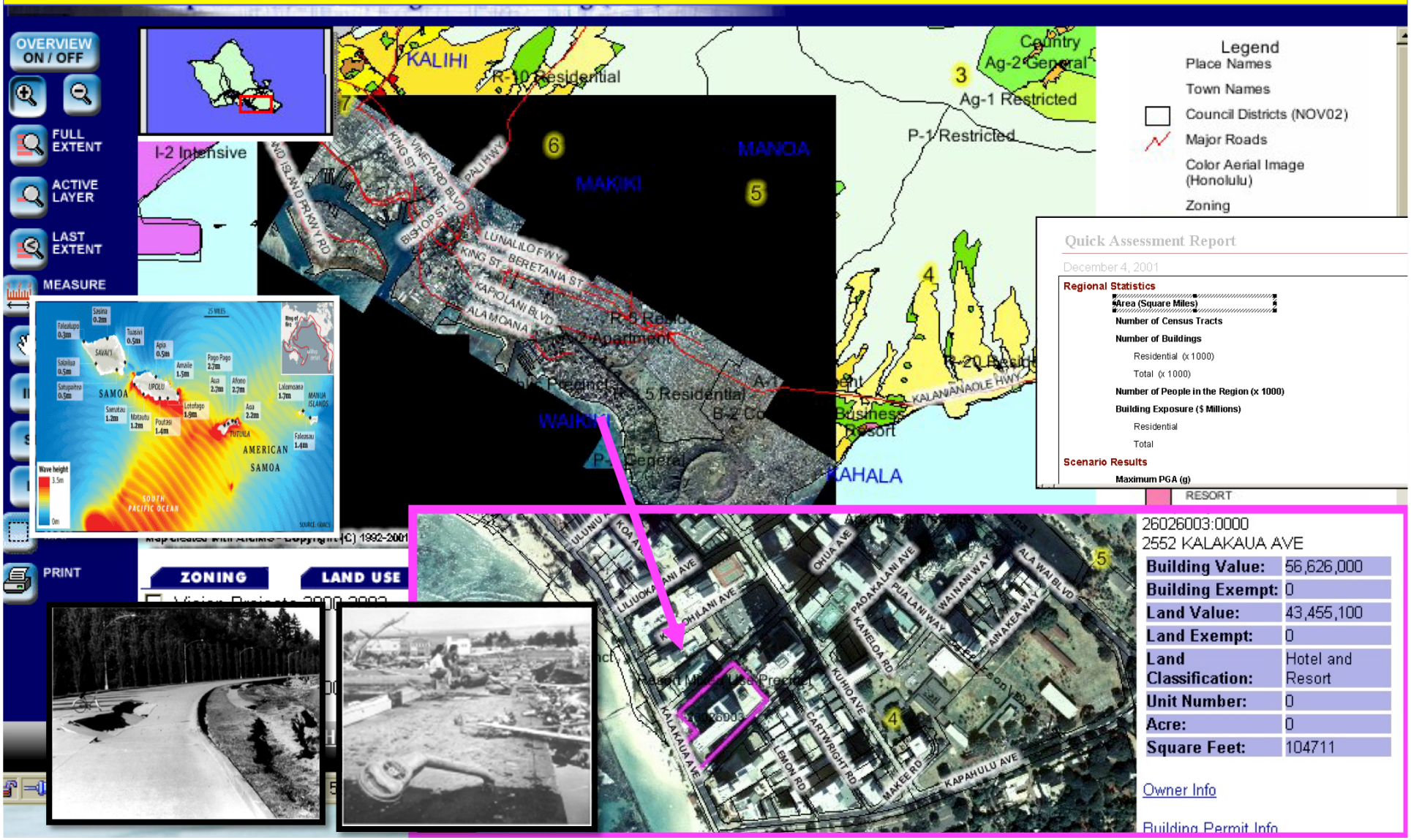
- Needed during Surveys
- Essential post-Survey - collecting, compiling, sharing
  - Secure and Public Sites
  - Data collectors can post data
  - Data Users can access data; Public site for broad sharing
  - User-friendly, Simple-to-create graphics
  - Useful Data Summaries for Reports



