

REFERENCE · COMPANION EDITION

HAWAI'I TSUNAMI

Operational Compendium & Source Register

*Aleutian earthquake
Detection, alerting, and evacuation across four counties*

Written by Jerry Perone

≈ 3,700 km
nearly 5 hours to cross—
about 4 hours to move

205 verified sources · 1947–2026

FEDERAL · STATE · FOUR COUNTIES · SCIENTIFIC RECORD

Compiled by
JERRY PERONE

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REFERENCE • TIER 1

Hawai'i Tsunami Operational Compendium

Detection, alerting, and evacuation
across four counties

OPERATIONAL CORE

205 verified sources • 1947–2026

Federal • State • Four counties • Scientific record

Compiled by Jerry Perone

25 August 2026

How it was built, and what to trust

Four parallel research passes surveyed the federal, state, county, and scientific-historical record. They returned 219 source entries; twelve documents had been found independently by two or three passes, leaving 205 unique sources spanning 1947 to February 2026.

This is **Tier 1, the operational core**: the alert thresholds, the authority chain, the zone system, the county divergences, the event record, and the 2025 after-action findings. No source document is reproduced in full. Each is represented by the data it alone holds.

Every factual claim carries a bracketed source identifier resolving to Appendix A. Contradictions in the source record are reported rather than reconciled. Documents that are known to exist but are not published are listed in Appendix B with the agency to ask.

- [F-00]** Federal source — NOAA, PTWC, NWS, FEMA, USGS, FCC, GAO, Congress
- [S-00]** State of Hawai‘i source — HI-EMA, HDOT, DLNR, DOE, DOH, statute, state GIS
- [C-00]** County source — Honolulu DEM, Hawai‘i County Civil Defense, MEMA, KEMA
- [H-00]** Scientific and historical record — field surveys, journals, catalogues, archives

Caution. Nothing in this document substitutes for the official guidance of the Pacific Tsunami Warning Center, the Hawai‘i Emergency Management Agency, or your county emergency management agency. Entries flagged *unverified* in Appendix A were confirmed by citation but could not be fetched directly, and should be obtained before formal quotation.

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Orientation

- 0.1 What this document is
 - 0.2 Ten things that decide the outcome
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0.1 What this document is

This is a working reference on how a tsunami is detected, announced, and evacuated in the Hawaiian Islands. It was compiled by surveying 205 verified sources — federal directives and statutes, State of Hawai‘i plans and administrative material, the published instruments of all four county emergency management agencies, and the scientific and historical record — and extracting from each one the data it alone holds.

It is not a summary of the tsunami hazard. It is a record of what the governing documents actually say, who they bind, and where they disagree with each other.

Three habits run through it. Every factual claim carries a bracketed source identifier keyed to the register in Appendix A, so any statement can be traced to the document it came from. Contradictions in the source record are reported rather than smoothed — where two official publications give different numbers for the same thing, both appear. And the documents that should exist but are not published are listed in Appendix B, with the agency to ask, so that the holes in the record are visible rather than silently absent.

0.2 Ten things that decide the outcome

Everything in this document elaborates one of the following.

One. Travel time is the whole problem. A tsunami generated on the south flank of Hawai‘i Island can reach Hilo Bay four to five minutes after the earthquake — faster than any warning can be issued [F-49]. The eastern Aleutian megathrust, the source the extreme evacuation zone was drawn for, gives four to five hours, the least warning of any distant source [F-46]. Chile gives fourteen to fifteen [H-47]. The response that is correct in one of those cases is fatal in another.

One spoke per source region • radius = travel time to Hawai‘i

FIGURE Travel time to Hawai‘i by source region. One spoke per source; radius is hours of warning. A local rupture is at the centre — four to five minutes to Hilo Bay.

Two. Three governments share the sequence, and each can only do its own part. The federal Pacific Tsunami Warning Center issues the official warning for Hawai‘i. The Hawai‘i Emergency Management Agency coordinates the statewide sounding of the first siren. Each county is responsible for evacuations and for issuing the all-clear [F-45]. No single agency owns the sequence end to end.

Three. The agency that owns the sirens cannot order an evacuation, and the agencies that order evacuations own no sirens. HI-EMA operates the statewide outdoor warning siren system under its authority to control warning devices [S-16][S-21]. The counties decide that an evacuation is necessary and order it [F-45]. During the July 2025 event on Maui, the state — not the county — controlled siren activation, which is not how the county’s own public materials read [C-35].

Four. Compulsory evacuation does not exist in Hawai‘i until someone signs a proclamation. Section 127A-12 confers everyday powers including *non-compulsory* evacuation. Mandatory evacuation lives in §127A-13, which unlocks only after a governor or mayor proclaims an emergency under §127A-14 — and that proclamation terminates automatically sixty days after issuance [S-20][S-21][S-22].

Five. "Extreme Tsunami Warning" is not a federal alert level. The Pacific Tsunami Warning Center issues four products: Information Statement, Watch, Advisory, Warning [F-06]. The extreme tier printed as a fifth level in every county brochure is a Hawai‘i map product laid over an ordinary Warning [C-22][C-29][C-40]. A resident hearing a Tsunami Warning on the radio has to already know which zone they are standing in.

Six. The mapped zone is a stated minimum, and it does not model a local tsunami at all. The state's own metadata says both things plainly: the evacuation zone is a guideline and should be considered the minimum safe evacuation distance, and the maps do not consider the destructive effects of a locally generated tsunami [S-25] [H-53]. Strong shaking is therefore its own instruction, independent of any zone line.

Seven. Where there is no reachable high ground, the published rule is vertical. Fourth floor or higher, in a reinforced-concrete building of at least ten stories [S-32] [C-01] [C-03]. Waikīkī has four inland routes for more than fifty thousand people [C-53]. Private high-rises are under no legal obligation to shelter the public [C-15], though state law grants immunity to private shelter owners, which is what makes the arrangement workable at all [S-19].

Eight. Four counties teach three different meanings for one shared siren system. On Maui, a siren sounding means evacuation is necessary and widespread flooding is expected [C-29]. On Hawai'i Island and Kaua'i, the brochures teach that each ring equals one hour of tsunami travel time [C-22] [C-40]. On O'ahu, the tone means tune in to radio or television, not evacuate [C-07]. Residents and visitors move freely among the islands; the instructions do not.

Nine. Most people who evacuated in July 2025 did not need to. Honolulu's after-action report — the only one of the four counties published — found that 92 percent of the vehicle trips made during the evacuation were unnecessary, that department staff ran the response on institutional knowledge rather than documented protocols, and that the City Emergency Operations Plan contained no tsunami-specific protocols at all [C-12] [C-60].

Ten. Comprehension, not coverage, is the binding constraint. In the foundational Hawai'i survey, only 13 percent of residents understood what the sirens meant, and length of residence in Hawai'i showed no correlation with understanding [H-57]. One in nine residents has limited English proficiency [S-42], and the 2026 national alerting analysis names multilingual communication as a specific Hawai'i gap [F-20].

0.3 How to read the citations

Every bracketed identifier resolves to a numbered entry in Appendix A, which gives the full title, issuing body, publication date, and URL of the source, together with the unique content that earned it a place in the register.

The prefixes are: **F** for federal sources, **S** for State of Hawai'i sources, **C** for county sources, and **H** for the scientific and historical record.

Entries flagged in Appendix A as *unverified* were confirmed by citation but could not be fetched directly at time of compilation, and should be obtained before formal quotation. Entries flagged *superseded* appear in this document only where the change itself is the point, and are labelled as such in the text.

0.4 What this tier omits

This is the operational core. It carries the alert thresholds, the authority chain, the zone system, the county divergences, the event record, and the 2025 after-action findings — the material needed to get the facts right.

It does not reproduce any source document in full, and it does not carry the deeper scientific apparatus: the modelling methodology papers, the landslide-tsunami literature beyond a summary, the superseded plan versions except where a change is the point, or the full 205-entry bibliography. Appendix A carries the operational subset. The complete register is maintained separately.

The Warning System

- 1.1 Three governments, one wave
 - 1.2 Federal — detection, forecast, and the alert decision
 - 1.3 State — the State Warning Point and the siren system
 - 1.4 County — the evacuation order and the all-clear
 - 1.5 Where the chain breaks
-

1.1 Three governments, one wave

Three levels of government act on a Hawai‘i tsunami, and each holds a power the other two do not. The federal government detects the earthquake, forecasts the wave, and decides what alert level to issue. The state receives that alert, staffs the round-the-clock communications point that carries it, and physically activates the sirens. The counties decide that people must move, order them to move, tell them where to go, open the places they go to, and decide when they may come back [F-45] [S-01] [S-44].

One federal page states the split in a single passage. NOAA's International Tsunami Information Center writes that "the PACIFIC TSUNAMI WARNING CENTER (PTWC) provides the official tsunami warnings for the state of Hawai‘i"; that "EACH COUNTY is responsible for TSUNAMI EVACUATIONS, and issuing the ALL-CLEAR"; and that "the Hawai‘i Emergency Management Agency (HI-EMA) coordinates the statewide sounding of the first siren. Subsequent siren soundings are the responsibility of each County" [F-45]. That formulation — federal alert, state first siren, county evacuation and all-clear — is the cleanest statement of the Hawai‘i chain in the public record [F-45].

The split is not an accident of organisation charts. It follows the general emergency-management principle the state itself states — that all incidents begin and end locally, and county authorities maintain operational control [S-03] — grafted onto a hazard whose detection is physically impossible at the county level. No county can operate a deep-ocean buoy array; no federal agency can know which Hanalei street floods first. The seam between those two facts is where Hawai‘i's tsunami system either works or fails.

Two consequences of that split surprise almost everyone who has not worked an event.

The first is that HI-EMA owns every siren in Hawai‘i and cannot order anyone to evacuate. The outdoor warning sirens are a single state-operated system, described by the state as the largest single integrated outdoor siren warning system for public safety in the world [S-16] [C-56]. Kaua‘i Emergency Management Agency states the ownership point plainly on its own siren page: the sirens on Kaua‘i are "owned and operated by the Hawai‘i Emergency Management Agency (HI-EMA)," not by the county [C-44]. Hawai‘i County's civil defense administrator describes the same division of labour — the state agency owns maintenance, repair and replacement, while county workers handle only minor repairs such as battery replacement [C-26]. Yet HI-EMA does not order evacuations; the counties do [F-45] [S-01]. The state's own statutory powers run to alerts, warnings, notifications and the control of "any type of warning device, system, or method," not to compelling anyone to leave [S-21].

The second is the mirror image: the counties order the evacuation and own no sirens. County emergency management agencies decide that an evacuation is necessary, issue the order, produce the evacuation maps, open the shelters, and determine safe re-entry [F-45] [S-01]. They do all of that across infrastructure the state owns and, in at least one documented case, the state actually operated during the event [C-35].

FIGURE The authority chain. The federal government issues the warning, the state sounds the first siren, the county orders the evacuation and gives the all-clear.

A DISTANT-SOURCE EVENT, STEP BY STEP

A distant tsunami is the case Hawai‘i plans for, because it is the case in which the warning system has time to work. The sequence below names who acts and on what trigger.

Detection. The United States Geological Survey's Advanced National Seismic System locates the earthquake and computes its magnitude. Hawai‘i is one of seven ANSS regions, and the USGS Hawaiian Volcano Observatory is

the participating regional network [F-36]. Seismic parameters flow to the Pacific Tsunami Warning Center in Honolulu [F-36] [F-49].

The alert decision. PTWC evaluates and issues. For a distant Pacific source with an estimated arrival more than three hours away and a magnitude at or above 7.9, the state's own decision matrix anticipates a Tsunami Watch [S-01]; PTWC's binding federal criteria escalate to a Warning when forecast or observed wave height exceeds one metre, when widespread inundation is possible, or when the impact is unknown [F-02]. Only PTWC can issue, upgrade, downgrade or cancel a Hawai'i tsunami alert [F-45] [F-01].

Receipt by the state. The State Warning Point, a state emergency communications centre staffed 24 hours a day and seven days a week, receives the PTWC message and handles statewide communications with county emergency officials [S-44]. It exists under HRS § 127A-7 [S-19].

First siren. For a distant tsunami, siren timing is coordinated between the State Emergency Operations Center and the county EOCs, and the first siren is sounded simultaneously statewide at least three hours before the first wave [S-01]. HI-EMA coordinates that first statewide sounding [F-45].

The evacuation order. The counties decide an evacuation is necessary and order it, on the trigger of the PTWC Warning product rather than a local threshold [F-45] [S-01]. On Maui the agency itself issues the order — MEMA's own release for 29 July 2025 states that "Maui Emergency Management Agency (MEMA) ... issued evacuations via sirens, Emergency Alert System, Wireless Emergency Alert" [C-34]. On Kaua'i, KEMA issued evacuation notices while the Office of the Mayor separately issued an emergency proclamation [C-48].

Supporting closures. The Hawai'i Department of Transportation closes state roadways, bridges, tunnels, commercial harbours and airports, and posts tsunami messages on freeway variable message signs [S-05] [S-40]. The Division of Boating and Ocean Recreation begins its Level One Alert a minimum of three hours before the arrival of the first wave and establishes harbour roadblocks one hour before [S-34].

Subsequent sirens. After the first statewide sounding, sirens sound hourly, with a final sounding 30 minutes before the first wave [S-01]. Subsequent soundings are a county responsibility under the federal description of the chain [F-45] — although on Maui in July 2025 the state agency, not the county, controlled siren activation [C-35].

Cancellation and all-clear. PTWC cancels when expected or observed wave height falls below 0.3 metres on a diminishing trend [F-02]. The all-clear that actually returns people to their homes is issued by the county [F-45]. Harbours require a separate harbour-specific all-clear before any vessel returns to port [S-34], and Department of Education schools return on the authority of the school administrator, not the county or the state [S-35].

The 29 July 2025 Kamchatka event ran this sequence in full and is the only Hawai'i tsunami evacuation with a published minute-by-minute state timeline. HDOT records a Tsunami Watch at 1:25 p.m., a Tsunami Warning at 2:43 p.m., government employees released at 2:56 p.m., Kulekole Pass opened for evacuation at 3:15 p.m., Nānākuli contraflow shutdown directed at 3:30 p.m., tsunami messages posted on freeway variable message signs at 3:42 p.m., all evacuation-zone roads confirmed clear at 7:00 p.m., and an estimated first wave at 7:17 p.m. — a margin of 17 minutes [S-40]. Maui County records MEMA full activation at 2:30 p.m. and MEMA-issued evacuations at 3:22 p.m. [C-34]. Kaua'i records the PTWC warning at 2:44 p.m., KEMA evacuation notices at 3:00 p.m., sirens at 3:25 p.m., nine refuge areas opened at 4:15 p.m., coastal roads and eleven bridges closed at 6:10 p.m., and the all-clear at 11:15 p.m. [C-49]. Statewide sirens sounded at 5:10 p.m., 6:10 p.m. and 6:40 p.m. [C-61].

Note what the all-clear is not. PTWC's cancellation is a statement about wave height, issued when expected or observed height falls below 0.3 metres on a diminishing trend [F-02]. It is not permission to go home. That permission comes from the county [F-45], and it is issued separately again for harbours by DOBOR [S-34] and for schools by each school administrator [S-35]. On 29 July 2025 Kaua'i's county all-clear came at 11:15 p.m. [C-49],

and Maui lifted its evacuation orders after 11 p.m. when the National Weather Service downgraded the alert to an advisory [C-61] — several hours after the first wave. The gap between "the wave is smaller than the threshold" and "the coast is safe to re-enter" is where dangerous currents persist [S-33].

The table below fixes the exclusive powers. Each row names something that actor alone can do.

ACTOR	WHAT THEY ALONE CAN DO	TRIGGER	AUTHORITY
USGS ANSS / HVO	Locate and size the earthquake	Any seismic event [F-36]	ANSS regional network role [F-36]
NOAA PTWC	Issue, upgrade, downgrade, cancel a Hawai'i alert	Forecast/observed thresholds [F-02]	NWSPD 10-7; 33 U.S.C. ch. 45 [F-01][F-27]
HI-EMA State Warning Point	Physically activate the statewide sirens	PTWC message; local quake >M7.5 [S-01]	HRS § 127A-7; § 127A-12 [S-19][S-21]
County EM agency	Order evacuation; give the all-clear	PTWC Tsunami Warning [F-45][S-01]	County agency mandate under HRS ch. 127A [S-19]
Mayor	Proclaim a local state of emergency	Mayor is sole judge of the danger [S-22]	HRS § 127A-14; § 127A-13(b) [S-22][S-20]
Governor	Order mandatory statewide evacuation	Only after a state-of-emergency proclamation [S-20]	HRS § 127A-13(a)(7) [S-20]

NOTE

Without an emergency proclamation there is no compulsory evacuation power anywhere in Hawai'i. HRS § 127A-12 limits the everyday power to *non-compulsory* evacuation; mandatory evacuation requires § 127A-13, which unlocks only on a gubernatorial or mayoral proclamation [S-21][S-20]. Every Hawai'i tsunami evacuation order that has not been preceded by a proclamation is, in law, an instruction the public is free to disregard.

1.2 Federal — detection, forecast, and the alert decision

SEISMIC INPUT

Tsunami warning begins as an earthquake problem. NOAA's tsunami monitoring depends on the Global Seismographic Network partnership among USGS, the National Science Foundation and IRIS, and Hawai'i is one of seven ANSS regions with the USGS Hawaiian Volcano Observatory as its participating regional network [F-36]. That is the institutional link between local Hawai'i seismic detection and the earthquake parameters PTWC works from [F-36].

For local sources the seismic path is not fast enough to matter. HVO states that a tsunami generated from the south flank of the Island of Hawai'i can wrap around and reach Hilo Bay four to five minutes after the earthquake — faster than any warning can be issued — and that residents should not wait for sirens or phone alerts when strong shaking occurs [F-49]. HVO cites the 1975 M7.2 Kilauea event with maximum run-up around 14 metres and the 2018 M6.9 event as the local benchmarks [F-49].

PTWC'S STATUTORY POSITION AND AREA OF RESPONSIBILITY

National Weather Service Policy Directive 10-7 is the top-level instrument that legally divides the two warning centres. The National Tsunami Warning Center at Palmer, Alaska covers "coastal regions of all U.S. states (except Hawaii)" plus Pacific and Atlantic Canada; the Pacific Tsunami Warning Center in Honolulu covers "Hawaii and all U.S. territories" plus Pacific and Caribbean nations [F-01]. This is the only place the Hawai'i carve-out is stated as policy rather than operational practice, and Appendix A of the directive is the authoritative index of which subordinate instruction governs which function [F-01].

The statutory foundation sits at 33 U.S.C. ch. 45, §§ 3201–3208, which requires NOAA to operate two primary warning centres specifically in Alaska and Hawai'i with fail-safe backup capability, to develop uniform operational procedures across the centres, and to provide forecasting incorporating tsunami inundation models and maps [F-27]. The 2017 reauthorization names the National Tsunami Warning Center and the Pacific Tsunami Warning Center explicitly in statute, adds research to the programme's mission, and requires standardized warning products and uniform software across the centres [F-28]. PTWC's reach is Hawai'i, the U.S. Pacific territories and over 90 countries [F-25].

The two centres are also each other's backup. The statutory requirement for fail-safe backup capability between them [F-27] means the Palmer centre can issue Hawai'i products if Honolulu goes down, which is the reason the uniform-procedures and standardized-products language in both the original statute and the 2017 reauthorization is more than housekeeping [F-27] [F-28]. The 2017 Act further directs that forecast models incorporate ocean observing systems, seismic networks and satellite detection, and creates a Tsunami Science and Technology Advisory Panel [F-28]. It is the law NTHMP cites as identifying NOAA as lead agency [F-28].

THE DART NETWORK

The deep-ocean buoy array is the instrument that converts a magnitude estimate into a measured wave. The network grew from six buoys in 2001 to a full network of 39 stations in March 2008 [F-37]; GAO recorded the same 39-buoy array and noted that DART maintenance consumed roughly 28 percent of the FY2009 tsunami programme budget [F-25]. The \$17.24 million supplemental appropriation of 2005, following the Indian Ocean disaster, launched the modern expansion [F-26].

Each station operates in two modes. In standard mode it reports four spot values of estimated sea-surface height at 15-minute intervals. In event mode, triggered by an internal detection algorithm, it sends 15-second values for the first few minutes and then 1-minute averages, reverting to standard mode after four hours without further detection [F-37]. The generations differ in telemetry: DART I transmits hourly on a one-way GOES link, while DART II carries a two-way Iridium link permitting remote troubleshooting and high-resolution data retrieval [F-37].

