

## Hazard maps and mitigation recommendations

### Tsunami Hazard Map:

The Tsunami Hazard Map shows the estimated tsunami inundation zone as estimated from the FEMA National Flood Insurance Rate Maps. The "VE zone" or high velocity wave action zone is equated with the tsunami inundation zone. The historical record in the Mitigation Plan shows that Pago Pago Harbor and other coastal areas of American Samoa have experienced tsunamis in the past.

### → Mitigation Plan recommendation:

Since critical facilities are located in or near mapped tsunami zones, run scientific tsunami models to further define the tsunami hazard zone and estimate the potential economic and social impacts for American Samoa.

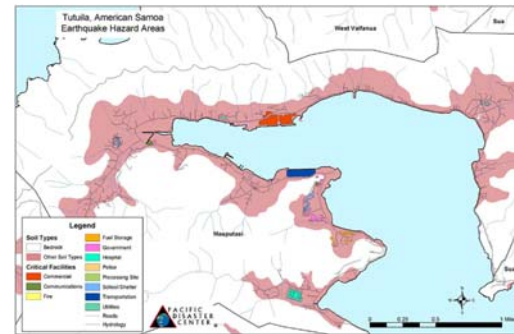
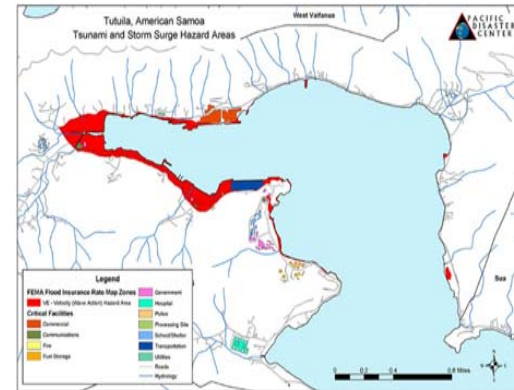
### Earthquake Hazard Map:

All of American Samoa has been subjected to strong-to-very-strong ground shaking from historical earthquakes. However, for any given earthquake, shaking may vary greatly for different areas of the islands. These relative ground-shaking intensities are designated as "low," "medium," and "high" hazard shaking areas. However, since there are no seismic recording stations in American Samoa, the actual ground motion for earthquakes are not presently recorded.

Areas of mapped bedrock are designated as "low" shaking hazard criteria (white). The earthquake hazard map has grouped all soil-type areas together as a "medium" shaking hazard criteria (red), differentiating these areas from known bedrock geology. Areas of "high" shaking hazard criteria are areas of non-engineered fill and reclaimed lands in low-lying areas. These relatively "high" shaking hazard areas are not shown on the map because these areas are only anecdotally known—they have not been mapped. Following an earthquake, areas of fill are often subjected to the strongest shaking, thus, the assignment of "high" hazard criteria in the Mitigation Plan.

### → Mitigation Plan recommendations:

- Map areas of known fill to define designated "high" ground shaking criteria in order to ensure that future development considers appropriate mitigation measures to minimize this known risk and
- Deploy seismic recording stations in low, medium, and high shaking hazard areas in order to understand actual ground shaking from future earthquakes in American Samoa.



*PDC gratefully acknowledges the American Samoa Government who granted us permission to publish the maps represented in this document.*



## Multi-Hazard Mitigation Planning

### PDC creates Mitigation Plan for American Samoa

In 2003, the Pacific Disaster Center (PDC) created a Natural Hazards Risk and Vulnerability Assessment (Assessment) as part of the American Samoa Hazard Mitigation Plan (Mitigation Plan) for the Territory of American Samoa. The project was completed in partnership with the University of Hawai'i, the American Samoa Government, and industry decision makers.

The Mitigation Plan is in compliance with guidelines established by the Federal Emergency Management Agency (FEMA) and meets the requirements of the Federal Disaster Mitigation Act of 2000, enabling American Samoa to receive federal assistance in the event of future natural disasters. The Mitigation Plan enables American Samoan officials to comprehensively plan long-range disaster mitigation efforts, thereby saving lives and reducing property losses.

As a result of the completion of the Mitigation Plan and the planning process, American Samoa has been awarded \$3.7 million by FEMA to complete its two highest priority hazard mitigation projects identified in the Mitigation Plan.



ABOVE: The picturesque Pago Pago Harbor area is the commercial and government center of American Samoa. It is also **vulnerable to six natural hazards** assessed in the American Samoa Hazard Mitigation Plan: tropical cyclones, earthquakes, floods, landslides, tsunamis and droughts.

LEFT: Pacific Disaster Center's Chief Scientist, Stan Goosby, briefs government officials and the public about six potential hazards that could affect American Samoa.