Tsunami Technical Clearinghouse (GIS)

Pre-loaded data layers + Daily field reports

User-selectable, multi-layer data display



FEMA - RESPONSE - Joint Field Office Coordination

- **Goal: Embed PTS in EM / ICS response structure**
- **Goal: Pre-cleared Mission SOW (for post-tsunami data collection by USG and/or university scientists)**
- **Goal: Tsunami Technical Clearinghouse (EQ model)**

Scope of Work
Tsunami Recovery Data - Hazard Mitigation Technical Support
FEMA-###-DR-##
Coastal Tsunami Runup (High Water Mark)
and Inundation Data Collection

BACKGROUND

(Introduction to this section should describe magnitude of current event which co include wave heights, spatial and temporal extent of impact, and if applicable ot historical events for the area. Information and wording on the event can usually found in the Incident Report in the SITREP.)

(For Example) On , Tsunami made landfall on the coast between and . This tsunami caused significant inundation and ru damages inland and along the coast in the State(s) of .

This scope of work has been completed to perform the Contract Task(s) Coastal Tsuna Runup (High Water Mark) and Inundation Data Collection. (Other Tasks may be inserted here and the Purpose and Contract Task fields may be copied from the appropriate documents. The Task Name should also be inserted into the title block above) in accordance with the Purpose and Contract Task sections below.

Scope of Work
Tsunami Recovery Data - Hazard Mitigation Technical Support
FEMA-###-DR-##
Coastal Analysis

BACKGROUND

(Introduction to this section should describe magnitude of current event which could include wave heights, spatial and temporal extent of impact, and if applicable other historical events for the area. Information and wording on the event can usually be found in the Incident Report in the SITREP.)

(For Example) On , Tsunami made landfall on the coast between and . This tsunami caused significant inundation and runup damages inland and along the coast in the State(s) of .

This scope of work has been completed to perform the Contract Task(s) Coastal analysis, (Other Tasks may be inserted here and the Purpose and Contract Task fields may be copied from the appropriate documents. The Task Name should also be inserted into the title block above) in accordance with the Purpose and Contract Task sections below.