Statute sets a floor on availability. NOAA is legally required to maintain the detection buoy array at not less than 80 percent operational capacity [F-27], a requirement restated in the 2017 reauthorization [F-28]. The floor exists because the array is expensive to keep alive: maintenance alone consumed roughly 28 percent of the FY2009 tsunami programme budget [F-25]. The post-2004 audit that preceded the expansion also recommended standardizing loss-estimation software, reducing false alarms, conducting system tests and evaluating the TsunamiReady programme — recommendations that are the origin of several present-day NTHMP requirements [F-26].

COASTAL WATER-LEVEL OBSERVATION

Deep-ocean measurement is confirmed at the coast. NOAA's Center for Operational Oceanographic Products and Services maintains an operational registry of coastal water-level gauges hardened and configured for tsunami

detection, organised by region and distinguishing active "Tsunami Capable Tide Station" from "Inactive Tsunami Tide Station" [F-39]. These gauges produce the confirmed wave-height observations PTWC uses to upgrade, downgrade or cancel a Hawai'i alert, and the associated CO-OPS 1-Minute Tsunami Water Level Data product is the higher-rate feed used during events [F-39].

FORECASTING: SIFT AND MOST

Both warning centres run the Short-term Inundation Forecasting for Tsunamis system. SIFT matches real-time DART and tide-gauge observations against a pre-computed generation and propagation database of unit-source scenarios, selects the best-fitting combination, and produces amplitude, flow-velocity and arrival-time estimates for offshore, coastal and inundation zones [F-48]. A full set of 77 high-resolution community forecast models exists, with Hawai'i among the covered regions [F-48].

The significance is procedural rather than scientific. SIFT is the mechanism by which a Hawai'i alert is upgraded or cancelled on the basis of mid-ocean measurement rather than magnitude alone [F-48]. That replaces the pre-2014 practice of triggering bulletins from magnitude bands [F-13].

WARNING LATENCY

The system has measurable and improving speed. Average time to issue a warning for distant tsunamis fell from 24 minutes in 2005 to 15.7 minutes in 2009, with 100 percent detection since 2005 [F-25]. For the February 2010 Chile event, PTWC issued its initial bulletin within 12 minutes [F-25].

The most recent Hawai'i figure is longer and reflects a different measurement point. For the 29 July 2025 Kamchatka earthquake, PTWC issued the warning one hour and 19 minutes after detection, with waves arriving just after 7:00 p.m. HST and a maximum measurement of 1.7 metres (5.7 feet) at Kahului, Maui [F-49]. The distinction that matters operationally is not between fast and slow warnings but between the two timing regimes: hours for a distant source, minutes for a local one [F-49].

Both regimes are visible in one number. The pre-2014 rulebook set PTWC a 10 to 20 minute response target after earthquake occurrence and records the April 2006 move to two watchstanders always on duty [F-13]. A centre meeting that target still cannot beat a wave that reaches Hilo Bay in four to five minutes [F-49]. For local sources the warning system is not the primary protective measure; ground shaking is, which is why both the WFO and HVO instruct residents to leave the evacuation zone on the shaking itself rather than wait for a siren or a phone alert [F-44][F-49].

WFO HONOLULU'S ACTUAL ROLE

The Weather Forecast Office in Honolulu is widely assumed to be the warning authority for Hawai'i. It is not. The WFO's own page states that PTWC "has responsibility for tsunami monitoring, and the subsequent issuance of any necessary watches or warnings," with the WFO functioning as an information conduit and educator rather than the warning originator [F-44]. The same page gives the siren rule by alert level: sirens sound for an urgent local warning and for a confirmed tsunami warning, but a watch from a distant earthquake involves "No siren sounding" [F-44]. It also carries the natural-warning instruction that falling or difficulty standing during a local earthquake is itself the cue to leave the evacuation zone immediately [F-44].

ITIC AND WHY HAWAI'I'S PUBLIC MATERIALS LIVE ON ITS PAGES

The International Tsunami Information Center is co-located with PTWC in Honolulu and carries a dual mandate under NWS Instruction 10-702. It runs tsunami training and TsunamiReady recognition support across the U.S. Pacific and Caribbean, monitors international warning activity under IOC coordination, and archives event data

with the World Data System [F-03]. That combination of domestic support and international liaison is why Hawai'i public-education products — the county TsuFacts brochures, the evacuation-zone explanations, the historical effects charts — are hosted on ITIC pages rather than on WFO pages [F-03][H-45][F-46].

NTHMP AND THE ONLY FORMAL ROUTE TO CHANGE A PTWC PRODUCT

The National Tsunami Hazard Mitigation Program is NOAA, FEMA, USGS and 28 coastal states and territories. Its 2024–2029 strategic plan sets four themes — Hazard and Risk Assessment; Education and Preparedness; Mitigation and Recovery; Alert, Warning and Response — names NOAA as lead agency and Coordinating Committee chair, and identifies the "Financial Assistance for Tsunami Activities" grant mechanism as the channel through which appropriated funds reach the state and territory partners [F-15]. That grant is what funds Hawai'i's tsunami mapping, evacuation zones and outreach [F-15]. The underlying statute fixes how the money divides: a minimum of 27 percent to mitigation and a minimum of 8 percent to research, against authorizations of \$25–29 million annually for FY2008–2012 and \$25.8 million annually for FY2016–2021 [F-27]. Mission and vision language in the strategic plan is what state grant applications must map to [F-15].

For a Hawai'i emergency manager who wants a PTWC product changed, there is exactly one formal channel. The NTHMP Warning Coordination Subcommittee's terms of reference establish that WCS consensus recommendations "represent the collective will" of NTHMP partners; that major changes are routed through the NTHMP Coordinating Committee to NWS via the formal service-change process while minor changes are implemented directly by the warning centres; and that the co-chairs are the two Tsunami Warning Center directors plus one state or territory emergency manager [F-19]. Outside experts may participate but cannot vote [F-19].

THREE DOCUMENTARY BREAKS THAT MATTER TO ANYONE READING THE RECORD

Three changes in the last twelve years alter how PTWC's output looks and where it is found. All three matter to anyone parsing archived material.

On 1 October 2014, PTWC eliminated the alerting terms "watch" and "warning" from its international WEPA40 PHEB Pacific product and moved to issuing Watch, Warning and Advisory only under separate headers for U.S. domestic locations [F-07]. That change, requested by PTWS member states, created the present-day separation between Hawai'i's domestic products and PTWC's international threat forecasts [F-07]. The companion service change notice for Guam and the Northern Marianas spells out the domestic product architecture Hawai'i's products mirror: three families — Tsunami Information Statements, Tsunami Watch/Warning/Advisory messages, and Tsunami Seismic Information Statements — each with its own WMO header and AWIPS identifier [F-08]. The international side of the same change is documented in the IOC users guide for PTWC's "enhanced products," which describes the wave-height threat forecast bands PTWC now transmits to national warning centres in lieu of issuing warnings directly, and the message templates for threat messages and information statements [F-14]. That document is the reference for understanding why PTWC's international output differs in form from what Hawai'i receives domestically; it could not be verified at the linked location and should be obtained directly before being relied on [F-14].

On 7 November 2016, the two warning centres consolidated onto a single tsunami.gov, with NTWC's site assuming the tsunami.gov URL and a six-month parallel-operations period during which the legacy PTWC site remained live [F-09]. This is why older Hawai'i emergency-management references to ptwc.weather.gov URLs no longer resolve to authoritative product pages [F-09].

Around 1 September 2021, the Mass News Disseminator header block changed from "NWS PACIFIC TSUNAMI WARNING CENTER EWA BEACH HI" to "NWS PACIFIC TSUNAMI WARNING CENTER HONOLULU HI," with the

explicit note that tsunami services were not otherwise affected [F-10]. The string differs before and after that date, which matters to anyone doing text matching across an archive of Hawai'i bulletins [F-10].

THE MISSING HAWAI'I USER'S GUIDE

PTWC publishes product user's guides for the jurisdictions it serves directly. The Puerto Rico, U.S. Virgin Islands and British Virgin Islands guide runs to roughly 145 pages and documents WMO and AWIPS product IDs, UGC code tables, the preliminary earthquake parameter block, the evaluation section, recommended-action wording, forecast tables with estimated arrival times and wave heights, sea-level observation tables, and impact statements — including pre-determined threat criteria keyed to magnitude, depth and distance, with different thresholds for nearby earthquakes under three hours' travel time versus distant ones [F-11]. A Guam and CNMI guide exists, as does one for American Samoa, and the tsunami.gov product-guides index carries a "Canada/US except Hawaii" operations manual [F-12].

Hawai'i is the only PTWC-served U.S. jurisdiction with no published product user's guide [F-11][F-12].

The gap has a parallel one level up. The National Response Framework, which governs post-impact federal operations, contains no tsunami-specific provision at all — it addresses major hurricanes, earthquakes and natural disasters generically [F-47]. Tsunami-specific federal response detail therefore lives in state and regional annexes rather than in national doctrine [F-47]. Between an absent national provision and an absent jurisdictional product guide, the documents that actually describe how a Hawai'i tsunami is run are state and county ones.

NOTE

Four other jurisdictions have a PTWC product user's guide. Hawai'i does not [F-11][F-12]. The functional substitutes are NWSI 10-701 for thresholds [F-02] and the tsunami.gov message definitions for wording [F-06] — neither of which explains how to read an actual Hawai'i bulletin.

1.3 State — the State Warning Point and the siren system

CONSTITUTION

The Hawai'i Emergency Management Agency is created by HRS § 127A-3, within a statutory architecture that also requires each county to maintain an emergency management agency (§ 127A-5), establishes the State Warning Point (§ 127A-7), sets out emergency powers and their delegation (§§ 127A-11 through 127A-13), governs the declaration of a state of emergency (§§ 127A-14 and 127A-15), and creates the Major Disaster Fund (§ 127A-16) [S-19]. HI-EMA sits within the Department of Defense, and the Adjutant General is the statutory head of the state emergency management structure as Director of Emergency Management [S-19][S-44]. Current leadership is Director MG Stephen F. Logan and Administrator David Lopez [S-44].

The chapter contains one provision of specific tsunami relevance beyond the alerting powers: § 127A-20 grants immunity to private shelter owners, which is the statutory basis making vertical evacuation into private hotels legally feasible [S-19]. Other load-bearing sections are § 127A-19 on shelters, § 127A-18 and § 127A-18.5 on mitigation and the Hazard Mitigation Special Fund, § 127A-25 on rules and orders, and §§ 127A-29 and 127A-30 on emergency-period offences and price controls [S-19].

HI-EMA publishes its own one-page plain-language crosswalk of which powers belong to mayors and which to the Governor. It is the only official state document that explicitly lists "operate the Statewide Outdoor Siren

Warning System" as a chapter 127A power, presents "direct non-compulsory evacuations" as a shared mayor and governor power, and reserves federal disaster requests, suspension of laws, direct operational control and suspension of state holidays to the Governor alone [S-23]. Read against § 127A-13, the practical shape of the authority is: everyone can warn, only a proclaiming executive can compel [S-21][S-20][S-23].

The current base plan carries the planning assumptions that frame every tsunami response decision: 90 percent of food and 100 percent of fuel are imported, the state holds five to seven days of food and faces five to eight days for West Coast cargo, and all seaports and most major airports sit inside tsunami or hurricane inundation zones [S-02]. That last assumption is the one that turns a tsunami from a coastal event into a logistics event. The base plan's Record of Changes is also the only place the evolution of HI-EMA activation levels is documented by number and date, with Change #23, Change #41 and Change #54 each revising the activation table [S-02].

THE STATE WARNING POINT

HI-EMA describes the State Warning Point as a "state emergency communications center staffed 24 hours, 7 days a week" handling statewide communications with county emergency officials [S-44]. That description matches the statutory establishment at HRS § 127A-7 [S-19]. The agency's own five-year strategic plan makes the 24/7 State Warning Point an explicit objective, with staffing and training as the measured deliverable [S-15].

Operationally, the State Warning Point is the entity that receives the PTWC message and physically activates the statewide outdoor warning sirens [S-01][S-44]. Nothing in the state's authority set lets it order anyone out of a zone [S-21].

THE SIREN SYSTEM

HI-EMA's own description claims the system is "the largest single integrated Outdoor Siren Warning System for Public Safety in the world" and publishes two engineering specifications found nowhere else: 121 decibels of output and a manufacturer's rated range of 3,400 feet, with actual coverage varying by terrain and conditions [S-16][C-56]. Units run on battery power with photovoltaic charging [C-56].

The inventory has moved. A 2021 state accounting gives 410 outdoor warning sirens with 76 new state-of-the-art units planned [S-43]. By the October 2023 launch of the Siren Status Map the state reported an inventory of 418 alert and warning sirens [S-18]. From the 2 October 2023 test, 326 were fully operational (78 percent), 29 needed HI-EMA in-house maintenance (6.9 percent), 37 needed contracted maintenance (8.9 percent), and 26 were inoperable or beyond repair (6.2 percent) [S-18]. The map defines a green/yellow/red/black status colour scheme and sits under the "Get Ready" tab at ready.hawaii.gov; it is the state's substitute for a formal siren audit [S-18]. The agency's own maintenance standard is to service one-third of the siren inventory annually for preventive maintenance [S-15]. At the county level, the only published per-island figure is Hawai'i Island's: 92 sirens installed, nine non-functional at an October monthly test [C-26].

The test protocol is fixed. Sirens are tested on the first business day of each month at 11:45 a.m. with a one-minute Attention Alert Signal — a steady tone — on all statewide outdoor warning sirens, coordinated with the Emergency Alert System Live Audio Broadcast test [S-17]. Malfunctions are reported to the counties: Honolulu 808-723-8960, Maui 808-270-7285, Kaua'i 808-241-1800, Hawai'i 808-935-0031 [S-17]. The only documented additional tone is a "whooping" HAZMAT tone tested near Campbell Industrial Park, covering Kalaeloa, Makakilo, Nānākuli, Kapolei and 'Ewa Beach [S-17].

The state publishes no tone-to-hazard decoding table. Its standing public instruction is that any non-test tone means tune to local radio, television or cable for official instructions [S-16]. There is no official statewide table distinguishing a "tsunami tone" from any other [S-16].

SIREN CADENCE FOR A TSUNAMI

The Tsunami Incident Annex specifies the cadence found nowhere else. For a distant tsunami, the first siren is sounded simultaneously statewide at least three hours before the first wave, then hourly, with a final sounding 30 minutes prior [S-01].

For a local event the rule inverts the normal coordination. For a local earthquake greater than M7.5, the State Warning Point sounds sirens in all counties immediately, without waiting for county concurrence [S-01]. This is the one circumstance in which the state acts on its own initiative across every county at once.

SUPPORTING STATE FUNCTIONS

The remaining state roles are set out in the emergency support function annexes and a small number of departmental procedures.

Transportation (SESF #1). HDOT is the Primary Agency with authority to close state airports, roadways, bridges and tunnels, and to close commercial harbours [S-05]. Responsibility divides by mode: Highways handles signage, barricades and damage assessment; Harbors handles closure and USCG-coordinated port restoration; Airports handles closure orders and evacuation support [S-05]. The annex contains no contraflow procedures — the gap the November 2025 Hawaii Tsunami Traffic Mitigation Plan was created to fill, following the 2025 event [S-05][S-40].

Communications (SESF #2). The Office of Enterprise Technology Services, not HI-EMA, is the coordinating agency for communications restoration [S-06]. The annex identifies Hawai‘i’s single-provider fragility for local telephone and cable, and its dependence on AT&T FirstNet, Hawaiian Telcom, the DoD Statewide Interoperability Coordinator, the Public Utilities Commission and RACES volunteers [S-06]. It confirms by omission that EAS, WEA and siren activation procedures live in the Tsunami Annex and the State Warning Point standard operating procedures rather than in the communications annex [S-06].

Planning and Information (SESF #5). This is the only annex that formally seats the Pacific Tsunami Warning Center and the Hawaiian Volcano Observatory as support agencies alongside the National Weather Service [S-07]. It defines the four SEOC Planning Section units — Situational Awareness with county desks and GIS support, Documentation, Technical Specialists and Hazard Advisors, and Planning — and the county-desk model of direct SEOC-to-county-EOC liaison that governs tsunami situational reporting [S-07].

Mass Care (SESF #6). The annex states flatly that “the state is not a shelter provider” [S-08]. Counties and the American Red Cross open and run shelters; the state coordinates resources on county request [S-08]. The state planning factor is that 11 to 35 percent of residents may need emergency shelter, feeding and sanitation after a disaster, with ADA, access-and-functional-needs and pet/service-animal requirements attached [S-08].

Public Health and Medical (SESF #8). The Department of Health is assigned the post-tsunami tasks of testing air, potable water sources and near-shore waters for contamination and issuing warnings, and of issuing certified death records and disposition-of-body permits [S-09]. Patient evacuation and relocation route through the Hawai‘i Healthcare Emergency Management coalition rather than direct state action [S-09]. The annex records the binding constraint for any mass-casualty scenario: statewide storage and mortuary capacity for fatalities is limited [S-09].

Public Safety and Security (SESF #13). This annex is the enforcement half of evacuation authority. It promotes compliance with gubernatorial emergency proclamations and handles traffic control and evacuated-area security, establishes the State Law Enforcement Coalition, and assigns lead agencies by venue — Harbor Police for maritime incidents, DLNR for state parks and ‘Iolani Palace [S-10]. It sets the National Guard rule: SESF #20

forces are "accompanied by sworn law enforcement officers, not solely in place of" them, meaning the Guard cannot itself enforce an evacuation order [S-10].

Small-boat harbours. The DLNR Division of Boating and Ocean Recreation tsunami plan is the only state small-boat-harbour procedure. Level One Alert begins "a minimum of three hours prior to the arrival of the first wave"; roadblocks are established one hour before expected arrival; harbour personnel are released to evacuate after utilities are shut off and vital non-digitized records, including vessel registrations, are removed [S-34]. Vessels are to relocate to waters 300 feet or more in depth as soon as a Tsunami Warning is declared, and a harbour-specific ALL CLEAR is required before any vessel returns to port [S-34]. Note the inconsistency in the state record: the DOBOR threshold is 300 feet of depth, while HI-EMA's public guidance gives 100 fathoms and, on a separate page, 100 metres [S-34][S-32][S-33].

Schools. Thirteen schools statewide lie inside primary (red) tsunami evacuation zones, and those schools must be able to evacuate within ten minutes because a locally generated tsunami can arrive in 15 to 30 minutes [S-36]. Tsunami is one of five mandatory drill types statewide, alongside lockdown, shelter in place, evacuation and earthquake [S-36]. The standing Department of Education Emergency Procedures Guide establishes that schools inside inundation zones evacuate immediately to higher ground on the school's own plan and by the school administrator's initiation, that schools outside zones "shall remain open unless directed otherwise by authorized DOE personnel or State Civil Defense," and that students may not return until the administrator gives the all clear [S-35]. The reference to State Civil Defense is a live defect: that entity was abolished when HRS chapter 128 was repealed by Act 111 of 2014 and replaced by chapter 127A, the same Act that renamed State Civil Defense to HI-EMA [S-24]. Any pre-2014 state publication citing chapter 128 authority is no longer legally operative [S-24]. The roster of the thirteen schools is not published; only the count is [S-36].

Public health messaging. The Department of Health's only public-facing tsunami content defers entirely to HI-EMA and county evacuation-zone guidance, contributing natural-warning-sign recognition and family preparedness messaging and routing the public to preparenowhawaii.org [S-45]. Its thinness is itself the finding: outside SESF #8 there is no DOH tsunami-specific procedure [S-45][S-09].

1.4 County — the evacuation order and the all-clear

The counties hold the decision that actually moves people. They decide that an evacuation is necessary, issue the order, produce the evacuation maps, open the shelters, and determine safe re-entry and the all-clear [F-45][S-01]. Part Four treats each county in detail; what follows is the principle and the one authority anomaly that belongs in the system chapter.

The four agencies are the Hawai'i County Civil Defense Agency, the Maui Emergency Management Agency, the City and County of Honolulu Department of Emergency Management, and the Kaua'i Emergency Management Agency [S-44]. Each is required to exist by HRS § 127A-5 [S-19]. Mayoral proclamation authority sits in state statute, not county ordinance: a mayor may declare a local state of emergency, is the sole judge of whether circumstances warrant it, and the proclamation self-terminates at 60 days unless ended sooner [S-22][C-57].

One documented fact contradicts how county materials read. During the July 2025 tsunami warning, the state Emergency Management Agency — not the county — controlled siren activation on Maui, as confirmed by MEMA's own administrator [C-35]. County public materials across all four counties read as though the county sounds its own sirens; on the largest evacuation in modern Hawai'i history, at least on Maui, it did not [C-35][F-45].

1.5 Where the chain breaks

The chain described above has five documented seams. Each is evidenced in the public record; none is speculative.