- Decision and Policy Support
- Institutional Capacity Development
- Risk and Vulnerability
- Security and Sustainability

*"PDC continues to develop new institutional capabilities to support emergency managers in our joint efforts to safeguard and sustain communities-at-risk."*

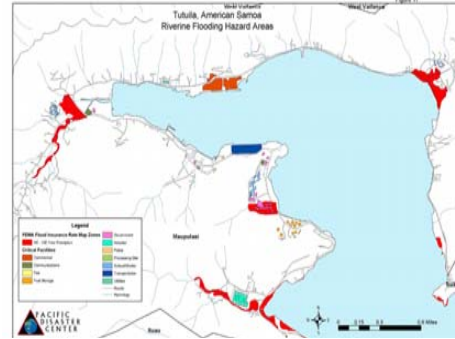
- Allen Clark, Executive Director, PDC

## Multi-hazard mitigation planning

### Phase I: Risk and Vulnerability Assessment

During Phase I of the project, PDC led a multiagency team to develop a comprehensive Assessment to determine American Samoa's risk from natural hazards. For the first time, remote sensing data was incorporated into a Geographic Information System (GIS) to analyze the vulnerability of critical facilities exposed by six dominant natural hazard threats:

- Tropical Cyclones
- Landslides
- Earthquakes
- Droughts
- Floods
- Tsunamis



*Tutuila, American Samoa Riverine Flooding Hazard Areas map of Pago Pago Harbor. Flood hazard areas for Pago Pago Harbor are based on FEMA Flood Insurance Rate Map Zones.*



*Flood damage included the island's only hospital, LBJ Hospital, during a May 2003 storm.*

### Phase II: Mitigation Plan Development

Phase II of the project created the Mitigation Plan, which required the active participation of local government officials to identify, assess, and select mitigation measures and prioritize projects to protect critical facilities and infrastructure.

Mitigation projects were then prioritized from the hazard and risk data compiled from the Phase I Assessment. PDC's digital hazard maps enabled local officials to quickly and easily view inundation zones from tsunamis and storm surges, riverine flooding, landslide risk, and levels of earthquake shaking (see sample hazard maps).

### PDC Partnerships

PDC compiled and analyzed data previously not gathered in American Samoa to assist in mitigation planning. PDC created hazard risk maps by building upon the work of the American Samoa GIS Users Group, the American Samoa Power Authority, and the Department of Commerce. PDC also utilized other sources of data including FEMA Flood Insurance Rate Maps and U.S. Department of Agriculture reports. PDC analysts and American Samoan officials have assessed risk in the Mitigation Plan by estimating the cumulative replacement costs for critical facilities that are vulnerable to the six hazards.

### PDC Composite Multi-hazard GIS Map

In addition to these individual hazard maps, PDC created a composite "multi-hazards" GIS map showing the intersection of multiple hazard layers depicting moderate or high risk. For example, the multi-hazards map showed the main hospital in both a high-risk flood zone and a high-risk landslide zone, enabling officials to visualize potential impacts and analyze what mitigative measures would be needed.

### May 2003 Severe Floods and Landslides

Local understanding for the need for mitigation planning was heightened when American Samoa sustained devastating floods in May 2003, just as the Assessment was completed.

Record-level rainfall caused flooding to critical facilities, including the hospital, and caused more than 20 landslides that killed at least five people. All of the major landslides and floods coincided with locations mapped as "high hazard" zones.

As a result of the flooding event, the American Samoa Hazard Mitigation Council has identified its highest priority mitigation project to be protecting the hospital.



*In May 2003, American Samoa received ten inches of rain within three hours, causing several landslides that resulted in at least five deaths and severe property damage.*

### Outcomes of Planning Process

Creating the Mitigation Plan resulted in several positive outcomes, including:

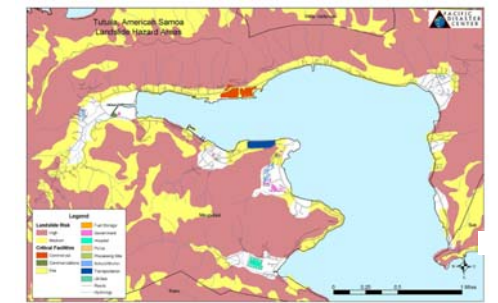
- Establishment of the American Samoa Hazard Mitigation Council;
- Historical hazard and loss estimation research;
- GIS mapping of hazard layers;
- GIS mapping of critical facilities;
- Increased public awareness about mitigation planning; and
- A sustained planning process for American Samoa.

### Community-Based Risk Management

PDC's successful development of the Mitigation Plan was made possible by a collaborative approach to working with a broad spectrum of local agencies.

The support and advocacy by the American Samoa government for the planning process ensures that mitigation planning will continue as a long-term policy.

Since the hazard mitigation planning process included community involvement, as well as extensive exposure through local television, radio, and newspapers, the residents of American Samoa are more likely to continue their support and participate in disaster mitigation efforts.



*Landslide Hazard Areas map of Pago Pago harbor, showing landslide risk.*