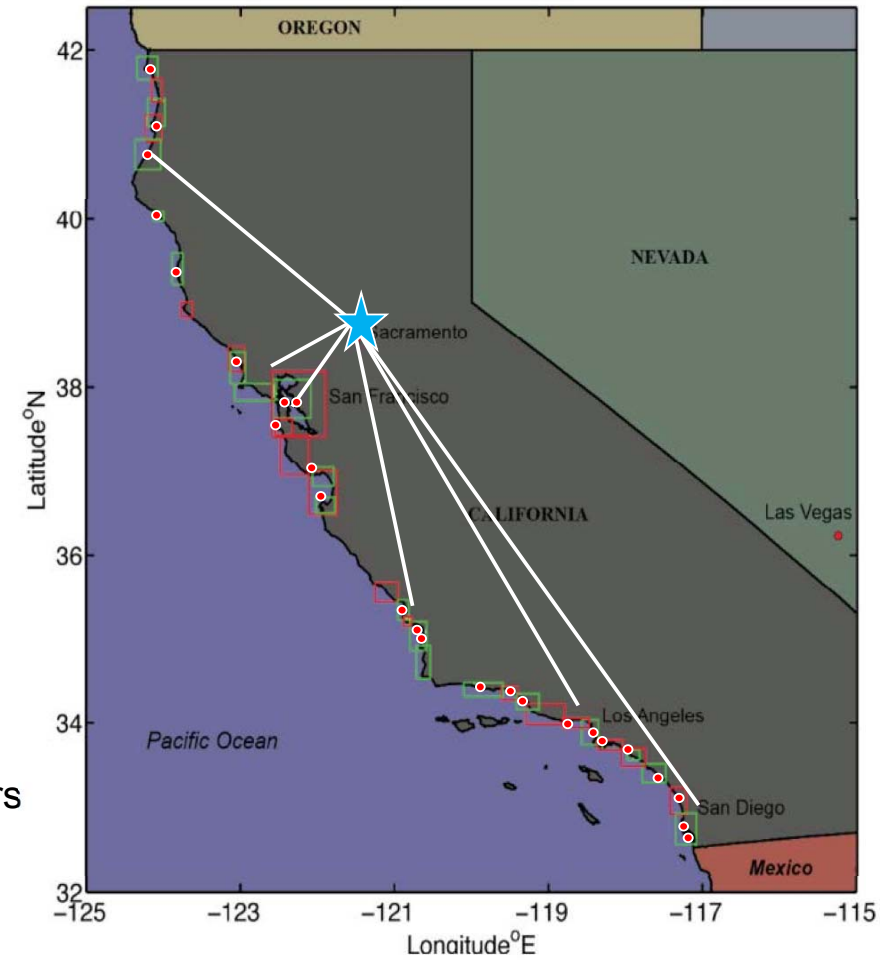
State Plans & Progress

- Hawaii Plan
- California Plan

California Geological Survey, EMA

Pre- and Post-Tsunami Field Team and Information Clearinghouse

- **During tsunami**
  - Developed tsunami observer program
  - Real-time field data collection and clearinghouse
  - Real-time instrument network
  - Real-time video camera network
- **After tsunami**
  - Collect perishable post-tsunami data
  - Establish post-event information clearinghouse
  - Provide observations of hazardous conditions and damage to CalOES, others



CGS CALIFORNIA GEOLOGICAL SURVEY

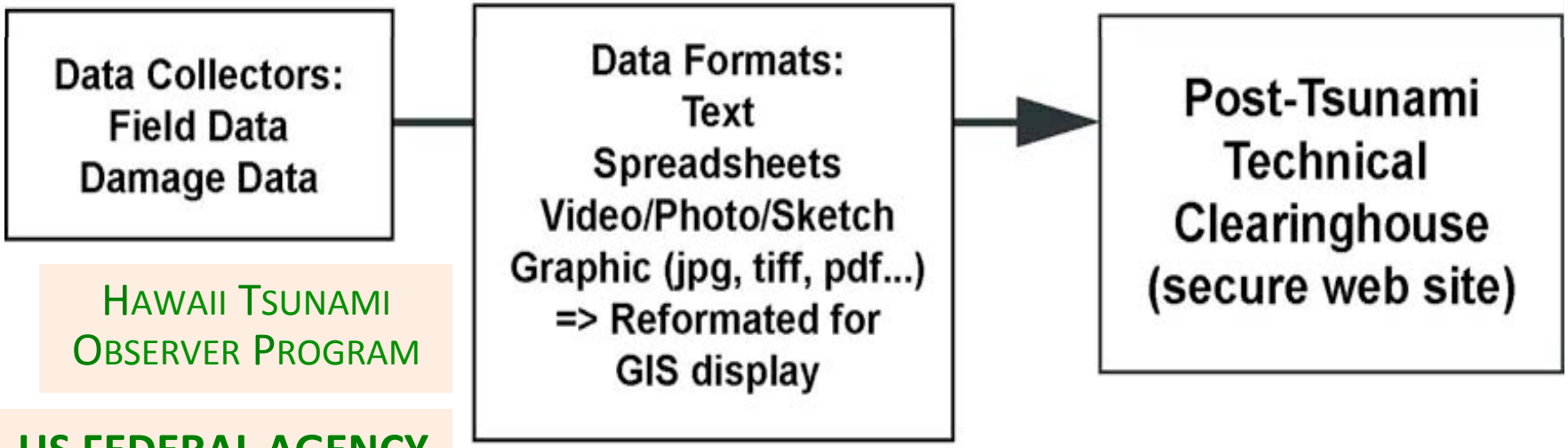
Cal OES GOVERNOR'S OFFICE OF EMERGENCY SERVICES

THE NATIONAL TSUNAMI HAZARD MITIGATION PROGRAM (U.S.)