1. The IPAWS/EAS responsibility gap. GAO's 2023 audit of the tsunami alerting chain made two recommendations. The first, that NOAA assess and publish the extent to which NOAA Weather Radio coverage reaches populated tsunami-risk areas, was closed as implemented in 2024 [F-24]. The second — that NOAA work with the FCC and FEMA to establish clear responsibilities and procedures for using IPAWS to deliver tsunami alerts to the Emergency Alert System — remains open [F-24]. That handoff is the point at which a federal warning becomes a broadcast alert, and the agencies' respective responsibilities at that point are still undefined [F-24] [F-42]. The consequence for Hawai'i is that the interface between the agency that knows a wave is coming and the system that tells the public about it has no owner of record.

2. No EAS event code exists for a Tsunami Advisory. The event-code table at 47 CFR § 11.31 carries TSW for Tsunami Warning and TSA for Tsunami Watch, and nothing for an Advisory [F-41]. Advisory-level events — the 0.3 to 1.0 metre band that closes beaches and harbours without emptying neighbourhoods — cannot be broadcast as a distinct EAS code [F-41]. This is a structural gap, not an implementation failure.

3. NOAA Weather Radio coverage. Hawai'i's tsunami-carrying NWR infrastructure is four transmitter groups on four channels: KBA99 (Mt. Ka'ala, O'ahu at 162.550 MHz and Hawai'i Kai, O'ahu at 162.450 MHz) covering Kaua'i, O'ahu, Moloka'i, Maui, Lāna'i and parts of Hawai'i Island; WWG75 (Haleakalā, Maui, 162.400 MHz); WWG27 (South Point 162.550, Kulani Cone 162.500, Kamuela 162.500) for parts of Hawai'i Island; and WZ2557 (Lihu'e 162.450, Kōke'e 162.400) for Kaua'i [F-43]. This is the coverage picture GAO ordered NOAA to assess, and the audit identified coverage gaps in tribal, rural and remote coastal areas [F-43] [F-24]. Four channels — 1, 3, 6 and 7 — carry the whole state [F-43]. Because the WFO operates these transmitters and is explicitly not the warning originator [F-44], NWR is a relay layer whose reach was, until the 2024 assessment, formally unknown [F-24].

4. Language access. One in nine persons in Hawai'i has limited English proficiency — the state's own planning factor, published when HI-EMA added Japanese and Tagalog captioning to its animated tsunami public service announcement [S-42]. The 2026 national tsunami alerting analysis flags multilingual communication as a critical Hawai'i gap, requiring duty officers to translate English alerts into clearer instructions for non-English-speaking populations [F-20]. The gap is named at the federal level and quantified at the state level; it is not closed at either. The state's designated tourism-facing product provides resources in 13 or more languages including Japanese, Korean, Spanish, Tagalog and Vietnamese, and the ITIC county brochure series is issued in 14 or more languages [S-46] [H-45] — but a brochure is a preparedness instrument, not an alerting channel. WEA's 360-character ceiling [F-40] and the siren's single tone [S-16] carry no language options at all.

5. Comprehension. The foundational Hawai'i study of warning understanding found that only 13 percent of surveyed residents understood what the sirens meant, despite very high awareness that the sirens are tested monthly [H-57]. Hilo residents showed only moderate awareness of natural tsunami warning signs, the majority expected to receive an official alert rather than act on environmental cues, and length of residence in Hawai'i showed no correlation with understanding [H-57]. The authors concluded that "a major change is needed in tsunami education" [H-57]. Read that alongside the state's decision not to publish a tone-to-hazard decoding table [S-16], and the siren's informational value to a resident who hears it is close to nil beyond "something is happening."

Two further structural exposures belong here.

Hawai‘i’s alerting depends on the DART buoy network in a way no continental state’s does. The 2026 national alerting analysis records Hawai‘i’s stated dependence on DART as a potential single point of failure given the state’s geographic isolation [F-20]. The statutory 80 percent availability floor [F-27] is the only formal protection against that dependence. The same analysis is the newest and most comprehensive cross-jurisdiction inventory of how tsunami alerts actually reach people, and it documents the Hawai‘i stack — WEA, NOAA Weather Radio, EAS and sirens under PTWC jurisdiction — in exactly that form [F-20]. No other federally sponsored document assembles alerting-pathway gaps this way [F-20].

And earthquake early warning does not reach Hawai‘i at all. ShakeAlert is scoped to California, Oregon and Washington; local Hawai‘i earthquake detection runs through USGS HVO and ANSS into PTWC [F-36]. For a local-source tsunami reaching Hilo Bay in four to five minutes [F-49], there is no automated seconds-scale warning layer beneath the tsunami warning system.

Alert Levels and Thresholds

- 2.1 The four federal levels
 - 2.2 The numbers behind the words
 - 2.3 The fifth tier
 - 2.4 Products and how to read one
 - 2.5 How an alert reaches a person
-

2.1 The four federal levels

The United States Tsunami Warning Centers publish four domestic alert levels. Their canonical public wording is as follows [F-06]:

- **Tsunami Warning** — "A tsunami with the potential to generate widespread inundation is imminent, expected, or occurring."
- **Tsunami Advisory** — "...potential to generate strong currents or waves dangerous to those in or very near the water..."
- **Tsunami Watch** — "A tsunami may later impact the watch area."
- **Tsunami Information Statement** — "An earthquake or tsunami has occurred of interest to the message recipients."

The bottom tier is a Hawai'i map product, not a federal alert category.

FIGURE The alert levels and what each asks of a person. The bottom tier is a Hawai'i map product, not a federal alert category.

Translated into what each asks of a person:

A **Warning** asks you to leave. It is the level at which the counties order evacuation of the mapped tsunami evacuation zone [S-01][F-45], at which sirens sound [F-44], and at which vessels are directed out of harbours to deep water [S-34]. It is the only level that empties a coastline.

An **Advisory** asks you to stay out of the water and off the shoreline, and changes nothing inland. The wording is explicit that the danger is to those "in or very near the water" [F-06]. Boating conduct at an Advisory is a matter of individual judgment against a strong-current risk, distinct from Warning conduct [S-34].

A **Watch** asks you to prepare and to stay tuned. It says a tsunami may later impact the area [F-06]. No siren sounds for a watch from a distant earthquake [F-44]. In the state's decision matrix a Watch corresponds to a distant event of M7.9 or greater with an estimated arrival three to six hours out [S-01] — the window in which counties and the state stage for a possible evacuation without ordering one.

An **Information Statement** asks nothing. It records that an earthquake or tsunami has occurred of interest to the message recipients [F-06], corresponding in the state matrix to a local event of M4.0 to 6.8 or a distant event of M6.5 to 7.8 [S-01]. Most Hawai'i tsunami products are of this kind, and their volume is part of why the higher levels are misread when they arrive.

Two further distinctions belong on this ladder and are not visible in the wording. The first is that PTWC also issues two *international* product types from Honolulu — a Tsunami Threat Message and a Tsunami Information Statement — which are not domestic alert levels and carry no Watch, Warning or Advisory terminology [F-06][F-07]. A Hawai'i reader who encounters PTWC's international output and reads it as a Hawai'i alert level is reading the wrong product family. The second is that these four levels are the *whole* federal set: there is no fifth level, and no separate category for a local-source event, a volcanic source, or an extreme scenario [F-06]. Section 2.3 deals with the consequence.

2.2 The numbers behind the words

Two formulations of the same ladder exist, and they are expressed in different units.

The binding federal operational criteria are in NWS Instruction 10-701 [F-02]. A Tsunami Warning is issued when forecast or observed wave height exceeds 1 metre, or when widespread inundation is possible, or when the impact is unknown. A Tsunami Advisory is issued when maximum forecast height is 0.3 to 1.0 metres, or observed height is 0.5 to 1 metre. Cancellation follows when expected or observed height falls below 0.3 metres with a diminishing trend [F-02]. No other federal document states these numbers as binding operational criteria [F-02].

The State of Hawai'i Tsunami Incident Annex expresses the same four levels as a decision matrix keyed to magnitude bands and estimated arrival windows, with runup as a secondary criterion [S-01]. The two are not in conflict; they are addressed to different readers. The federal criteria tell a watchstander when to issue. The state matrix tells a state or county duty officer what to expect and what to stage.

LEVEL	NWSI 10-701 CRITERION (FEDERAL, BINDING) F-02	STATE ANNEX CRITERION (HAWAI'I) S-01
Information Statement	Event of interest to recipients [F-06]	Local M4.0–6.8; distant M6.5–7.8
Watch	Tsunami may later impact area [F-06]	Distant M≥7.9, ETA 3–6 hours
Advisory	Forecast 0.3–1.0 m; observed 0.5–1 m	M≥6.9 with runup 0.3–1.0 m
Warning	Forecast/observed >1 m; or widespread inundation possible; or impact unknown	M≥6.9 with runup ≥1.0 m — full evacuation
Cancellation	Below 0.3 m on a diminishing trend	Not separately stated in the matrix

Read the two columns as two dialects of one ladder, not as two ladders. A magnitude band is a proxy the state uses to anticipate a product; a forecast wave height is the criterion PTWC actually applies [F-02][S-01]. A resident who hears "magnitude 8.8" on the radio and infers an alert level is using the state's proxy, not the federal rule.

Update cadence. NWSI 10-701 also fixes how often the next message comes: 30 to 60 minutes when the source is inside the centre's Domestic Service Area, 60 minutes when outside, stretchable to 120 minutes after the third message in prolonged events [F-02]. The same instruction specifies VTEC and UGC segmentation of domestic products [F-02]. For an emergency manager, the cadence is the planning number — it sets how long a county EOC waits between authoritative updates.

The superseded pre-2014 hierarchy. Before the 2014 product change, PTWC ran a magnitude-triggered bulletin hierarchy: Information Bulletins for M6.5–7.5; Regional Fixed Warnings for M greater than 7.5 within 1,000 km; Regional Expanding Warnings for M greater than 7.8; and a Pacific-Wide Warning upon tsunami confirmation [F-13]. The same rulebook records PTWC's 10 to 20 minute response target after earthquake occurrence and the April 2006 move to two watchstanders always on duty [F-13]. This hierarchy is **superseded** and is given here only because it explains the shape of pre-2014 archived bulletins and the origin of the state's magnitude-band framing [F-13][F-07].

Why the two formulations matter in practice. The federal criteria are forecast-based, which means a Hawai'i alert level can change on measurement without the earthquake changing at all — that is the whole purpose of running DART observations through SIFT [F-48][F-02]. Forecasts carry error. In the February 2010 Chile event PTWC forecast 2.5 metres crest-to-trough at Hilo, 2.2 metres at Kahului and 0.5 metres at Honolulu, against observed amplitudes of roughly 1 metre at Hilo, 0.98 metres at Kahului and 0.28 metres at Nāwiliwili — approximately a factor-of-two over-forecast at the key sites, producing a statewide evacuation for a wave that did not arrive [H-21]. The 2010 sequence also shows the cadence in operation: the earthquake at 8:34 p.m. HST on 26

February, the first PTWC warning fifteen minutes later, sirens around 6:00 a.m. on the 27th, first waves roughly 14.5 hours after the earthquake, and the warning lifted by 2:00 p.m. the following day [H-21].

The public-comprehension failure runs the other way. HDOT's own after-action briefing on the July 2025 event identifies gaps in public understanding of Watch versus Advisory versus Warning as a principal finding [S-40]. Given that an Advisory has no EAS event code [F-41] and generally fails the WEA Imminent Threat test [F-40], the level most likely to be misunderstood is also the level with the weakest delivery path.

2.3 The fifth tier

Every current county tsunami brochure in Hawai'i prints five alert levels, not four. The Hawai'i Island, Maui County and Kaua'i County TsuFacts tri-folds all carry an "Extreme Tsunami Warning" as a fifth tier above Warning [C-22][C-29][C-40], and the ITIC brochure series description confirms the four federal levels "plus the Extreme Tsunami Warning for magnitude 9+ earthquakes" [H-45].

There is no such federal alert category. PTWC's domestic alert set is Warning, Advisory, Watch and Information Statement [F-06].

What "Extreme Tsunami Warning" actually denotes is a **map product**, not an alert level. Hawai'i operates a two-tier evacuation zone system: Tier 1 standard zones based on historical events, and Tier 2 "Extreme" zones representing "a worst case, extreme, once in a thousand years tsunami event" [F-46]. HI-EMA's own framing is that red zones are evacuated during any tsunami warning while yellow zones are evacuated only for an extreme tsunami, framed as a magnitude 9.0-plus scenario [S-33]. Honolulu states the activation criterion in plain terms: "If an earthquake happens in the Eastern Aleutian Islands with a magnitude 9.0 or greater, it will cause a rare, more extreme tsunami event" [C-01]. ITIC dates the modelling to 2010, names the eastern Aleutian Trench as "the most dangerous far-field tsunami to prepare for," and states that a magnitude 9.2 eastern Aleutian earthquake "would far exceed the flooding observed in Hawai'i from past historical tsunamis" [F-46][H-52].

The difference in what it asks for is the whole point. On an ordinary Warning, evacuees leave the red zone; on an Extreme Tsunami Warning, they leave red *and* yellow [C-29][C-03]. The safe-condition test differs too: on O'ahu, evacuees from the standard zone are safe on reaching yellow *or* green, while evacuees from the extreme zone must reach green [C-01].

The practical consequence is a mismatch between what is broadcast and what is asked. A resident hears an ordinary Tsunami Warning on the radio — because that is the only product PTWC issues [F-06] — and must then know, unaided, which zone applies to them and whether this particular warning is the extreme case. Nothing in the federal product distinguishes the two [F-06]. The distinction lives entirely in county map products and brochures [C-22][C-29][C-40][C-01].

The scale difference is not marginal. USGS quantification of the extreme inundation zone counts roughly 248,749 residents and 91,528 households — 18 and 20 percent of state totals — along with 18,693 businesses (37 percent of state totals) and 245,827 employees (42 percent of the state labour force), across 91 coastal communities in the four counties [F-32]. Federal pedestrian-evacuation modelling finds that adopting the extreme zone roughly triples affected residents, employees and facilities and adds a 26 percent increase in hotel visitors encouraged to evacuate; 98 to 76 percent of residents in the standard zone can walk clear in under 15 minutes at reasonable speeds, but 76 percent of hotel visitors in the extreme zone would need more than 15 minutes [F-35]. The state annex gives the exposure figure as more than 17 percent of state population and 55 percent of total households inside the extreme inundation zone [S-01]. Ordering the yellow zone is therefore not an incremental extension of a red zone order; it is a categorically larger operation.

Timing compounds it. Kauaʻi's published guidance gives a 3.5-hour window for an extreme event [C-39]. ITIC gives roughly four to five hours of evacuation time for the Tier 2 scenario and describes it as the least warning of any far-field threat to Hawaiʻi [F-46] [H-52]. Either figure is shorter than the at-least-three-hours-before-first-wave siren cadence the state plans around [S-01] leaves comfortable, and both are far shorter than the roughly 14 to 15 hours a Chilean source allows [C-09].

NOTE

"Extreme Tsunami Warning" is printed as a fifth alert level in every county brochure [C-22] [C-29] [C-40] [H-45] and does not exist as a federal alert category [F-06]. It is a Hawaiʻi map product tied to an eastern Aleutian M9.0-plus scenario [C-01] [S-33] [F-46]. Any document that lists five federal tsunami alert levels is wrong.

2.4 Products and how to read one

Hawaiʻi's PTWC product identifiers follow the domestic naming convention documented in the 2014 service change notices: Tsunami Information Statements, Tsunami Watch/Warning/Advisory messages, and Tsunami Seismic Information Statements, each with its own WMO header and AWIPS identifier [F-08]. The Hawaiʻi products are TSUHWX and TIBHWX for Pacific-source events and TSUHW1 and TIBHW1 for local Hawaiʻi earthquakes [F-11]. The Mass News Disseminator header block reads "NWS PACIFIC TSUNAMI WARNING CENTER HONOLULU HI" from about September 2021 and "...EWA BEACH HI" before that [F-10].

Because no Hawaiʻi user's guide exists [F-11] [F-12], the structure of a PTWC domestic bulletin has to be read off the one comparable published guide. That guide documents the following sequence: WMO and AWIPS product identifiers; UGC code tables identifying the affected segments; a preliminary earthquake parameter block; an evaluation section; recommended-action wording; forecast tables giving estimated arrival times and wave heights by location; sea-level observation tables; and impact statements [F-11]. It also documents PTWC's pre-determined threat criteria keyed to magnitude, depth and distance, with different thresholds for nearby earthquakes — those under three hours' travel time — versus distant ones [F-11]. A Hawaiʻi bulletin should be expected to carry the same block sequence; the absence of a Hawaiʻi-specific guide means this is inference from a sibling product, not documented Hawaiʻi practice [F-11] [F-12].

Two practical reading notes follow from the product structure. The forecast table is the block a county duty officer works from, because it carries estimated arrival times and wave heights by named location [F-11] — the two numbers that set the siren cadence [S-01] and the harbour timings [S-34]. The sea-level observation table is the block that tells whether the forecast is holding, since it carries the DART and tide-gauge values PTWC is using to decide whether to upgrade, downgrade or cancel [F-39] [F-37] [F-02].

The post-event clock. NWS Instruction 10-703 sets the only federal timetable for evaluating a warning after the fact. The public feedback survey link must be posted on tsunami.gov within one day of a significant Warning or Advisory and removed after two weeks; the emergency-management questionnaire goes out within one week; and final compiled results are due within ten weeks [F-04]. Survey initiation authority for domestic events rests with the Analyze, Forecast and Support Office Director or the affected state or territory; international surveys run under UNESCO auspices [F-04]. This is the instrument that would govern a post-event review of any Hawaiʻi warning [F-04].

2.5 How an alert reaches a person

PTWC issues a product [F-45]. That product does not, by itself, reach a phone, a radio or a siren [F-42]. Between issuance and a person there is a stack of distinct delivery systems, each with a different originator, a different payload limit and a different failure mode [F-20][F-42].

IPAWS — the aggregator. FEMA's Integrated Public Alert and Warning System is the national local-alerting system that distributes through Wireless Emergency Alerts, the Emergency Alert System and NOAA Weather Radio, using the Common Alerting Protocol as the shared digital format so one message reaches all channels simultaneously [F-42]. The unit of alerting authority is the Collaborative Operating Group, or COG [F-42]. This is the structural fact that most often gets stated backwards: **HI-EMA and the four county agencies, not PTWC, originate the alerts that actually move Hawai'i residents** [F-42]. PTWC issues the hazard product; the state and county COGs issue the public alert. GAO found the NOAA-FCC-FEMA responsibilities at exactly this handoff are still undefined [F-24].

Wireless Emergency Alerts. WEA is governed by 47 CFR Part 10. Section 10.400 establishes the four alert classes and sets the Imminent Threat threshold: urgency must be Immediate or Expected, severity Extreme or Severe, and certainty Observed or Likely [F-40]. A tsunami warning qualifies; an advisory generally does not [F-40]. Section 10.430 requires support for 360 characters, with a 90-character fallback for technically incapable infrastructure [F-40]. Section 10.450(a) requires delivery to 100 percent of the target area with no more than 0.1 mile of overshoot — the provision that makes shoreline-only geotargeting of a Hawai'i evacuation zone technically feasible [F-40]. No tsunami-specific provision appears anywhere in Part 10 [F-40].

The Emergency Alert System. EAS carries the event codes TSW for Tsunami Warning and TSA for Tsunami Watch, and no code for a Tsunami Advisory [F-41]. Location is expressed as a PSSCCC code: P for county subdivision 0–9, SS for the state or territory ANSI code, and CCC for the county ANSI code, with 000 meaning the whole state [F-41]. Four originator codes exist — EAS, CIV, WXR and PEP — and WXR is the code carried by NWS-originated tsunami alerts [F-41].

NOAA Weather Radio. Four transmitter groups on four channels cover Hawai'i: KBA99, WWG75, WWG27 and WZ2557, on 162.400, 162.450, 162.500 and 162.550 MHz [F-43]. Coverage is uneven by design — the transmitters are sited on high ground, and GAO ordered NOAA to assess how far the signal actually reaches populated tsunami-risk areas [F-43][F-24].

The sirens. 418 statewide, 121 decibels, a manufacturer's rated radius of 3,400 feet, and no published tone-to-hazard decoding table [S-18][S-16]. The siren carries one bit of information: that something has happened and the listener should go find out what [S-16].

County mass notification. Each county runs its own opt-in platform. HI-EMA's visitor guide maps each county to its vendor: Hawai'i County to Everbridge, Maui County to Genasys, O'ahu to HNLAlert, and Kaua'i to WENS [S-46]. Two of those have moved since. O'ahu's HNL Alert offers full registration at hnlalert.gov or zero-registration SMS-only enrollment by texting "HNLALERT" to 888777, delivering by SMS, email and push through the Public Safety by Everbridge app, and is explicitly positioned as a complement to WEA, sirens and broadcast interrupt because it can carry persistent messages with images and links [C-06]. Hawai'i County's enrollment keyword is "HAWAIIALERTS" to 888777, and the county publishes a voluntary broadcast-partner list of AM 670 plus fifteen named FM frequencies [C-19]. Kaua'i's ALERT Kaua'i migrated to Everbridge on 5 May 2026, delivering phone calls, text and email — notably including voice calls — with the county Department of Water sharing the platform [C-42]. Treat the vendor mapping in the state visitor guide as of its publication date, not as current: the Kaua'i entry is superseded by the 2026 migration [S-46][C-42].

The redundancy requirement. The TsunamiReady guidelines a Hawai‘i county must satisfy set the minimum: at least three different methods of *receiving* official alerts, and at least three different methods of *disseminating* them to the public [F-22]. Communities with a year-round population of 15,000 or more must operate their own emergency operations centre, and hazard zones must be designated and mapped with signage for danger areas, evacuation routes and assembly areas as locally determined [F-22]. Hawai‘i holds 17 TsunamiReady recognitions — four counties, thirteen communities and one government site [F-23]. Recognition is a floor on channel count, not a guarantee that any one channel reaches a given household.

The table below states what each channel can and cannot do.

CHANNEL	WHO ORIGINATES	WHAT IT CAN CARRY	KNOWN LIMIT
IPAWS/CAP	HI-EMA or a county COG [F-42]	One CAP message to all channels [F-42]	NOAA–FCC–FEMA roles undefined [F-24]
WEA	Alerting authority via IPAWS [F-42]	360 chars, 90-char fallback [F-40]	Advisory generally fails Imminent Threat test [F-40]
EAS	WXR for NWS-originated alerts [F-41]	Audio interrupt, TSW/TSA codes [F-41]	No event code for an Advisory [F-41]
NOAA Weather Radio	WFO Honolulu transmitters [F-43]	Continuous voice broadcast [F-43]	Coverage gaps unassessed until 2024 [F-24]
Outdoor sirens	HI-EMA State Warning Point [S-01]	One tone, no message [S-16]	13% comprehension; no decoding table [H-57][S-16]
County platform	County EM agency [S-46]	Text, email, voice, images, links [C-06][C-42]	Opt-in; four vendors, no common addressing [S-46]

NOTE

Six channels, five originators, and no single message that reaches everyone. The one channel that reaches every person in a coastal zone without opt-in — the siren — carries no information at all [S-16], and only 13 percent of surveyed residents could say what it meant [H-57].

Zones, Maps, and Vertical Evacuation

- 3.1 Red, yellow, green
 - 3.2 How the zones were drawn
 - 3.3 Who owns which map
 - 3.4 Vertical evacuation
 - 3.5 A different map entirely — the Tsunami Design Zone
-

3.1 Red, yellow, green

Hawai'i's tsunami zones are a three-term controlled vocabulary, and the place where all three terms coexist and are formally enumerated is a single state GIS product: the Tsunami Evacuation — All Zones layer, published by the Hawai'i Statewide GIS Program in the Office of Planning and Sustainable Development as Hazards MapServer layer 11 [S-29]. That layer carries thirteen fields and three symbologies — a backward-diagonal fill, a vertical fill, and a square-marker fill — and names the three classes exactly: **Tsunami Evacuation Zone**, **Extreme Tsunami Evacuation Zone**, and **Tsunami Safe Zone** [S-29]. Everything else in the Hawai'i zone literature — county map sheets, brochures, address-lookup applications, the colour shorthand of red, yellow and green — resolves back to those three terms. Where a document uses a fourth name, or uses "extreme" to describe an alert rather than an area, it is departing from the state's own vocabulary.

The two evacuation classes are also published separately, and both are authoritative in their own right: the standard zone as Hazards MapServer layer 2, covering all eight islands including Ni'ihau and Kaho'olawe, with open-data mirrors in CSV, Shapefile, GeoJSON, KML, WFS and WMS under "No License Provided" terms [S-28]; and the extreme zone as Hazards MapServer layer 12, whose attribute schema — Island, Zone_Type, Zone_Desc, Zone_Code, Tsu_Evac, Evac_Zone, plus area and perimeter — is the machine-readable definition of zone membership [S-27]. The three products do not share a common island coverage: the standard zone spans eight islands [S-28], the extreme zone is published per island from four county sources [S-27], and the safe zone covers seven islands and omits Hawai'i Island [S-30]. A user assembling a statewide picture from the three layers will therefore find the coverage ragged, and the ragged edges are not errors — they reflect which county has produced which product.

The three classes, in the state's own vocabulary, are best read as a table of asks rather than a table of colours.

CLASS (STATE TERM)	COLOUR	WHAT IT ASKS FOR	TRIGGERED BY
Tsunami Evacuation Zone	Red	Leave, for any tsunami warning [S-33]	Any Tsunami Warning [S-33] [C-03]
Extreme Tsunami Evacuation Zone	Yellow	Leave, only for the extreme scenario [S-33]	The M9.0+ eastern Aleutian case [C-01]
Tsunami Safe Zone	Green	Destination; where evacuees are clear [S-30]	Not applicable — it is an arrival area [S-30]

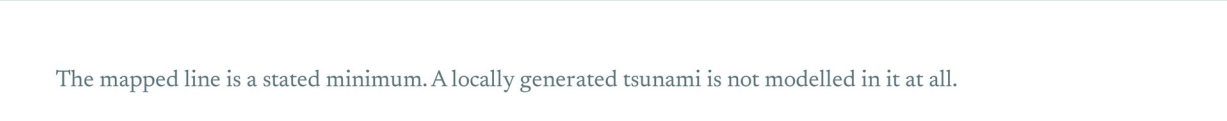


FIGURE Red, yellow, green — and up. The mapped zone is a stated minimum, and it does not model a locally generated tsunami.

What each colour asks for is different, and the difference is not one of degree. The **red zone** is the tsunami inundation zone that must be evacuated during *any* tsunami warning [S-33]. The **yellow zone** is the extreme tsunami inundation zone, evacuated only for the rare scenario the state frames as a magnitude 9.0 or greater earthquake [S-33]. Honolulu states the activation criterion for the yellow zone in the plainest terms published by any county: "If an earthquake happens in the Eastern Aleutian Islands with a magnitude 9.0 or greater, it will cause a rare, more extreme tsunami event" — with the standard zone defined against historical impacts over the past hundred years and the extreme zone against that single modelled class of source [C-01].

The safe-condition test is where the two zones diverge operationally, and it is the detail most often lost in public messaging. A person evacuating the red zone is clear on reaching **either yellow or green**. A person evacuating the extreme zone must reach **green** [C-01]. Yellow is a destination for one population and an origin for the other,

in the same event, on the same map sheet. O‘ahu’s printed Waikiki sheet states the corresponding decision rule for the public: “For most Tsunami Warnings, evacuate out of the red zone; in the unlikely case of an ‘Extreme Tsunami Warning’, evacuate out of the red and yellow zones” [C-03]. Maui County’s brochure prints the same mapping — Warning means evacuate red zones, Extreme Warning means evacuate yellow and red [C-29], as does Kaua‘i’s consolidated map book [C-38].

NOTE

“Extreme Tsunami Warning” is a Hawai‘i map-and-brochure convention, not a federal alert level. PTWC’s domestic alert set remains Warning, Advisory, Watch and Information Statement [F-06], and the extreme zone is a state and county map product built on federally funded University of Hawai‘i modelling, not a fifth rung on the federal ladder [F-46]. County brochures that print a five-tier alert ladder including “Extreme Warning” [C-22][C-29] are describing a locally adopted evacuation trigger, not a product PTWC issues.

The third class is the newest and the least known. **Tsunami Safe Zones** was created on 13 March 2025 and covers seven islands — Ni‘ihau, Kaua‘i, O‘ahu, Kaho‘olawe, Moloka‘i, Lāna‘i and Maui — notably excluding Hawai‘i Island [S-30]. It is the only state tsunami map product that tells an evacuee where to *go* rather than what to *leave* [S-30]. That inversion matters more than its obscurity suggests: every other product in the family is defined by hazard, and a person who has left a hazard area has not necessarily arrived anywhere in particular. The exclusion of Hawai‘i Island from the safe-zone layer means the island with the state’s worst tsunami casualty history has no state-published destination geometry to pair with its evacuation geometry.

Three standing legal cautions govern use of all of these maps, and they appear together in the state’s canonical metadata record and again on HI-EMA’s public guidance page:

- 1. The zone is a minimum, not a maximum.** The evacuation zone “is a guideline and should be considered the minimum safe evacuation distance” [S-25][H-53]. HI-EMA restates this for the public as the rule that evacuation zones are a minimum safe distance, not a maximum [S-32].
- 2. The maps do not model a locally generated tsunami.** “These maps do not consider the destructive effects of a locally generated tsunami. If you feel shaking, move inland immediately, well away from the evacuation zone” [S-25][H-53]. The public-facing form is the same instruction: if you feel shaking, move inland immediately and well beyond the mapped extent, because a local source can exceed it [S-32].
- 3. Stay 100 feet from ocean-connected waterways and marinas.** Inland waterways and marinas connected to the ocean carry tsunami energy inland past the mapped shoreline, and the state’s standing instruction is to keep at least 100 feet away from them [S-32][H-53].

These are not disclaimers in the boilerplate sense. Each of the three describes a class of exposure the map geometry does not represent, and each is the state’s own published acknowledgement of a limit in its product. The first says the line is soft on the inland side. The second says the line does not apply at all to the fastest and least warnable class of event. The third says the line is drawn against the open coast and not against the waterways that penetrate it. A reader who treats the mapped boundary as a hard, complete, all-source inundation limit is using the product against the express instruction of the agency that publishes it [S-25][S-32][H-53].

Kaua‘i’s map book carries the same warning in the county’s own words, adding that the data “is not intended to replace site survey” [C-38] — a reminder that the zone is a planning geometry derived from modelled inundation, not a surveyed line on the ground.

3.2 How the zones were drawn

The extreme zone exists because of a five-step scientific chain that runs from 2011 to 2017, and it is worth telling in order, because each step supplies something the next one needs.

Step one: the question reopened. Butler's 2012 paper in *Seismological Research Letters* re-examined whether the Aleutian arc could host a Mw 9-plus rupture aimed at Hawai'i [H-36]. The motivation was Tōhoku: an event that had exceeded every prior hazard assessment for its own margin, which raised the obvious question of whether assessments elsewhere were similarly bounded by the historical record rather than by the physics [H-36]. This is the earliest citable step in the chain that ends with the adopted yellow zones.

Step two: physical evidence. In 2014, Butler, Burney and Walsh reported marine sediment — coral fragments, mollusc shells and beach sand — recovered from roughly 2 m (6.5 ft) below the surface inside the Makauwahi sinkhole on Kaua'i, 100 m (328 ft) from shore and behind 7 m (23 ft) walls [H-34]. Radiocarbon dating placed the depositing event 350–575 years before publication. Modelling across Mw 9.0–9.6 Aleutian–Alaska scenarios showed that only a magnitude greater than 9.0 reproduces the observed inundation, requiring water levels of 8–9 m (26–30 ft) at that site against roughly 2.5 m there in 1946 — at least three times the size of the 1946 event [H-34]. Recurrence was estimated at roughly once per thousand years, about 0.1 percent annually, with corroborating deposits of the same age at Sedanka Island, Alaska and on the western Canadian and U.S. coasts [H-34]. This is the finding that converted an abstract seismological possibility into a Hawai'i event that had demonstrably happened.

Step three: a date. In 2017 the same group, with Rubin, refined the Makauwahi dating using U-series and radiocarbon coral dating and linked the Kaua'i deposit to the "orphan" Sanriku tsunami recorded in Japan in 1586 — an event whose waves were logged in Japan with no local earthquake to explain them [H-37]. Tightening the date is what converts the extreme-zone scenario from an undated envelope into an event with an assignable position in a recurrence sequence [H-37].

Step four: the modelling basis. Butler, Walsh and Richards (2017, *Natural Hazards*) is the actual modelling basis for Hawai'i's extreme evacuation zone [H-35]. It ran **40 distinct scenarios from Mw 8.6 to Mw 9.6** through two independent codes — NOAA's operational SIFT/SIM and the University of Hawai'i research code NEOWAVE — with named scenarios including Mw 9.25ab (50 m shallow slip over 20 m deeper slip), Mw 9.43 on a 1,000 km fault and Mw 9.6 on a 1,400 km fault [H-35]. Forecast maximum runups exceed the historical record by factors of two to ten: 30–35 m at Hilo, comparably extreme values at Kahului and Hale'iwa, and over 40 m against the steep cliffs at Hanalei, Kaua'i [H-35]. The governing conclusion for zone design is a single sentence, and every user of the yellow zone should know it: "maximal tsunami inundations everywhere in the Hawaiian Islands cannot be generated by a single large earthquake" [H-35].

That sentence is why the extreme zone is an **envelope** rather than one event's footprint. No single yellow-zone line anywhere in Hawai'i corresponds to a scenario that would simultaneously produce the yellow-zone line somewhere else. The map is the union of forty modelled outcomes, and any attempt to read it as a picture of "the" extreme tsunami misreads the product.

Step five: why the numbers are so large. The hydrodynamic mechanism behind runups of 30–40 m is amplification of drawdown and runup by tsunami N-waves from mega-Aleutian sources crossing Hawai'i's narrow insular shelves [H-59]. This is the reason Hawai'i cannot be assessed with continental-shelf assumptions, and the reason extreme-scenario runups are so large relative to the open-ocean wave height that produces them [H-59].

Two more recent results tighten the eastern Aleutian case considerably. In 2024, Yamazaki, Lay, Cheung, Witter, La Selle and Jaffe resolved the 67-year-old anomaly of the 1957 Andreanof event — Hawai'i runups far larger

than the assigned magnitude could explain — by identifying 12–26 m of shallow slip over a 600 km section of the **eastern** Aleutians, a tsunami-earthquake component of Mw 8.3–8.6 embedded in an overall Mw 8.6–8.8 rupture spanning about 1,200 km [H-13]. Only that eastern shallow slip reproduces the 6–12 m (20–40 ft) waves observed in Hawai‘i, which prior seismic-only models could not [H-13]. The USGS statement of the result puts it in citable agency language: the eastern Aleutian slip "now accounts for the documented tsunami heights" in Hawai‘i [H-14]. The implication for zone design is direct — the segment aimed squarely at Hawai‘i is empirically demonstrated to slip shallowly and tsunamigenically, which is precisely the behaviour the extreme scenarios assume.

The companion 2025 paper supplies recurrence. Modelling stratigraphic tsunami deposits, Yamazaki, Cheung, Lay, La Selle, Witter and Jaffe identified three eastern Aleutian ruptures over 700 years — an 18th-century event at about Mw 8.4, a 15th-century event at about Mw 7.9, and a 14th-century event at about Mw 8.7 — giving intervals of roughly 200–300 years [H-15]. The 14th-century event could have exceeded the inundation of the 1957 tsunami, and the modelled waves crossed more than 3,910 km of Pacific [H-15]. This is the strongest published argument that Hawai‘i’s historical record alone understates the hazard [H-15].

Federally, the source assumption behind the extreme zone is documented as a composite of two great Aleutian scenarios at Mw 9.3 and Mw 9.6 [F-32], and ITIC’s operational framing describes the design event as a magnitude 9.2 eastern Aleutian earthquake that "would far exceed the flooding observed in Hawai‘i from past historical tsunamis," an unlikely worst case recurring roughly once every thousand years and giving only four to five hours of evacuation time — the least warning of any far-field threat to Hawai‘i [H-52][F-46].

THE FEDERAL STANDARDS THE PRODUCTS MUST MEET

Hawai‘i’s inundation products are funded through the National Tsunami Hazard Mitigation Program and must conform to the NTHMP Mapping and Modeling Subcommittee’s guidelines. Part I fixes the numeric modelling standards: nearshore grids fine enough that a significant coastal feature spans more than three cells; DEM cell sizes under 3 arc-seconds, approximately 90 m, designated "Type 1"; a bottom friction coefficient with $n = 0.025$, cited as the ASCE 7 reference value; the NOAA Forecast Source Database as the default distant-source resource; and mandatory conformance to NTHMP benchmark standards before a code may be used for federally funded mapping at all [F-16].

Part II defines the products. Three map types are distinguished by data resolution — Type 1 above 90 m, Type 2 at approximately 10 m, Type 3 site-specific [F-17]. Maximum-inundation maps must **envelope all modelled scenarios plus documented historical events**, which is the federal restatement of the same envelope logic Butler, Walsh and Richards reached from the modelling side [F-17][H-35]. Mappers are directed to extend the inland boundary beyond the modelled extent to absorb the 10–20 percent model discrepancy observed in narrow areas — the technical origin of the "minimum, not maximum" caution in 3.1 [F-17][S-25]. Part II also sets the re-evaluation triggers that drive periodic Hawai‘i remapping: after any actual tsunami, on discovery of a significant new source, every five to ten years, or on technological advance [F-17].

Three points in Part II bear directly on how Hawai‘i’s zone lines should be read. First, the Type 2 designation at approximately 10 m resolution is the same grid spacing the state specifies for its high-resolution design-zone product [F-17][S-38], which means the evacuation and design families share a resolution class even though they answer different questions. Second, the envelope requirement is a floor, not a ceiling: the maximum-inundation map must cover all modelled scenarios **plus** documented historical events, so a zone that failed to contain a known historical runup would be non-conformant [F-17]. Third, the instruction to extend the inland boundary past the modelled extent means the published line is deliberately conservative relative to the model — and the state’s "minimum, not maximum" caution then tells the public it is still not conservative enough to be treated as a limit [F-17][S-25].

Part III supplies the fallback for coastline with no numerical model, which is relevant to Hawai‘i’s remote and unmodelled shorelines: the default screening rule treats coastal areas, bays, inlets and river reaches below 10 metres (about 33 feet) elevation as at risk, and endorses Green’s Law approximation for projecting offshore amplitude onshore, plus interpolation from neighbouring modelled areas with a safety margin applied to maximum recorded historical runup [F-18].

WHY 2014

The re-evaluation triggers are not theoretical in Hawai‘i. The 2011 Tōhoku event proved that the 2010 evacuation maps had underestimated flooding, and that finding is the documented origin of the 2014 remapping [S-13]. The structural evidence is preserved in the superseded O‘ahu dataset itself: the pre-2014 tsunevac_oahu layer carried a single binary attribute, ZONE = 1 or 0, with **no extreme-zone class at all** [S-26]. That schema is direct evidence that the yellow zone did not exist before the 2014 remapping [S-26]. When O‘ahu’s extreme zone was released, it was reported as extending roughly two to three times deeper inland than the 2010 line — in Waikīkī reaching the H-1 corridor where the prior boundary had ended above the Ala Wai — modelled on an M9.0-plus Aleutian event producing an approximately 30-foot surge, and characterised at the time by PTWC’s Gerard Fryer as carrying about a 5 percent chance of occurring in any person’s lifetime [C-18].

3.3 Who owns which map

The custody arrangement is easy to state and easy to get wrong. **Zone geometry originates with each county. The state standardises, projects and publishes it** [S-25]. The Hawai‘i Statewide GIS Program in OPSD is the custodian of the authoritative statewide layers, but it is not the author of the lines; it takes four county datasets and standardises them into UTM Zone 4 HARN [S-25]. The state’s own methodology statement is correspondingly thin and county-derived: O‘ahu’s zones derive from “peer review of the inundation models provided by UH Researchers” combined with “the operational needs of Honolulu’s First Responders,” and Kaua‘i’s “were developed using updated scientific techniques and technology... in conjunction with County Public Safety officials” [S-25]. The state does not publish runup values or source-event parameters for the extreme zone, and refers users to the individual counties for them [S-25].

The practical consequence is that the vintage of a zone line depends entirely on when its county last redrew it. The state’s own metadata record gives the provenance and currency per island.

ISLAND	SOURCE	VINTAGE
Kaua‘i	County of Kaua‘i	April 2025 [S-27][C-50]
O‘ahu	City and County of Honolulu	April 2025 [C-50]
Maui, Moloka‘i, Lāna‘i	County of Maui, via Pacific Disaster Center	August 2013 [S-27][C-50]
Hawai‘i Island	County of Hawai‘i	March 2025; corrections applied 20 November 2025 [S-27][C-50]
Ni‘ihau	NOAA	October 2016 [C-50][C-38]

Two entries in that table carry findings rather than dates. **Maui County’s zones are twelve years older than the others** [C-50]. The state’s own PDC-hosted map viewer carries a caution directing Maui users to the county site for current maps, consistent with the stale 2013 data in the statewide layer [S-31]. And **Hawai‘i County’s data had to be corrected on 20 November 2025 after the state layer was found to be inaccurate** [C-50] —

the only documented instance in the record of a published state zone layer being wrong and having to be repaired.