Hawaii EMA – ITIC

Science Data Supporting Emergency Response

HT-POP COORDINATOR
LIAISE SCIENCE – EMERGENCY RESPONSE



HAWAII TSUNAMI OBSERVER PROGRAM

US FEDERAL AGENCY PROTOCOL

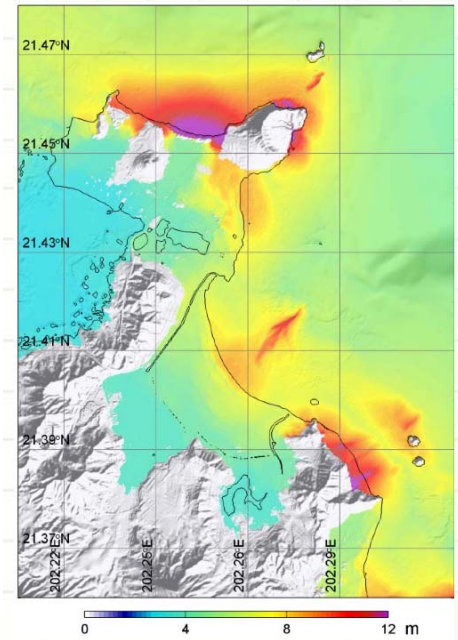
INTERNATIONAL SURVEYS (ITST)

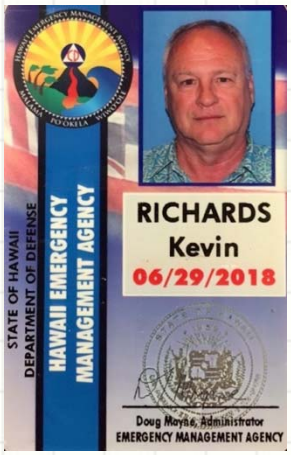
Long-term Data Archive
National Center for Environmental Information
(NOAA NCEI, formerly NGDC)

Coordinated Management – Build from ITST

HT-POP COORDINATOR – ITIC

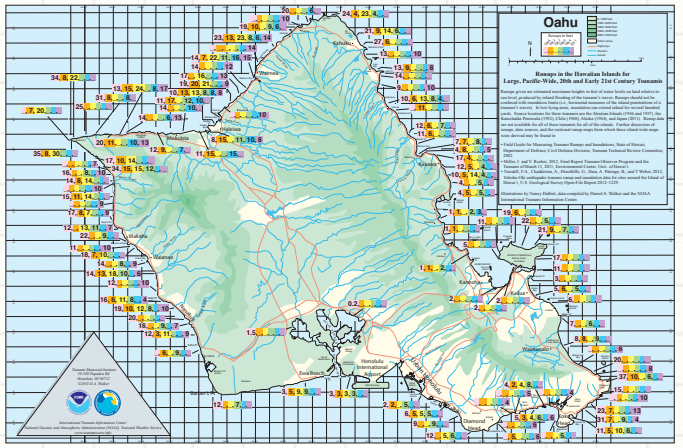
- Pre-Field Planning
  - Local Experts / Guides
- Field Procedures (HTOP, external)
- Exiting the field
  - Data sharing, Report, Archiving






'Tidal Waves' Called Misnomer; Science Terms Them 'Tsunamis'

Hamakua Is Spared By Waves



USG POST-TSUNAMI PROTOCOL

1. COORDINATION

- Federal
  - NOAA – NWS ITIC / NTWC-PTWC / WCM, OAR Tsunami, NESDIS NCEI, NOS CO-OPS / OCM
  - USGS – NEIC, CMGP Tsunami (Coastal and Marine Geology), EROS Satellite (Earth Resources Observation and Science Center)
  - Other ?
- State / Local (EMA, Civil Defense)
- University research, NSF NHERI Rapid Response
- Professional Orgs – ASCE, EERI
- International

2. TSUNAMI TECHNICAL CLEARINGHOUSE

Thank You

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International Tsunami Information Center (ITIC)
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