Two minor discrepancies in the record should be noted rather than smoothed. The extreme-zone MapServer metadata gives Kauaʻi's source as County of Kauaʻi **March** 2025, while the state's cautions document and the county-side record give **April** 2025 [S-27] [C-50]. And the question of whether Hawaiʻi County operates a yellow zone at all is genuinely unresolved in the published record: the statewide extreme-zone layer carries Hawaiʻi Island geometry sourced from the County of Hawaiʻi [S-27] and the county's own public brochure prints a five-tier alert ladder including "Extreme Warning" [C-22], but NWS/ITIC's side-by-side comparison of the four counties attributes two-tier mapping to Oʻahu, Maui and Kauaʻi and does not attribute an extreme tier to Hawaiʻi County [C-54] [C-20]. The state Tsunami Safe Zones layer likewise excludes Hawaiʻi Island [S-30]. This should be resolved with the Hawaiʻi County Civil Defense Agency directly; it is the single most consequential structural ambiguity in the zone record.

A further consequence of county-origin geometry is that the state cannot answer questions about the extreme zone's inputs. The state publishes no runoff values and no source-event parameters for the extreme zone and directs enquiries to the counties [S-25], while the counties publish map sheets rather than model documentation. The chain from a modelled runoff figure to a drawn boundary is therefore not reconstructible from published sources for any island; it exists in the peer-review and operational-input process the state metadata describes in a sentence [S-25], and in the underlying academic modelling [H-35], but not in a document that connects the two.

THE AUTHORITATIVE LOOKUP TOOL, BY COUNTY

The state designates which tool is authoritative for each county, and the designation is not uniform [C-55]. **Maui County and Kauaʻi County are both routed to NOAA's national viewer** at tsunami.coast.noaa.gov, while **Honolulu and Hawaiʻi County are routed to their own county GIS applications** [C-55] [S-32].

COUNTY	AUTHORITATIVE LOOKUP, PER THE STATE	TYPE
Honolulu	City and County GIS zone-lookup web map [C-04] [C-55]	County application
Hawaiʻi	Hawaiʻi County Civil Defense zone lookup [C-20] [C-55]	County application
Maui	NOAA national viewer (tsunami.coast.noaa.gov) [C-55]	Federal viewer
Kauaʻi	NOAA national viewer (tsunami.coast.noaa.gov) [C-55]	Federal viewer

For Oʻahu that application is the DEM/CCH GIS address-lookup web map, which renders standard and extreme zones as separate toggleable layers and is the only Oʻahu resource where the two tiers can be queried against a specific street address rather than read off a static sheet [C-04]. For Hawaiʻi Island it is the county's Civil Defense zone lookup, carrying the March 2025 data with the November 2025 corrections [C-20]. The effect of the split is that Maui County maintains its own numbered PDF evacuation sheet series in its DocumentCenter — each sheet printing the three-band legend of Safe Zone, Tsunami Evacuation Zone and Extreme Tsunami Evacuation Zone — while the state and the federal information centre both point the public somewhere else, leaving the county's own map series effectively unadvertised [C-33].

THE MAP BOOKS

Four distinct map-book products exist, in four different formats, with four different distribution models.

The **Pacific Disaster Center's interactive viewer** is the digital successor to the printed telephone-directory tsunami map books and the only place the official sheet-by-sheet pagination survives: Kauaʻi 10 sheets, Oʻahu 21, Molokaʻi 7, Lānaʻi 5, Maui 12, Hawaiʻi Island 15 — **70 sheets total** [S-31][H-54]. Extreme tsunami evacuation zones are shown for Oʻahu only within this viewer [S-31][H-54].

Oʻahu's regional map book is a 43-sheet set indexed by DEM in four regions — Windward 14 sheets, South Shore 13, Leeward 7, North Shore 9 — each a separate PDF with a stable honolulu.gov URL, re-posted in September 2025 [C-02]. This is the only sheet-level map inventory published by any county at that granularity.

Kauaʻi publishes its complete two-tier map book as a single downloadable PDF — 22 map sheets plus an overview covering Kauaʻi and Niʻihau from Lihūʻe and Nāwiliwili through Waimea, Port Allen, Poʻipū and the Nā Pali Coast — and is the only county of the four to publish its whole extreme-zone map book as one file [C-38]. The document carries the operative decision rule and a disclaimer that the data "is not intended to replace site survey" and does not account for locally generated tsunami effects [C-38].

Hawaiʻi County distributes its numbered evacuation map series through its Laserfiche records-management repository rather than a public web map library, which is why the sheets are hard to find; sheet 1 covers Hilo, the most tsunami-consequential locality in the state [C-21].

WHO AND WHAT IS INSIDE THE EXTREME ZONE

The federal count is the USGS community-exposure study, which quantifies the extreme inundation zone using 2010 Census data across 91 coastal communities in the four counties: approximately **248,749 residents** and **91,528 households** — 18 and 20 percent of state totals — plus **18,693 businesses** (37 percent of state totals) and **245,827 employees** (42 percent of the state labour force) [F-32]. The inundation zone used is the composite of two great Aleutian Mw 9.3 and Mw 9.6 scenarios, making this the federal documentation of the source assumption behind the state's extreme zones [F-32].

The operationally decisive federal finding, however, is about movement rather than exposure. The USGS pedestrian-evacuation analysis finds that 98 to 76 percent of residents in the standard evacuation zone can walk clear in under 15 minutes at reasonable speeds — but that **76 percent of hotel visitors in the extreme zone would need more than 15 minutes** [F-35]. Adopting the extreme zone **roughly triples** the affected residents, employees and facilities, and adds a **26 percent increase in hotel visitors** encouraged to evacuate [F-35]. Bottlenecks concentrate on Oʻahu's North Shore for the standard zone and all around the Oʻahu coastline for the extreme zone [F-35].

NOTE

The extreme zone is not a larger version of the same problem. Tripling the affected population while adding a quarter again as many hotel visitors, into an evacuation window ITIC puts at four to five hours [H-52], changes the character of the operation from a coastal clearance to a metropolitan one.

3.4 Vertical evacuation

THE PUBLISHED RULE

The statewide rule, as published, is: **the fourth floor or higher of a reinforced-concrete building of at least ten stories**. It appears in the state's own guidance and in every county's public materials, with only trivial variation in wording.

- HI-EMA: in tall reinforced-concrete buildings of 10-plus stories, go above the fourth floor — the state's only published vertical-evacuation floor threshold [S-32].
- Honolulu DEM: "proceed to the fourth floor or higher of a building that is 10 stories or taller" [C-01].
- O'ahu's printed Waikiki map sheet, which carries the authoritative legend text: "Structural steel or reinforced concrete buildings of ten or more stories provide increased protection on or above the fourth floor; if you are caught near the shoreline consider using vertical evacuation" [C-03].
- Hawai'i County: fourth floor and higher of a concrete building, given as the fallback where horizontal evacuation is not possible [C-22].
- Maui County: fourth floor or higher of a building at least ten stories of reinforced concrete [C-29].
- Kaua'i: reinforced-concrete buildings of ten-plus stories, fourth floor or higher, alongside the recommendation to walk or bike rather than drive [C-39].
- The ITIC TsuFacts brochure series, issued per county in fourteen or more languages, prints the two-mode instruction: "Quickly leave Red Tsunami Evacuation Zones to Green Safe Zones" **or** "evacuate vertically to the 4th floor and higher of a concrete building," moving immediately after shaking without waiting for a warning [H-45].

That rule replaced an earlier and materially different O'ahu standard. O'ahu Civil Defense previously recommended climbing "three stories or higher, in a steel-reinforced building at least six stories tall" [C-15]. The shift — from three-of-six to four-of-ten — is documented in only one place, and the direction of the change is toward a substantially smaller eligible building stock [C-15].

THE ENGINEERING BASIS

The technical rationale behind the county rule sits with ITIC, whose vertical-evacuation guidance sets structural criteria that are more demanding than the public rule they underwrite:

ITIC CRITERION	REQUIREMENT
Structure	Reinforced or steel-reinforced concrete [C-53]
Height above inundation	At least 2 storeys above expected inundation depth [C-53]
Seismic	Earthquake-resistant [C-53]
Refuge area	Minimum 1 m ² per evacuee [C-53]
Duration	Designed for 12–24 hours of short-term protection [C-53]
Code	ASCE/SEI 7-16 tsunami load compliance [C-53]

The public rule — fourth floor of ten storeys — is a proxy for those criteria, not a restatement of them. It asks a member of the public to identify a building by two observable attributes (apparent construction material and apparent storey count) that stand in for six engineering conditions, none of which a person standing on the sidewalk can verify. That is a reasonable design choice for a public instruction, but it means a building satisfying

the public rule is not thereby demonstrated to satisfy the criteria [C-53]. The same page records the single most important county-level building-code fact for vertical evacuation: **all four Hawai'i counties adopted by reference IBC section 1615, Tsunami Loads and Effects, effective 13 November 2018** [C-53]. ITIC also states Honolulu's specific rationale — "more than 50,000 tourists ... crammed into a three square mile area that has just 4 evacuation routes inland" [C-53].

The federal engineering document is FEMA P-646, third edition, *Guidelines for Design of Structures for Vertical Evacuation from Tsunamis* [F-29]. It requires that refuge structures be assigned **Tsunami Risk Category IV**, and mandates that refuge-area elevation carry a conservative margin above the design tsunami elevation, on the stated ground that "overtopping of the refuge area will result in unacceptable loss of life" [F-29]. Its Table 5-2 gives maximum spacing of vertical evacuation structures as a function of ambulatory speed and warning time — the tool for deciding how many refuges a district needs and where [F-29]. The third edition revised the debris-impact expression to remove over-conservatism present in the second [F-29]. Hawai'i is not incidental to the document: Section 2.1.1 uses Hawai'i as its case study — 159 deaths in Hilo from the 1946 Aleutian tsunami, 61 deaths from the 1960 Chilean tsunami, \$40 million damage from 2011 Tōhoku, and 1975 local Hawaiian tsunami runup exceeding 6 metres (20 feet) — and Figure 4-6 is the Waikīkī Beach evacuation map [F-29]. FEMA P-646A is the non-engineering companion, written for mayors, county councils and emergency managers rather than structural engineers, covering the siting, ownership, liability, funding and community-acceptance decisions that precede design, and containing no design equations at all [F-30]. Those are precisely the questions a Hawai'i county would face before commissioning a purpose-built refuge structure — and, notably, precisely the questions that go unanswered when the refuge stock is instead assembled ad hoc from privately owned towers [F-30] [C-15].

The spacing table is the part of P-646 with the most direct planning consequence. Because maximum spacing is a function of ambulatory speed and warning time [F-29], the number of refuges a district needs is set by how fast its slowest population can move and how much notice it gets — which is why the federal pedestrian-evacuation finding that 76 percent of hotel visitors in the extreme zone need more than 15 minutes to walk clear [F-35] translates directly into a refuge-density requirement rather than merely a messaging problem.

THE LEGAL PROBLEM

Stated squarely: **privately owned high-rises are under no legal obligation to provide shelter to the general public** [C-15]. Every element of Hawai'i's vertical-evacuation doctrine — the fourth-floor rule, the county map legends, the ITIC criteria, the Waikīkī model results — depends on buildings whose owners are not required to open them, and cannot be compelled to.

What makes the arrangement feasible at all is HRS §127A-20, which grants immunity to private shelter owners [S-19]. That immunity is the statutory basis on which a hotel or condominium can admit the public during a tsunami evacuation without assuming the liability exposure that would otherwise make the decision irrational. It does not create an obligation; it removes a disincentive.

The documented practical failures follow from that gap. An account of an actual attempted vertical evacuation in Waikīkī records narrow unmarked stairways, locked doors and unhelpful staff [C-15]. The same source records 1994 false-alarm gridlock and up to 100,000 people in the Waikīkī low-lying area [C-15]. None of those failures is an engineering problem. They are consequences of a doctrine that assigns a life-safety function to buildings that have no duty to perform it and no standard telling them how.

THE QUANTITATIVE CASE

The case for vertical evacuation in Waikīkī rests on one agent-based model and its restatements. The peer-reviewed model — Kim, Kaviari and colleagues, published in *Transportation Research Part D* in 2022 —

simulates pedestrian, bicycle and vehicle evacuation of Waikīkī's dense resident-plus-visitor population under short notice, and quantifies the marginal life-saving value of vertical evacuation, added Ala Wai Canal crossings, and reduced warning lead time [H-58]. It is the only Hawai'i-specific agent-based evacuation model located in this research [H-58].

Its population assumptions and modelled outcomes by mode are: **18,000 residents plus approximately 29,000 hotel-room occupants, with 30 minutes of warning** [C-16]. Car evacuation produces roughly a 40 percent fatality rate among vehicle evacuees — about 11,000 deaths. Vertical evacuation clears all evacuees to safety within 22 minutes. Bicycle evacuation yields a 0.02 percent fatality rate [C-16]. The city's transportation director drew the operational conclusion directly from those results: "if you're in a safe place, stay there" [C-16].

The 2025 restatement, published by the University of Hawai'i in the week after the July 2025 Kamchatka evacuation, gives the marginal values against a catastrophic-scenario baseline: **38,760 projected deaths with no intervention; vertical evacuation saving over 55,000 lives** as the single most effective measure; a proposed **Ala Wai Canal pedestrian bridge saving approximately 13,860**; and **cutting alert time from 10 minutes to 5 minutes saving more than 4,500** [H-32] [S-47]. Bridge plus faster alerts together reduce fatalities to roughly 20 percent of the baseline [H-32] [S-47]. These are the only published numbers attached to Waikīkī vertical-evacuation policy [S-47].

The baseline and the savings figure are not arithmetically commensurable — 55,000 lives saved against a 38,760-death baseline reflects different scenario populations within the modelling, and the compendium reports both as published rather than reconciling them.

THE HONEST CAVEAT

There is no published state standard for vertical evacuation. The only state-issued floor threshold is the informal "above the fourth floor in buildings of 10-plus stories" on HI-EMA's guidance page [S-32], and **Waikīkī vertical evacuation in July 2025 was executed by individual hotels under county coordination, not under a published state standard** [S-39]. Likewise, no county in Hawai'i appears to impose a mandatory tsunami evacuation-plan requirement on hotels; the closest published instruments are Hawai'i County's voluntary business emergency evacuation plan template [C-27] and the counties' 2018 adoption of IBC §1615 by reference [C-53]. A doctrine that the modelling identifies as the single most effective life-saving measure available to Waikīkī currently rests on a web-page sentence and voluntary hotel practice.

3.5 A different map entirely — the Tsunami Design Zone

There is a fifth Hawai'i tsunami map, and it is not an evacuation product at all. The **Tsunami Design Zone** is an engineering zone: it determines which buildings must be *designed* to resist tsunami loads. It does not tell anyone where to go, and it is not drawn to the same criteria as the red or yellow zones [S-37]. Confusing the two is a real operational risk — a Tsunami Design Zone boundary on a plan set is a construction requirement, not an evacuation line, and a building inside the design zone may be outside the evacuation zone or vice versa.

The two families differ on every axis that matters.

	EVACUATION ZONES (RED / YELLOW)	TSUNAMI DESIGN ZONE
Purpose	Where people leave from [S-33]	Which buildings must resist tsunami loads [S-39]
Basis	Deterministic scenario envelope, Mw 8.6–9.6 [H-35]	Probabilistic, 2,500-year return period [S-37]
Custodian	Counties draw; state GIS publishes [S-25]	OPSD Coastal Zone Management, with HI-

	EVACUATION ZONES (RED / YELLOW)	TSUNAMI DESIGN ZONE
		EMA [S-37]
Island coverage	Statewide, per county [S-27][S-28]	O‘ahu, Maui, Kaua‘i [S-37]
Legal effect	Guidance; evacuation ordered by county [S-25]	Binding on new construction via IBC §1615 [S-39]

The standard behind it is ASCE/SEI 7 Chapter 6, *Tsunami Loads and Effects*, the first national consensus standard for tsunami-resistant design, applying to Alaska, Washington, Oregon, California and Hawai‘i [F-31][S-37]. It is the code basis referenced by FEMA P-646 and the source of the $n = 0.025$ friction value used in the NTHMP modelling guidelines [F-31][F-16]. The companion public lookup is the ASCE 7 Tsunami Hazard Tool [S-37][F-31].

Hawai‘i’s contribution is a set of state-commissioned high-resolution **Probabilistic Tsunami Design Zone maps built on a 2,500-year return period**, produced under the Office of Planning and Sustainable Development’s Coastal Zone Management Program with HI-EMA, covering **O‘ahu, Maui and Kaua‘i** [S-37][F-31]. The modelling was done with **NEOWAVE**, developed with Kwok Fai Cheung of UH Ocean and Resources Engineering — the same modelling lineage that produced the extreme evacuation zones [S-38][H-35]. The technical specification is published in only one place: a **10 m horizontal grid** for the high-resolution product, and the ASCE 7-16 calibration constraint that **no site-specific point may fall below 80 percent of the ASCE Tsunami Geodatabase offshore wave heights** [S-38].

The binding legal effect comes from the State Building Code. Hawai‘i’s amended IBC Section 1615 requires **Risk Category III and IV buildings** — and Risk Category II buildings meeting all three of a set of tests — to be designed to ASCE 7-16 Chapter 6 when located in a Tsunami Design Zone [S-39]. Risk Category III and IV covers schools, hospitals, emergency shelters and power stations [S-37]. The three Risk Category II triggers are precise, and are published only in the state code amendments:

4. Occupancy A, B, E, I, M, R-1, R-2, or higher-education laboratories;
5. Tsunami inundation depth exceeding **3 feet** within the building footprint;
6. Highest occupiable floor exceeding **75 feet** [S-39].

The zones referenced are those in the ASCE 7 Tsunami Design Geodatabase **version 2016-1.0** [S-39]. The code was approved 20 April 2021, with errata issued 18 May 2021 [S-39].

The consequence should be stated plainly: **the requirement applies only to new buildings and additions** [S-39]. It is not retroactive, and no provision requires an existing structure to be assessed or upgraded. That is the legal reason most existing Waikiki towers are not tsunami-designed [S-39] — which is the same building stock the state’s vertical-evacuation guidance directs the public into [S-32], and the same stock the UH model credits with saving more than 55,000 lives [H-32]. The design standard and the evacuation doctrine point at the same buildings from opposite ends, and only one of them is binding.

The Four Counties

- 4.1 Reading the differences
 - 4.2 City and County of Honolulu
 - 4.3 Hawai'i County
 - 4.4 Maui County
 - 4.5 Kaua'i County
 - 4.6 The seven differences that matter
-

4.1 Reading the differences

Four county agencies stand between a federal alert and a person who has to move. They receive the same product from the same warning centre [F-45], they rely on one state-owned siren system described by its operator as the largest single integrated outdoor siren warning system for public safety in the world [C-56], and they operate under one statute that requires each county to maintain an emergency management agency [S-19]. Above the county line, Hawai'i is a single system. Below it, the four counties diverge in almost everything that determines what a resident or a visitor actually experiences: how many zone tiers the county maps, what it teaches a siren to mean, what kind of facility it opens when it orders people out, how it addresses the order, and which vendor carries it.

None of these divergences is hidden. Each is published, in the county's own materials, and most are published without any indication that the neighbouring county does it differently. The consequence is that preparedness knowledge acquired on one island is partly wrong on the next — a real operational problem in a state where residents and visitors move between islands constantly, and where the statewide siren sounding that opened the 29 July 2025 evacuation was heard simultaneously by populations who had been taught three different meanings for it [C-19] [C-29] [C-40].

This chapter treats each county in turn: its constitutive authority and leadership, its zone products, its alerting architecture, its shelter doctrine, its planning record, and what it actually did on 29 July 2025. The comparison below is the map of the chapter. Every row is a dimension on which the counties do not agree.

DIMENSION	HONOLULU (O'AHU)	HAWAI'I	MAUI	KAUA'I
Zone tiers	Two — TEZ / XTEZ [C-01]	Contested; no extreme tier attributed [C-54] [C-20]	Two [C-54] [C-29]	Two [C-54] [C-38]
Zone data vintage	April 2025 [C-50]	March 2025, corrected 20 Nov 2025 [C-50] [S-27]	August 2013 [C-50] [S-27]	April 2025; Ni'ihau Oct 2016 [C-50]
Siren meaning taught	Tune in to radio/TV/online [C-07]	Go to your radio; one ring = one hour of travel time [C-19] [C-22]	Evacuate; widespread flooding expected [C-29]	One ring = one hour; go to your radio [C-40]
Who sounds the siren	HI-EMA-owned system [C-56] [F-45]	HI-EMA-owned; 92 on island [C-26] [C-56]	HI-EMA controlled activation, July 2025 [C-35]	Stated as HI-EMA-owned and operated [C-44]
What opens	16 outdoor assembly areas, no services [C-08] [C-58]	10 indoor gyms, armories, centres [C-58]	7 indoor community and school facilities [C-58]	9 indoor refuge areas [C-58] [C-49]
Evacuation addressed by	Zone colour: red, or red + yellow [C-03]	Zone colour and named district [C-22] [C-21]	Named Genasys Protect zone [C-36] [C-35]	Zone colour: red, or red + yellow [C-38]
Mass-notification platform	HNL Alert, Everbridge-delivered [C-06]	Everbridge, since July 2025 [C-43] [C-19]	Genasys Protect, since 1 May 2025 [C-36]	ALERT Kaua'i; Everbridge from 5 May 2026 [C-42] [C-43]
Siren inventory published	Not published [C-26]	92 installed, 9 inoperable at one test [C-26]	Not published [C-26]	Locations by four regions; count not published [C-44]
Controlling constraint	Single-egress communities; Waikiki density [C-17] [C-53]	Hilo bayfront and Hilo Bay [C-25] [C-59]	Three separate islands in one county [C-30] [C-61]	Hanalei Bridge [C-45] [C-48]

DIMENSION	HONOLULU (O'AHU)	HAWAI'I	MAUI	KAUA'I
2025 after-action report	Yes, released 15 July 2026 [C-12] [C-60]	None evidenced	None evidenced	Committed, not published [C-49]
TsunamiReady sub-county	Ten communities plus one military site [C-51] [F-23]	None [C-51]	One — South Maui [C-51]	One — Hanapēpē-'Ele'ele [C-51]

Two rows in that table are findings in themselves. Maui County's evacuation-zone geometry is twelve years older than every other county's [C-50] [S-27], and Maui County has the highest proportional population exposure in the state [C-30]. And only one of the four counties has published an after-action report on the largest evacuation in modern Hawai'i history [C-12].

4.2 City and County of Honolulu

CONSTITUTIVE AUTHORITY

Honolulu is the only county whose emergency management agency is constituted by charter in a form that does more than establish the office. Article VI, Chapter 19 of the Revised Charter of the City and County of Honolulu 1973, as amended, runs from §6-1901 to §6-1904 and establishes the Department of Emergency Management within the executive branch, sets the director's qualification requirement in emergency management and disaster response, assigns the department's powers, duties and functions, and — uniquely among the four counties — creates a standing **Citizens Advisory Commission on Emergency Management** [C-13]. The charter also records that an earlier department was repealed and its functions re-established under Chapter 19 [C-13]. No other county charter in Hawai'i creates a standing citizens' advisory commission on emergency management [C-13].

The ordinance-level counterpart is Article 25 of the Revised Ordinances of Honolulu, codified at ROH §2-25.1, "Director of emergency management," carrying an editor's note dating the article's effectiveness to 13 August 1993 pursuant to Civil No. 88-1285-04 [C-14]. Two points of citation hygiene follow. The article sits in ROH Chapter 2, Administration — **not** in Chapter 6, Funds, Fees and Loan Programs — which corrects a common mis-citation [C-14]. And the mayoral proclamation authority that Honolulu, like every other county, relies on is not in the ordinances at all: it sits in state statute at HRS §127A-14, which makes the mayor the sole judge of whether circumstances warrant a local state of emergency and terminates the proclamation automatically at 60 days [C-57].

The current DEM director is Dr. Randal A. Collins, CEM, and the department's address is 650 South King Street, Basement [C-06].

THE TWO-TIER ZONE SYSTEM AS HONOLULU STATES IT

Honolulu publishes the plainest statement of the two-tier system produced by any county. The standard Tsunami Evacuation Zone (red) is defined against historical impacts over the past one hundred years; the Extreme Tsunami Evacuation Zone (yellow) is defined against a single modelled class of source, and the county states the activation criterion in operative terms: "If an earthquake happens in the Eastern Aleutian Islands with a magnitude 9.0 or greater, it will cause a rare, more extreme tsunami event" [C-01].

The same page carries the county's vertical-evacuation rule — "proceed to the fourth floor or higher of a building that is 10 stories or taller" — and, most consequentially, the fact that **the safe-condition test differs by zone**: a

person evacuating the standard zone is safe on reaching either yellow or green, while a person evacuating the extreme zone must reach green [C-01]. Yellow is a destination for one population and an origin for another, in the same event, on the same map sheet. That distinction is stated on the county's guidance page and is easy to lose in any abbreviated retelling.

THE MAP BOOK, THE LOOKUP, AND THE HAZARD EXPLORER

O'ahu's evacuation map book is the most granular county map inventory published in the state: 43 named regional inset sheets across four regions — Windward 14, South Shore 13, Leeward 7, North Shore 9 — each a separate PDF with a stable honolulu.gov URL, re-posted in September 2025 [C-02]. This is the sheet-level structure a plan or a hotel procedure would need to reference by name, and no other county publishes an equivalent index [C-02].

The parcel-level answer comes from a different product. The DEM/CCH GIS address-lookup web map renders the standard and extreme zones as separate toggleable layers and is the only O'ahu resource where the two tiers can be queried against a specific street address rather than read off a static sheet [C-04]. Both HI-EMA and NWS/ITIC name it as the authoritative O'ahu source [C-04][C-55].

Since the 2025 event the county has steered the public to a third tool. The **O'ahu Hazard Explorer** is a multi-hazard successor that overlays tsunami evacuation zone with flood zone, dam and levee evacuation area, and wildfire risk for a single pinned address, and produces a printable result sheet intended for inclusion in a family or business disaster plan [C-05]. It was last modified on 16 June 2026 [C-05]. Its status is not merely that of a newer application: it is named in the DEM July 2025 after-action report as the recommended remedy for public confusion about zone membership, which is why it is the tool the county now points people to [C-05][C-60].

THE WAIKĪKĪ SHEET

Map 1 — Waikīkī, dated April 2015, carries the printed official vertical-evacuation legend in the county's own words:

NOTE

"Structural steel or reinforced concrete buildings of ten or more stories provide increased protection on or above the fourth floor; if you are caught near the shoreline consider using vertical evacuation." [C-03]

The same sheet prints the two-tier decision rule for the public: "For most Tsunami Warnings, evacuate out of the red zone; in the unlikely case of an 'Extreme Tsunami Warning', evacuate out of the red and yellow zones" [C-03]. On that sheet the extreme zone reaches the H-1 corridor inland of Waikīkī, with named anchor facilities including Kapi'olani Medical Center, Waikīkī and Kūhiō Elementary, the Honolulu Zoo and the Ala Wai Golf Course [C-03]. When the extreme zone was released, it was reported as extending roughly two to three times deeper inland than the 2010 line — in Waikīkī reaching the H-1 where the prior boundary had ended above the Ala Wai — modelled on an M9.0-plus Aleutian event producing an approximately 30-foot surge [C-18].

HNL ALERT

O'ahu's opt-in mass-notification system offers two enrolment paths of very different weight. Full registration at hnlalert.gov produces a topic-selectable subscription; alternatively, a resident or visitor can enrol for SMS only, with **zero registration**, by texting **HNLALERT to 888777** [C-06]. Delivery is by SMS, email, and push notification through the Public Safety by Everbridge application [C-06].

The county is explicit that HNL Alert is a *complement* to Wireless Emergency Alerts, the sirens and broadcast interrupt — not a substitute for them [C-06]. The stated reason is a capability difference: HNL Alert carries persistent messages with images and links, which sirens and WEA cannot [C-06]. That distinction matters operationally. A WEA is capped at 360 characters with a 90-character fallback [F-40], and a siren conveys no message at all [S-16]; the persistent, linkable channel is the only one in the O‘ahu stack that can carry a map, a shelter list, or a correction.

O‘ahu's monthly test timing differs from the generic statewide description: sirens and EAS are tested on the first business day of each month at 11:45 a.m. [C-07]. The county also defines what the steady tone actually instructs — "tune into local radio, TV or other official online media," not "evacuate" [C-07] — enumerates the four WEA categories including local evacuation and shelter orders, and names the official DEM social channels (@Oahu_DEM) used as the confirming source during a warning [C-07].

ASSEMBLY-AREA DOCTRINE

Honolulu's shelter doctrine is the sharpest county divergence in the entire record, and the county states it plainly. For a tsunami, Honolulu opens **assembly areas**: outdoor parking lots or fields, minimally staffed, with no services and bathrooms only if available, active only while the warning is in effect [C-08]. For a hurricane, the same county opens **Hurricane Refuge Areas**: pre-engineered buildings intended to hold people for hours to days [C-08]. All locations are pet-friendly with a leash or carrier requirement, and the county warns that refuge buildings "HAVE NOT been designed or hardened for hurricane conditions" [C-08].

The stated rationale for the tsunami approach is a single clause: "unsafe areas are known in advance" [C-08]. That is a defensible doctrine on its own terms. A tsunami evacuation is a short, geographically bounded movement out of a mapped zone during a bounded warning period; a person who has left the zone is safe, and does not need a hardened building, a cot or a meal. The hurricane case is the opposite on every axis — the hazard is areal rather than linear, the duration is days, and the danger is the building the person is standing in.

The problem is not the doctrine. It is that the doctrine is unique to one county and the word is not. On 29 July 2025, Honolulu opened **16 Tsunami Assembly Areas** — McKinley High School, Hāhā‘ione Valley Neighborhood Park, Waimānalo District Park, Niu Valley Middle School and twelve further district parks and community facilities — plus three makai-bound closures on Fort Weaver Road [C-58]. On the same evening, Hawai‘i County opened ten indoor facilities, Maui County seven, and Kaua‘i County nine [C-58][C-49]. A person who has evacuated on one island and expects "shelter" to mean the same thing on another has a specific, foreseeable, and unaddressed misunderstanding.

THE QUANTITATIVE CORE: CHAPTER 17

Chapter 17 of the City and County of Honolulu 2025 Local Hazard Mitigation Plan is the richest quantitative tsunami source produced by any Hawai‘i county [C-09]. The plan was adopted in July 2025 and is effective through 1 July 2030, assessing tsunami within a 20-hazard scope and framing which tsunami actions are fundable under FEMA hazard mitigation assistance programmes [C-10]. The chapter index places tsunami at Chapter 17 alongside Chapter 4 Risk Assessment, Chapter 5 Hazard Identification, Chapter 6 Climate Change and Sea Level Rise, and Chapter 23 Mitigation Strategy [C-11] — and Chapter 6 matters to a tsunami reader because sea-level-rise projections are the input that shifts future inundation extents beyond the currently mapped zones [C-11].

The exposure figures separate cleanly into two families, and they are not interchangeable.

MEASURE	STANDARD	EXTREME
Residents in inundation area	40,026 (4.0%) [C-09]	149,936 (14.8%) [C-09]
Buildings in inundation area	10,186, \$20.4B [C-09]	36,967, \$72.2B [C-09]
Residents in evacuation zone	69,483 (6.9%) [C-09]	121,659 (12.0%) [C-09]
Critical facilities	321 [C-09]	883 [C-09]
Debris estimate	8,474 tons [C-09]	300,630 tons [C-09]

The inundation and evacuation-zone counts differ because they measure different things: the inundation area is the modelled flooded extent, the evacuation zone is the operational boundary drawn around it [C-09]. Note the direction of the difference. In the standard case the evacuation zone holds substantially *more* people than the inundation area — 69,483 against 40,026 — because the operational line is drawn conservatively outward. In the extreme case it holds *fewer* — 121,659 against 149,936 [C-09]. Anyone quoting a single "population at risk" figure for O‘ahu should say which of the four numbers it is.

Within the 883 critical facilities in the extreme zone are **125 health and medical facilities and 57 energy facilities** [C-09]. The debris figures are the starkest ratio in the chapter: an extreme event generates roughly thirty-five times the debris tonnage of a standard one [C-09].

The historic runup record for O‘ahu, as the chapter states it: 11.3 m at Makapu‘u and 10.9 m at Ka‘ena Point in 1946; 9.1 m at Ka‘ena in 1957; 5.2 m at Camp Erdman in 2011 [C-09]. Costs: the 2011 Tōhoku event cost the City \$3.4 million, plus \$1 million at Ke‘ehi and \$300,000 at Hale‘iwa small boat harbours; the January 2022 Hunga Tonga event cost \$3.32 million [C-09]. The chapter records **111 tsunamis measured on O‘ahu between 1819 and 2025** — 107 distant-source and 4 local — of which 8 produced deaths or damage [C-09].

Warning time by source region, as the chapter gives it: 4.5 hours from Alaska, 14 to 15 hours from Chile, and 30 to 60 minutes for a local source [C-09].

The forward-looking figure is the one a planner should read twice. New development from 2020 to the present has placed **406 units inside the extreme zone**, and in **Ko‘olau Loa, 75.0 percent of all new development is in the extreme zone** [C-09]. Exposure on O‘ahu is not a static inheritance from mid-century construction; it is being added to now, and in one district it is being added to almost exclusively.

THE 2025 AFTER-ACTION REPORT

The City and County of Honolulu Department of Emergency Management after-action report for the July 2025 tsunami was prepared with the consultant Ascentra and released on 15 July 2026 [C-12]. It is the single most important county document produced in the last two years, and it is the only after-action report published by any Hawai‘i county for the 29 July 2025 event [C-12].

A caveat on sourcing. The report PDF could not be fetched directly during this research. Its URL was confirmed independently by two secondary sources — Hawai‘i Public Radio and Honolulu Civil Beat — and the contents summarised below are drawn from those two accounts rather than from the document itself [C-12][C-60]. It should be obtained and read in full before any of these findings is relied on operationally.

The headline finding is behavioural: **92 percent of the vehicle trips made during the O‘ahu evacuation were unnecessary**, a figure drawn from an initial Hawai‘i Department of Transportation congestion study [C-12]. The underlying HDOT study is not published [C-12].

The organisational findings are more consequential for planning. DEM staff relied on **institutional knowledge rather than documented protocols**; new employees had received no tsunami-specific training; and — the finding that reframes everything else — **tsunami-specific protocols were not in the City Emergency Operations Plan** and must be added [C-12]. The department ran the response with **15.5 positions covering 24/7 operations** [C-12] [C-60]. Thirteen new positions were subsequently funded by the City Council, eight of them DEM-requested [C-12].

The recommendation set covers protocols, training, capacity and public understanding: add tsunami-specific protocols to the City EOP, expand training, add capacity, improve hazard awareness through the O’ahu Hazard Explorer, promote vertical evacuation, and redesign the evacuation maps to show only the relevant zone [C-12] [C-60]. The map recommendation is a direct response to the two-tier confusion described in 4.2 above: a sheet showing both red and yellow requires the reader to know which one applies today.

One recommendation deserves precise handling because it is easily misread as an existing capability. The report recommends **developing emergency response reserve personnel** [C-60]. This is a recommendation, not a programme in being. Honolulu does not currently operate an emergency response reserve corps; the after-action report proposes that it create one [C-60].

THE GAP THE REPORT IMPLIES

No public City and County of Honolulu Emergency Operations Plan or tsunami annex exists — no URL for either was located in this research. The after-action report explains why the search fails: it recommends that tsunami-specific protocols **be added** to the City EOP, which implies that the plan in force during the largest evacuation in modern Hawai’i history contained no tsunami annex at all [C-12]. For a county with 121,659 residents inside its extreme evacuation zone [C-09], that is the most significant documentary gap in the county record.

4.3 Hawai’i County

THE AGENCY AND ITS ALERTING ARCHITECTURE

The Hawai’i County Civil Defense Agency is reachable at (808) 935-0031 and civildefense@hawaiicounty.gov [C-22]. Its opt-in enrolment keyword is **HAWAIIALERTS to 888777** — distinct from O’ahu’s HNLALERT on the same shortcode [C-19] [C-06]. The county runs Civil Defense Alerts and separate Hawai’i Police Department alerts on the same platform [C-19], and both moved to Everbridge in July 2025 [C-43].

Hawai’i County is the only county that publishes its full voluntary broadcast-partner list for Civil Defense messages: AM 670 plus fifteen named FM frequencies — 92.7, 93.1, 94.7, 95.9, 96.1, 97.1, 97.9, 98.5, 99.1, 100.3, 101.5, 102.7, 105.3, 106.9 and 107.7 [C-19]. That list is the practical answer to the question the county’s own siren doctrine raises. Because the siren is defined as an instruction to seek a message rather than as the message itself, the roster of stations carrying the message is operationally load-bearing, and only this county publishes it [C-19].

The county’s own record contains one documented failure of that architecture. During the January 2022 Hunga Tonga event, Hawai’i County Civil Defense sent its advisory at 2:03 a.m. — after the waves had already arrived in West Hawai’i — and no sirens sounded on that side of the island [H-29].

SIREN DOCTRINE AND INVENTORY

The county states its siren doctrine explicitly: a siren tone means go to radio, television or mobile device for the message, not evacuate on the tone alone [C-19]. The public brochure adds a convention used nowhere else in the state except Kaua’i’s edition of the same brochure family — **"each ring equals 1 hour of tsunami travel time coming to Hawai’i"** [C-22]. That convention is not used in Maui County’s equivalent brochure [C-22] [C-29]. The

brochure also directs evacuation "by foot or bicycle if at all possible," gives the vertical-evacuation fallback as the fourth floor and higher of a concrete building, prints the five-tier alert ladder from Information Statement through Extreme Warning, and carries a 1819–2025 timeline of 24 tsunamis affecting Hawai‘i [C-22].

Hawai‘i County is the only county whose siren inventory and failure rate are on the public record: **92 sirens installed island-wide, with 9 non-functional during an October 1 monthly test** — roughly 10 percent — as stated by Civil Defense Administrator Talmadge Magno [C-26]. The same source gives the maintenance split that applies statewide: the state Emergency Management Agency owns maintenance, repair and replacement, while county workers handle only minor repairs such as battery replacement [C-26]. That division is why a county cannot unilaterally fix its own coverage, and why the county-published malfunction reporting numbers route a report into a state repair queue [C-26][S-17].

THE UNRESOLVED QUESTION OF THE EXTREME TIER

Hawai‘i County operates an official zone-determination tool, named as authoritative by both HI-EMA and NWS/ITIC, carrying March 2025 zone data with corrections applied on 20 November 2025 [C-20][C-55]. Whether the county maps an extreme tier at all is genuinely unresolved in the published record, and this compendium does not resolve it. The evidence runs both ways.

Against an extreme tier: NWS/ITIC's side-by-side comparison of the four counties' evacuation mapping states that two-tier maps "were found necessary and updated for Maui and Kauai County," lists O‘ahu, Maui and Kaua‘i with two-tier products, and does not attribute an extreme tier to Hawai‘i County [C-54][C-20]. The state's Tsunami Safe Zones layer likewise excludes Hawai‘i Island [S-30].

For an extreme tier: the county's own current public brochure prints the full five-tier alert ladder including "Extreme Warning" [C-22], and the statewide Extreme Tsunami Evacuation Zones GIS layer carries Hawai‘i Island geometry sourced from the County of Hawai‘i with a March 2025 date and November 2025 corrections [S-27][C-50].

Those two bodies of evidence cannot both be complete. The question should be put directly to HCCDA. It is the single most consequential structural ambiguity in the county record, because it determines whether the largest island in the state operates the same evacuation vocabulary as the other three [C-54][C-20][C-22].

MAPS, PLANS AND THE LAND-USE INSTRUMENT

The county's evacuation maps are a numbered sheet series — sheet 01 covers Hilo, the most tsunami-consequential locality in the state — distributed through the county's Laserfiche WebLink records-management repository rather than through a public web map library [C-21]. That distribution choice, rather than any absence of product, is why Hawai‘i County's evacuation sheets are hard to find [C-21].

The 2020 Multi-Hazard Mitigation Plan public review draft of 18 May 2020 was the predecessor plan of record, carrying the county's tsunami hazard profile, Hilo Bay inundation history and exposure and loss estimates [C-23]. It is superseded in substance by the 2025 update, prepared by Tetra Tech, led by HCCDA, with more than 25 stakeholder organisations participating [C-24]. The 2025 plan is the current governing mitigation document for Hawai‘i Island tsunami risk; its chapter PDFs are not exposed on the county's hub page, so the tsunami chapter must be requested directly [C-24].

The instrument that actually shapes the ground is not the mitigation plan. It is Chapter 5, Flooding and Other Natural Hazards, of the General Plan for the County of Hawai‘i — adopted February 2005 by Ordinance 05-025 and amended in December 2006, May 2007, December 2009 and June 2012 [C-25]. Chapter 5 is structured as Introduction and Analysis, Goals, Policies, Standards, and then district-by-district guidance across all nine districts, which means tsunami land-use standards are stated separately for South Hilo and Hilo Bay than for

Puna, Ka‘ū, Kona, Hāmākua and the rest [C-25]. That district-specific structure is the policy vehicle through which the post-1946 and post-1960 Hilo bayfront setback and open-space pattern is perpetuated in current law [C-25]. Hawai‘i County’s long-run answer to the tsunami hazard is a land-use answer, and it is carried in a general plan chapter rather than in an emergency-management document.

SELF-SERVICE PREPAREDNESS INSTRUMENTS

Hawai‘i County publishes a set of preparedness instruments no other county publishes: **Project 360 – ‘Ohana Emergency Plan**, a **Business Emergency Evacuation Plan Template** in Word format, and a **Community Emergency Response Plan Template**, also in Word [C-27]. The business template is the closest thing any of the four counties publishes to a self-service commercial evacuation planning instrument, and it is therefore the nearest available substitute for a hotel or resort tsunami evacuation requirement — which no county in Hawai‘i appears to impose [C-27].

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Hilo recorded an amplitude of 4.9 feet above normal sea level, the second highest observed in the state that evening [C-59]. The county opened ten indoor facilities: Ka‘ū District Gym, Kea‘au Armory, Kealakehe High Gym, Nā‘ālehu Community Center, Pāhoa Neighborhood Facility, Panaewa Park, Pu‘ueo Community Center, Waimea Community Center, Waikoloa Elementary and Yano Hall [C-58]. Mayor Kimo Alameda led the county response [C-59].

Four tactics were used on Hawai‘i Island that no other county used [C-59]:

7. Downtown Hilo entrances were physically blocked, closing the bayfront district rather than relying on messaging to keep people out of it [C-59].

8. Helicopters with loudspeakers were flown over beaches, reaching beach users who were outside the range of every other channel in the alerting stack [C-59].

9. A crew was hiked into Waipi‘o Valley to reach a population with no road access and no reliable coverage [C-59].

10. Keaukaha residents were moved across the closed Hilo airport runway, using the airfield as an evacuation corridor once flight operations had stopped [C-59].

Each of these addresses a coverage or egress problem that is specific to the island’s geography, and each is the kind of action that exists in practice but not in any published county procedure located in this research.

One documentary note belongs with this county. The zone data behind its lookup tool was corrected on **20 November 2025 after the State layer was found to be inaccurate** [C-50][S-27]. It is the only documented instance in the record of a published state tsunami zone layer being wrong and having to be repaired, and it happened four months after the county had used those zones in a live evacuation [C-50][S-27].

4.4 Maui County

MEMA AFTER LAHAINA

The Maui Emergency Management Agency is the only county emergency management agency in Hawai‘i whose strategic plan is explicitly restructured around alerting lessons from a mass-casualty event. *Always Preparing, Stronger Together: Building a Resilient Maui Nui*, the 2025–2030 MEMA Strategic Plan published in 2024, runs 37 pages and states that MEMA was funded for 15 positions with an opportunity for 7 more in FY25, to 22 [C-28].

Goal 4 of the plan covers Public Information, Alerts and Warning. Objective 4.4 addresses the public siren warning system with performance measures for **both** siren functionality and community awareness of what sirens mean [C-28]. That second measure is unusual and worth noting: it commits the agency to measuring public comprehension, not merely equipment status — the gap the foundational Hawai‘i warning study quantified at 13 percent comprehension [C-28][H-57]. Objective 4.5 introduces Genasys Evac for targeted location-based alerting, and the plan sets a redundancy requirement across SMS, email, social media, sirens, radio, television and mobile applications [C-28].

Staffing has since nearly tripled, from 9 to 25 employees, with 3 more from 1 October 2026 [C-35]. Administrator Amos Lonokailua-Hewett took over in January 2024, after Herman Andaya's resignation [C-35].

THE SIREN POLICY SHIFT

Maui's post-Lahaina change to siren doctrine is the most significant single doctrinal revision in the county record. **Sirens now activate based on communication disruption — a cell service failure, for example — rather than on hazard type** [C-35]. The administrator's stated rationale is a single sentence: "the siren is a sound — it doesn't provide a message" [C-35].

That is a coherent position, and it is arguably the correct one given what is known about siren comprehension [H-57][S-16]. But it sits directly against what the county's own public brochure teaches. The April 2025 Maui County TsuFacts tri-fold states that sirens sounding means evacuation is necessary and that "significant and widespread land flooding is expected" [C-29]. Hawai‘i County's and Kaua‘i's editions of the same brochure family, issued by the same partners on the same date, teach the opposite: a siren means go to your radio, and each ring equals one hour of tsunami travel time [C-22][C-40]. Three doctrines, one shared siren system, one brochure series, one issue date.

The Maui brochure also gives the vertical-evacuation threshold as the fourth floor or higher of a building of at least ten stories of reinforced concrete, lists MEMA contacts at (808) 270-7285 and Emergency.Management@mauicounty.gov, and prints the full five-tier alert ladder with the explicit zone mapping — Warning means evacuate red zones, Extreme Warning means evacuate yellow and red [C-29].

One authority fact must be stated without qualification, because every county's public materials read as though the county sounds its own sirens. **During the July 2025 tsunami warning, the state Emergency Management Agency — not MEMA — controlled siren activation** [C-35]. This is confirmed by MEMA's own administrator, and it is the single most important authority distinction found in the county research [C-35]. It is consistent with the federal description of the split, under which HI-EMA coordinates the statewide sounding of the first siren and subsequent soundings are the county's responsibility [F-45], but no county's public materials convey it.

GENASYS PROTECT AND EVACUATION BY NAMED ZONE

MEMA announced Genasys Protect on 7 April 2025 and the platform went live on **1 May 2025**, under a multi-year contract covering alerting plus AI traffic management [C-36]. The predetermined evacuation zones are **all modelled to clear in 30 minutes or less**, and Ladris AI traffic modelling was prioritised to Lahaina and Pā‘ia [C-35]. (The county's own announcement page returned a rate-limit error during this research and could not be fetched directly; it is corroborated by StateScoop, Maui Now, Spectrum News and a Genasys press release [C-36].)

The structural point is not the vendor. It is the addressing scheme. Maui County now issues zone-specific evacuation orders against **named evacuation zones**, while the other three counties order evacuation by **tsunami zone colour** [C-36][C-35][C-03][C-38]. Those are different languages for the same instruction. A red-zone order is legible to anyone holding any Hawai‘i tsunami brochure; a named-zone order requires the recipient

to know which named zone they are standing in, which requires the platform, which requires enrolment or a lookup. The advantage is precision and modelled clearance time; the cost is that a Maui evacuation order is not intelligible to a person carrying the mental model the other three counties teach, and cross-county mutual aid and statewide messaging both get harder as the gap widens.

THE 2025 HAZARD MITIGATION PLAN

The County of Maui 2025 Hazard Mitigation Plan — HI-EMA review draft May 2025, dated August 2025, in "Approvable Pending Adoption" status — runs over 400 pages and covers Maui, Molokaʻi and Lānaʻi in one countywide analysis [c-30].

It assesses tsunami in a way no other county plan does: **three separate inundation scenarios by recurrence interval** — SOEST at 400 years, GAT at 1,500 years, and ASCE at 3,500 years — rather than the two-tier red and yellow framing the county uses operationally [c-30]. The plan and the map sheets therefore answer different questions: the plan asks what happens at a given return period, the sheets ask what to evacuate on a given alert.

Two exposure findings stand out. **29.5 percent of the county's critical infrastructure and community lifeline facilities sit in tsunami inundation zones, and more than 20 percent of Maui County residents live in tsunami-vulnerable areas** — the highest proportional population exposure of any Hawaiʻi county [c-30]. Against those findings, the plan rates tsunami a **"Low" overall hazard** [c-30]. That ranking judgment differs materially from Honolulu's treatment of the same hazard [c-30] [c-09], and it is stated here as the plan states it rather than reconciled. A "Low" rating in a multi-hazard plan is a composite of probability, consequence and other weighted factors, and it governs which mitigation actions compete successfully for funding — so the disjunction between the state's highest proportional exposure and a "Low" hazard rating is a finding with funding consequences, not merely a semantic one.

The 2020 Maui County Hazard Mitigation Plan remains relevant as baseline: it was the plan in force during both the 2023 Lahaina fire and the 2025 tsunami, and a separate "2020 MCHMP Amendments" document records interim changes made between the two plan cycles — the only place those amendments are captured [c-31].

THE COUNTY HISTORICAL RECORD

Maui County's own hazard profile gives the most specific county-level historical dataset available online [c-32].

ITEM	FIGURE
Tsunami events 1800–2020	61, of which 7 caused significant damage, injury or death [c-32]
Recurrence	About one event every 3.5 years; rated "likely" [c-32]
1946 fatalities	14 dead, 2 injured, 3 homes destroyed [c-32]
1946 wave heights	To 33 feet [c-32]
1957 declaration	Wailuku-Kahului, March 1957, \$5M [c-32]
1960 declaration	Wailuku-Kahului, May 1960, \$763,000 [c-32]
2011 cost	\$6.37M — the county's costliest [c-32]

The 1946 event was Maui's deadliest, damaging Kahului, Honolua, Honokōhau, Hāmoa, Keʻānae, Lower Pāʻia and Māla [c-32]. In 1960, waves "washed inland for a distance of about 3,000 feet" [c-32]. The 2011 event struck south and west Maui [c-32]. The county states its risk zone as within one mile of shore and below 25 feet elevation [c-32].

THE COUNTY'S OWN MAP SERIES

Maui County maintains a numbered PDF evacuation sheet series in its DocumentCenter — "Maui Eleven — Kahakuloa Bay" is a representative sheet — each printing the three-band legend of Safe Zone, Tsunami Evacuation Zone and Extreme Tsunami Evacuation Zone [c-33]. The oddity is what the higher tiers do with it. HI-EMA and NWS/ITIC both point the public for Maui County to NOAA's national viewer at tsunami.coast.noaa.gov rather than to these county sheets [c-33][c-55], and MEMA's own 29 July 2025 evacuation press release likewise directed the public to the NOAA viewer for zone lookup rather than to county maps [c-34]. The county's map series is effectively unadvertised by the county, the state and the federal information centre alike [c-33][c-34][c-55].

THE MAUI ISLAND PLAN

The enforceable land-use instrument is Chapter 3, Natural Hazards, of the Maui Island Plan within the Maui County General Plan 2030, adopted in 2012 [c-37]. It addresses tsunami among natural hazards and is the instrument through which Kahului and Lahaina shoreline development standards are set [c-37]. It is distinct from the hazard mitigation plan in the way that matters: its policies are enforceable through zoning and permitting rather than advisory [c-37].

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MEMA's own press release gives the county's activation timeline: **full activation at 2:30 p.m.**, NWS Tsunami Warning at **2:45 p.m.**, MEMA-issued evacuations at **3:22 p.m.**, first wave expected at **7:17 p.m.** [c-34]. The release establishes the authority chain in the county's own words — "Maui Emergency Management Agency (MEMA) ... issued evacuations via sirens, Emergency Alert System, Wireless Emergency Alert" — which makes MEMA itself the evacuation-ordering body on Maui, not the mayor [c-34]. Fifty-two minutes elapsed between full activation and the evacuation order [c-34].

A note on the warning time. MEMA's release gives 2:45 p.m. [c-34]; HDOT's official state timeline gives 2:43 p.m. [s-40]; Kāua'i reporting gives 2:44 p.m. [c-49]. The spread is two minutes and the discrepancy is in the source record, not in this account.

The three statewide siren activations that evening came at **5:10 p.m.**, **6:10 p.m.** and **6:40 p.m.** — the actual cadence used, which no county document states [c-61]. Maui Bus ended operations by 6:30 p.m. [c-61]. Kahului Harbor observers recorded the water receding approximately 15 feet around 8 p.m. [c-61]. MEMA lifted the evacuation orders after 11 p.m., when NWS downgraded to advisory [c-61]. Kahului recorded 5.7 feet of amplitude above normal sea level — the highest observed in the state, with a crest-to-trough range of about 11 feet [c-59].

Maui County took utility protective actions no other county took. It **proactively closed water valves in Wailuku, Kahului and Lahaina and shut down wastewater pump stations** ahead of the wave, and evacuated the Maui Beach Hotel door to door [c-59]. Seven facilities opened, including Moloka'i High School, Kihei Community Center, the Velma McWayne Santos Center, Lahainaluna High School, Hāna High School and the Mayor Hannibal Tavares Community Center [c-58]. The Maui Police Department announced the closure of all Kahului Beach Road access points [c-58].

The Moloka'i and Lāna'i detail is thin in the public record, and what exists is worth preserving: **Kalaupapa Airport staff prepared to evacuate to the lighthouse**, and water service was shut down in Moloka'i coastal areas [c-61]. The dedicated Moloka'i and Lāna'i tsunami runup observation map is the only product in the ITIC county set covering those two islands together [c-52].

THE VINTAGE PROBLEM

Maui County's evacuation-zone data dates from **August 2013**, produced via the Pacific Disaster Center — twelve years older than O'ahu's, Kaua'i's and Hawai'i County's 2025 vintages [C-50][S-27]. The state GIS record documents this per island; the state's own PDC-hosted map viewer carries a caution directing Maui users to the county site for current maps, consistent with the stale data in the statewide layer [C-50][S-27][S-31].

NOTE

Maui County runs the newest alerting technology in the state on the oldest evacuation-zone geometry in the state — a Genasys platform live since May 2025 [C-36] issuing orders against zones drawn in August 2013 [C-50][S-27] — in the county with the highest proportional population exposure to tsunami of the four [C-30].

4.5 Kaua'i County

KEMA AND ITS PUBLISHED INSTRUMENTS

The Kaua'i Emergency Management Agency publishes two instruments that no other Hawai'i county publishes in any form [C-41].

The first is the **Emergency Refuge Area Status Page**, a live ArcGIS application showing which refuge areas are currently open [C-41]. Every county publishes a list of potential facilities; only Kaua'i publishes real-time status against that list [C-41]. This matters because every county's list carries the caveat that not all listed facilities will open in any given event [C-45], which leaves a resident of the other three counties with a list and no way to know which entry is live.

The second is the **Monthly Siren Reporting Tool** at arcg.is/1riain5, a crowd-sourced instrument through which residents report siren audibility after the monthly test [C-41]. Against a system whose manufacturer-rated radius is 3,400 feet but whose actual coverage varies with terrain [C-56], and whose statewide readiness is otherwise reported only as an aggregate operational count [S-18], resident audibility reporting is the only published mechanism in the state for detecting a coverage gap that a functioning siren still produces.

ALERT KAUA'I AND THE EVERBRIDGE MIGRATION

ALERT Kaua'i delivers phone calls, text messages and email [C-42]. The voice-call channel is worth noting because the O'ahu and Hawai'i County descriptions do not emphasise it [C-42][C-06][C-19]. The system's hazard scope is stated as tsunamis, hurricanes, earthquakes and flash flooding, and the Kaua'i Department of Water shares the platform for water outage and boil-water notices [C-42]. Registration is by portal, by telephone at (808) 241-1800, or by email to kema@kauai.gov [C-42].

The county migrated from Inspiron to **Everbridge on 5 May 2026**, on the recommendation of a county selection committee [C-43]. The operational reason the change matters is a reach change rather than a feature change: Everbridge's **Resident Connect** database reaches on-island contacts *beyond traditional opt-in lists*, which is materially broader than an opt-in-only roster [C-43]. For a county whose 2025 experience identified visitors in vacation rentals as the group least able to find evacuation guidance [C-49], a database that reaches beyond self-enrolled residents addresses precisely the population that failed to be reached.

The migration also consolidated the state. Hawai'i County Civil Defense and the Hawai'i Police Department moved to Everbridge in July 2025, so with Kaua'i's move, three of four counties now run the same platform [C-

43]. Note that the state's visitor-facing guide maps Kauaʻi to WENS [S-46], which predates the May 2026 migration and should be read as superseded [C-43][C-42].

SIRENS

Kauaʻi states plainly what the other three counties leave implicit: the county's sirens are "owned and operated by the Hawaiʻi Emergency Management Agency (HI-EMA)," not by the county [C-44]. That sentence is the clearest county-side confirmation of the ownership arrangement that governs all four counties [C-44][C-56], and it is the counterpart to the Maui finding that HI-EMA controlled siren activation on 29 July 2025 [C-35].

Siren locations are published across four separately addressable regional sub-pages — North, East, South and West Kauaʻi — the most granular public siren geography published by any Hawaiʻi county [C-44].

THE CONSOLIDATED MAP BOOK

Kauaʻi publishes its complete two-tier evacuation map book as a **single downloadable PDF**: 22 map sheets plus an overview, dated January 2016, covering Kauaʻi and Niʻihau from Lihūʻe and Nāwiliwili through Waimea, Port Allen, Poʻipū and the Nā Pali Coast [C-38]. It is the only county of the four to publish its whole extreme-zone map book as one consolidated file [C-38]. Niʻihau's zone data is separately sourced from NOAA, dated October 2016 [C-38][C-50].

The book prints the operative decision rule — "in the unlikely case of an 'Extreme Tsunami Warning' ... evacuate out of the red and yellow zones" — and a disclaimer that the data "is not intended to replace site survey" and does not account for locally generated tsunami effects [C-38]. The second half of that disclaimer is the standing state caution restated in county form [C-38][C-50], and on Kauaʻi it is not academic: the extreme-scenario modelling that produced the yellow zone forecasts over 40 metres of runup against the steep cliffs at Hanalei [H-35].

THE 3.5-HOUR WINDOW AND THE 2025 BROCHURE

Kauaʻi's earlier Tsunami Facts FAQ carries a numeric threshold present in no other county document reviewed: for an Extreme Tsunami Warning, it states that a **3.5-hour window** may be available [C-39]. That is a tighter figure than the four-to-five-hour evacuation time the federal information centre attaches to the extreme scenario [C-39][F-46], and it appears in no other Hawaiʻi county material. The same document gives the Kauaʻi vertical-evacuation formulation — reinforced concrete buildings of ten or more stories, fourth floor or higher — alongside the recommendation to walk or bicycle rather than drive, and the three natural warning signs of severe shaking, unusual ocean behaviour and a roaring sound [C-39].

The current April 2025 edition carries a 1819–2025 map showing **33 tsunamis** affecting Hawaiʻi — a higher count than the Hawaiʻi Island edition of the same brochure, which shows **24** [C-40][C-22]. Both editions were issued by the same partners on the same date [C-40][C-22]. The two counties filter the same underlying record differently; the common data source behind both is the ITIC historical effects wall chart compiling every recorded tsunami effect in Hawaiʻi from 1812 to 2022 [C-62]. Kauaʻi uses the Hawaiʻi-Island-style siren convention of one ring per hour of travel time, unlike Maui's [C-40][C-29].

The brochure includes a detailed inset evacuation map for the **Wailua-to-Kealia corridor**, and notably does **not** carry a Hanalei or north-shore inset — despite the north shore being the county's most constrained evacuation area [C-40].

THE REFUGE-AREA LIST AND THE HANALEI NEGATIVE

KEMA's potential refuge area list names **19 facilities across three regions** — North/East, Central, and South/West — including the Kauaʻi Humane Society [C-45]. It carries the standing caveat that "not every refuge area on this list will be opened during an emergency" [C-45], which is the caveat the county's live status page exists to resolve [C-41].

The most consequential detail on the list is a negative. The only North Shore entries are **Kilauea Neighborhood Center Gym and Kilauea Elementary** — **there is no Hanalei refuge area** [C-45]. Hanalei residents and visitors must therefore cross the Hanalei Bridge to reach refuge, and the nearest refuge is at Kilauea [C-45]. That single geographic fact is why bridge management, rather than shelter capacity or messaging, is the controlling operational lever on Kauaʻi's north shore [C-45][C-48].

THE 2026 MITIGATION AND RESILIENCE PLAN

The County of Kauaʻi Multi-Hazard Mitigation and Resilience Plan, Volume 1 of 2, dated 2026 with references through October 2025, carries its tsunami hazard chapter at Section 7 [C-46]. The section is structured around Table 7-2 (exposed population and property in the tsunami inundation zone), Table 7-3 (communities with high or above social vulnerability located in the tsunami inundation area), Figure 7-3 (critical facilities in tsunami inundation areas) and Table 7-4 (loss impact); Volume 2 carries the appendices [C-46].

Table 7-3 is the distinguishing feature. **Kauaʻi is the only county whose plan indexes tsunami exposure against a social vulnerability threshold by community** [C-46]. Every county plan quantifies who is inside the zone; only this one identifies which communities inside the zone are least able to respond [C-46].

Set against that, the same plan carries **exactly one tsunami-specific mitigation action countywide** — the lowest of any county plan reviewed [C-46]. The analytical sophistication and the mitigation output run in opposite directions, and the gap between them is the plan's most notable feature.

CAPACITY AND ITS DEPENDENCY

KEMA's capacity trajectory is documented in hard numbers in the agency's FY2021 annual report: **6 positions in FY2020** (2 grant-funded), **18 in FY2021** (14 grant-funded), and **26 projected for FY2022** (22 grant-funded), on a FY2021 programme expenditure of about \$2.23 million — \$996,886 in salaries and \$1.22 million in operations [C-47]. The agency more than quadrupled in size in two years, and it did so on grant funding: **22 of the 26 projected FY2022 positions were grant-funded** [C-47]. That dependency is a structural fragility not visible in any other county document [C-47]. The report also records the tsunami activations of the period — an advisory in October 2020 and a watch activation in March 2021 — and the "Tsunamis Live!" public training events of April and May 2021 [C-47].

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Kauaʻi's timeline is the most completely documented of the four counties [C-49][C-48].

TIME	ACTION
1:25 p.m.	PTWC Tsunami Watch [C-49]
2:44 p.m.	Tsunami Warning [C-49]
3:00 p.m.	KEMA issues evacuation notices [C-49]
3:25 p.m.	Sirens sound [C-49]
3:50 p.m.	Hanalei Bridge westbound halted, eastbound open [C-48]

TIME	ACTION
4:15 p.m.	Nine refuge areas open [C-49]
6:10 p.m.	Coastal roads and eleven bridges close [C-49][C-48]
11:15 p.m.	All-clear [C-49]

KEMA issued its evacuation notices **16 minutes after the warning** [C-49]. The operationally decisive action came 66 minutes later: at 3:50 p.m., westbound Hanalei Bridge traffic was halted while eastbound remained open, converting the island's single north-shore lifeline into a one-way outbound evacuation route [C-48]. No written procedure for that conversion was located in this research, although its execution reads as pre-planned [C-48].

Ten closure points were activated at 6:10 p.m., named in the county-side record: Kaumuali'i Highway at Fort Elizabeth; Kaumuali'i west of Lele Road; Kaumuali'i at Waialo Road; the Po'ipū Road roundabout; Ala Kinoiki at Weliweli; Nāwiliwili at Lala; Rice at Mōkoi; Kūhiō at Kapule; Kūhiō at Kāmole; and Kūhiō at Hanalei Plantation Road [C-48]. The parallel account records eleven bridges closed at the same time [C-49]. The two counts describe overlapping but not identical sets — closure points and bridges — and are reported here as published rather than reconciled [C-48][C-49].

Refuge areas took approximately **1,800 people**, with about **150 staying overnight** — the only per-county occupancy figures located for the 29 July 2025 event in any county [C-49]. Hanalei itself was blocked to vehicular entry as the county's highest-risk coastal town [C-59], and Hanalei recorded 3.0 feet of amplitude [C-59].

The authority arrangement on Kaua'i is distinct in a way that shows only in the primary record: **an emergency proclamation was issued by the Office of the Mayor while KEMA ordered the evacuation** [C-48]. Kaua'i is the only county for which a mayoral proclamation is documented during the 2025 event [C-48], and the proclamation authority is state statutory, under HRS §127A-14 [C-57].

KEMA Administrator Elton Ushio committed publicly to a post-incident review [C-49]. No Kaua'i after-action report has been published [C-49].

One finding from Kaua'i generalises to every county with a visitor economy. **Visitors staying in vacation rentals, rather than in hotels, were the group least able to find evacuation guidance** [C-49]. A hotel has staff, a front desk, a public-address system and an operator with a relationship to the county; a vacation rental has none of these, and its occupants are outside every institutional channel except WEA and the sirens — one of which is capped at 360 characters [F-40] and the other of which carries no message at all [S-16].

4.6 The seven differences that matter

1. Tier structure diverges. O'ahu, Maui and Kaua'i operate two-tier evacuation zones — a standard red zone and an extreme yellow zone [C-01][C-29][C-38]. NWS/ITIC's side-by-side comparison of the four counties does not attribute an extreme tier to Hawai'i County [C-54][C-20], while Hawai'i County's own brochure prints a five-tier alert ladder including "Extreme Warning" [C-22] and the statewide extreme zone layer carries county-sourced Hawai'i Island geometry [S-27]. The question is unresolved in the published record and should be put to HCCDA directly [C-54][C-20][C-22].

2. Siren meaning is taught three different ways across one shared system. On Maui, a siren means evacuate: the county brochure states that sirens sounding means evacuation is necessary and that significant, widespread land flooding is expected [C-29]. On Hawai'i Island and Kaua'i, the same brochure series teaches that

a siren means go to your radio, and that each ring equals one hour of tsunami travel time [C-22][C-40]. On O‘ahu, the steady tone instructs the public to tune into local radio, television or other official online media — not to evacuate [C-07]. Four counties, three doctrines, one state-owned siren system [C-56], and residents and visitors moving freely among them.

3. Shelter doctrine diverges so far that a visitor's expectation of "shelter" is wrong on three islands out of four. Honolulu opens outdoor, minimally staffed assembly areas with no services, active only while the warning is in effect, on the stated rationale that unsafe areas are known in advance [C-08]. Hawai‘i County, Maui County and Kaua‘i County open staffed indoor facilities — gyms, armories, school buildings and community centres [C-58][C-49]. On 29 July 2025 that produced 16 outdoor assembly areas on O‘ahu against 10, 7 and 9 indoor facilities on the other three islands [C-58][C-49]. The word "shelter" carries a different promise in each case, and no county's materials say so.

4. Siren activation authority is not what county materials imply. MEMA's administrator confirms that during the July 2025 tsunami warning, HI-EMA — not the county — controlled siren activation [C-35]. Kaua‘i states on its own siren page that its sirens are owned and operated by HI-EMA [C-44], and the sirens are a single state-operated system statewide [C-56]. The federal description of the split is that HI-EMA coordinates the statewide sounding of the first siren, and subsequent soundings are each county's responsibility [F-45]. Every county's public materials nonetheless read as though the county sounds its own sirens, and on the largest evacuation in modern Hawai‘i history, at least on Maui, it did not [C-35].

5. Zone data vintage varies by twelve years. O‘ahu's and Kaua‘i's zones date from April 2025; Hawai‘i County's from March 2025, with corrections applied on 20 November 2025 after the state layer was found inaccurate; Maui County's from **August 2013**, via the Pacific Disaster Center [C-50][S-27]. The county with the oldest geometry is the county with the highest proportional population exposure in the state — more than 20 percent of residents in tsunami-vulnerable areas, and 29.5 percent of critical infrastructure and community lifeline facilities inside inundation zones [C-30]. Twelve years separates the line a Maui evacuee is asked to cross from the line an O‘ahu evacuee is asked to cross.

6. Evacuation addressing is diverging between colour and named zone. Since 1 May 2025, Maui County issues evacuation orders against named Genasys Protect zones, each modelled to clear in 30 minutes or less [C-36][C-35]. The other three counties order by zone colour — red for a warning, red and yellow for an extreme warning [C-03][C-22][C-38]. Both schemes work internally. Neither translates. Statewide messaging, cross-county mutual aid and any visitor carrying a single mental model of Hawai‘i tsunami evacuation all become harder as the two addressing schemes drift apart.

7. Only one county has published an after-action report on the largest evacuation in modern Hawai‘i history. Honolulu's DEM report, prepared with Ascenttra and released on 15 July 2026, found that 92 percent of the vehicle trips made during the O‘ahu evacuation were unnecessary; that staff relied on institutional knowledge rather than documented protocols; that new employees had no tsunami-specific training; and that tsunami-specific protocols were not in the City Emergency Operations Plan and must be added [C-12][C-60]. KEMA's administrator committed publicly to a post-incident review [C-49]; no Kaua‘i report has been published. No Maui or Hawai‘i County after-action report is evidenced. Three counties evacuated their coastlines and produced no public record of what they learned.

THE TSUNAMIREADY DISTRIBUTION

The federal recognition roster closes the chapter, because its distribution measures something none of the county documents does: how deeply the national preparedness programme penetrated *below* the county tier.

Hawai‘i carries **17 TsunamiReady entities** — all four counties, plus community and government-site recognitions [C-51][F-23]. The named communities are ‘Āina Haina, ‘Ewa Beach, Kailua, Hanapēpē-‘Ele‘ele, Hau‘ula, Mā‘ili, Mākaha, Mānoa, Nānākuli, South Maui, Wai‘anae and Wahiawā, with Marine Corps Base Hawai‘i as the government and military site [C-51][F-23].

Two arithmetic notes on the roster. NWS describes the 17 as comprising 4 counties, 13 communities and 1 government site — a set that sums to 18, not 17 [C-51][F-23]. And the page names 12 communities, not 13 [C-51][F-23]. Recognition and expiration dates for the individual designations are not published on the roster page [C-51][F-23]; both discrepancies should be resolved with the NWS Honolulu Forecast Office.

The distribution is the finding. Of the twelve named communities, ten are on O‘ahu — ‘Āina Haina, ‘Ewa Beach, Kailua, Hau‘ula, Mā‘ili, Mākaha, Mānoa, Nānākuli, Wai‘anae and Wahiawā — as is the one government and military site [C-51][F-23]. One is on Kaua‘i (Hanapēpē-‘Ele‘ele) and one on Maui (South Maui) [C-51][F-23]. **None is on Hawai‘i Island [C-51].**

That is the island with 92 sirens and roughly a tenth of them non-functional at a recent test [C-26]; the island whose public brochure prints the alert ladder that no comparison table credits it with operating [C-22][C-54]; the island whose evacuation maps are distributed through a records-management repository [C-21]; and the island where 159 people died in 1946 and 61 in 1960 [S-33]. The county itself is recognised [C-51]. Not one of its communities is.

The federal guidelines set what a recognised community must satisfy: designated and mapped tsunami hazard zones; signage for danger areas, evacuation routes and assembly areas as locally determined; at least three different methods of receiving official alerts and three of disseminating them; a county-operated EOC where the year-round population is 15,000 or more; and a three-year follow-up exercise and education period after recognition [F-22]. Against those criteria, sub-county recognition is a measure of local organisational effort, not of local hazard. The distribution across Hawai‘i’s four counties therefore says less about where the waves go than about where the programme took root — and it took root, overwhelmingly, on one island.

The Event Record

- 5.1 What the record says in total
 - 5.2 The master table
 - 5.3 The events that set policy
 - 5.4 Local-source tsunamis
 - 5.5 The extreme scenario and the evidence for it
 - 5.6 Where the record is thin
-

5.1 What the record says in total

Tsunamis have killed more people in Hawai‘i than any other natural hazard, and no two official publications agree on how many [S-33]. The HI-EMA hazard page gives 263 killed since 1900 [S-33]; a HI-EMA news release issued for Tsunami Awareness Month gives 293 for the same period [S-41]. Both are current state materials, and the gap between them is thirty deaths [S-33] [S-41].

NOTE

The State of Hawai‘i publishes two different tsunami death tolls for the same period: 263 killed since 1900 on the HI-EMA hazard page [S-33], and 293 killed since 1900 in the agency's Tsunami Awareness Month release [S-41]. Neither cites the other. Cite the source, not the number.

The 293 figure has a traceable origin. The historical-effects chart produced by NOAA's National Centers for Environmental Information with the International Tsunami Information Center summarises 1812 to 2022 as nine tsunamis, 293 deaths, and over \$625 million in cumulative inflation-adjusted damage — a *damaging-event* count, not a count of tsunamis observed [H-46] [C-62].

The state's 2018 Hazard Mitigation Plan gave the long-run baseline in fuller form: since 1812 there have been more than 160 tsunamis in Hawai‘i, 135 confirmed and 26 unconfirmed, with over 2,000 runup observations; nine confirmed events caused 294 deaths and over \$600 million in damage [S-13]. The same section supplied the recurrence rule of thumb that still circulates in Hawai‘i briefings — that the state should expect a potentially damaging tsunami, one requiring coastal evacuation, approximately once every six years [S-13]. That document is superseded: the 2023 plan replaced it with a scenario-based risk assessment built on the Great Aleutian Tsunami and dropped the long-run statistics altogether, so the six-year rule and the 294-death figure have no current state source [S-12] [S-13].

The federal record counts differently again. The national tsunami hazard assessment prepared by NOAA NGDC and the U.S. Geological Survey classes Hawai‘i in the highest category, "Very High," and supplies the frequency statement most often quoted federally: a tsunami with a runup greater than 3.0 m, irrespective of source distance, hits Hawai‘i on average about once every ten years [F-33]. Its Hawai‘i tallies are 114 recorded events, 18 of them with runup exceeding 3.0 m, 326 deaths, \$59 million in damage, and 1,592 runup observations, the 1946 Hilo event alone producing over 400 runup records [F-33]. The federal 326 deaths exceeds both state figures, and its \$59 million is a fraction of the ITIC chart's \$625 million because one is nominal and the other inflation-adjusted [F-33] [H-46].

At the county scale the counts shrink again. Honolulu's 2025 Local Hazard Mitigation Plan records 111 tsunamis measured on O‘ahu between 1819 and 2025 — 107 from distant sources and four locally generated — of which eight caused deaths or damage [C-09].

Four differences account for all of this, and all four are legitimate. Start year: 1812, 1819 and 1900 are all in use, and the pre-1900 events include the deadliest local-source tsunami in the record [S-13] [C-09] [S-33]. Inclusion threshold: a count of *tsunamis observed* is an order of magnitude larger than a count of *tsunamis that killed or damaged*, which is why 160-plus events and nine events appear in the same paragraph of the same plan [S-13]. Validity rating: NCEI assigns each source event a validity code, and a compiler who admits only events rated above zero drops entries a more inclusive compiler keeps [F-38] [H-43]. And geography: statewide, per-island and per-county tallies are not interchangeable [C-09].

The underlying record is the same in every case. The NCEI/World Data Service Global Historical Tsunami Database holds over 2,400 tsunamis in two linked files — a Source file carrying date, location, cause, validity code, water height, fatalities, injuries and dollar damage, and a Runup file carrying location, wave arrival time, maximum water height and inundation distance per observation point [H-43]. Federal documentation counts over 2,200 source events rated above zero and more than 27,000 runup observations [F-38]. The HazEL query interface is the practical route to the Hawai‘i subset when a number in this Part needs to be reproduced or updated [H-44].

The disagreement runs down to public-education products issued in the same month by the same programme. The April 2025 TsuFacts brochure for Hawai‘i Island carries an 1819–2025 timeline of 24 tsunamis affecting Hawai‘i [C-22]; the Kaua‘i edition of the same series, same date, shows 33 [C-40]. Both are built from the ITIC/NCEI historical-effects wall chart, and the counties filter that common record differently [C-62]. An event count from a county brochure is that county’s editorial threshold.

5.2 The master table

The table below consolidates every damaging or policy-setting event in the record, plus the prehistoric benchmark and the modelled design envelope as clearly labelled non-historical rows. Where a figure is not stated in the sources compiled here the cell reads “—” rather than carrying an inferred value, and travel times marked with a source region are that region’s typical transit to Hawai‘i rather than an event-specific measurement.

DATE	SOURCE REGION	MAGNITUDE	TRAVEL TIME	MAX HAWAI‘I RUNUP (WHERE)	DEATHS (HI)	DAMAGE (HI)
1868-04-02/03	Local — Ka‘ū, Hawai‘i Is. [H-20]	M7.9, or M7.5 [H-20] [H-19]	Minutes [F-49]	13.7 m / 45 ft Keauhou Landing [H-19]; 46 ft nr Halape [H-47]	47 tsunami + 34 landslide [H-42]; 77 total [H-20]	108 homes destroyed [H-42]
1877-05-10	Iquique, Chile	—	14–15 hr (Chile) [H-47]	12 m oscillations	5	37 dwellings destroyed [H-42]
1923-02-03	Kamchatka [H-47]	—	6–7 hr (Kamchatka) [H-47]	20 ft Hilo; 12 ft Hale‘iwa [H-47]	1 [H-42]	~\$26 M in 2023 dollars [H-42]
1946-04-01	Unimak I., Aleutians [H-05]	Mw 8.6 [H-05]	4.9 hr to Hilo [H-05]	54 ft Waikolu Valley, Moloka‘i; 45 ft Hā‘ena; 27 ft Hilo [H-47]	158 [H-46]; 159 [H-42] [H-47]	\$26 M (1946) [H-05]; ~\$370 M (2023) [H-42]
1952-11-04	Kamchatka [H-10]	Mw 9.0 [H-10]	6–7 hr (Kamchatka) [H-47]	6.1 m Hawai‘i Is.; 4.5 m O‘ahu N shore [H-10]	0 [H-10]	\$0.8–1.0 M (1952) [H-09] [H-10]
1957-03-09	Andreanof Is., Aleutians [H-12]	Mw 8.3 [H-12]; rupture Mw 8.6–8.8 [H-13]	5–6 hr (Aleutian) [H-47]	16 m Hā‘ena, Kaua‘i; 3.9 m Hilo [H-12] [H-46]	0 [H-12]	~\$5 M (1957) [H-12]; \$300 K [H-42]
1960-05-22/23	Valdivia, Chile [H-08]	—	~15 hr; 440–445 mph [H-08] [H-06]	35 ft Hilo waterfront; statewide 2–17 ft [H-06]	61, all Hilo [H-06]	\$23.5 M [H-25]; ~240 ha inundated [H-46]

DATE	SOURCE REGION	MAGNITUDE	TRAVEL TIME	MAX HAWAI'I RUNUP (WHERE)	DEATHS (HI)	DAMAGE (HI)
1964-03-27/28	Prince William Sound, AK	—	Hilo 5.4 hr; Honolulu 5.3 hr	4.8 m Honolulu; 3.7 m Kahului; 3.0 m Hilo	0	\$53 K Kahului + \$15 K Hilo (1964) [H-16]
1975-11-29	Local — Kalapana, Kilauea S flank [H-17]	M7.2 [H-17]	Minutes; onset 0448 HST [H-17]	47 ft Keauhou [H-19]; 12.2–14.6 m SE coast [H-18]; 20 ft Kamoamoa [H-17]	2 at Halape [H-17]	\$3.75 M [H-17]; \$4.1 M [H-18]
2010-02-27	Maule, Chile	M8.8	~14.5 hr	Observed 1 m Hilo; 0.98 m Kahului; 0.28 m Nāwiliwili	0	Not stated; statewide evacuation [H-21]
2011-03-11	Tōhoku, Japan [H-25]	—	~8 hr (Japan) [H-47]	5 m Hawai'i Is., O'ahu, Kaua'i [H-46]; 17 ft Kealakekua [H-47]	0	\$30 M [H-25]; \$38 M [H-46]; ~\$7.5 M [S-43]
2022-01-15	Hunga Tonga– Hunga Ha'apai volcano [H-26]	Volcanic; not seismic [H-26]	Lamb wave ~710 mph, ahead of water wave [H-27]	~3 ft West Hawai'i [H-29]; 0.86 m Makapu'u [S-12]	0	~\$75 K Kailua- Kona [H-42]; \$3.32 M Honolulu Co. [S-12]
2025-07-29	Kamchatka [H-30]	Mw 8.8; source ~8.7 [H-30]	~6 hr [H-30] [S-40]	5.7 ft Kahului; 4.9 ft Hilo; 4.0 ft Hale'iwa; 3.0 ft Hanalei [C-59]	0 [C-59]	Not stated; statewide evacuation [C-59]
2026-04-20	Sanriku, Japan	M7.7	No threat declared	None	0	None [H-33]
Prehistoric, ~1450–1675 CE	E. Aleutians [H-34]	Mw >9.0 [H-34]	4–5 hr [H-52]	8–9 m modelled at Makauwahi, Kaua'i [H-34]	—	Deposit 100 m inland behind 7 m walls [H-34]
Design envelope (modelled)	E. Aleutians [H-35]	Mw 8.6–9.6, 40 scenarios [H-35]	4–5 hr — least warning of any far-field source [H-52]	30–35 m Hilo; >40 m Hanalei cliffs [H-35]	—	2–10× the historical record [H-35]

Read the table across, and read the travel-time column first: every other number in the row is a consequence of it. A Chilean source gives Hawai'i roughly fifteen hours — enough to sound sirens overnight, evacuate in daylight and still hold a shift change [H-08]. A Japanese source gives about eight hours, a Kamchatka source six to seven, an Aleutian source about five — and 1946 reached Hilo in 4.9 hours [H-47] [H-05]. The modelled extreme eastern-Aleutian scenario gives four to five hours, the least warning of any far-field threat to Hawai'i [H-52] [F-46]. A local source gives minutes: a tsunami generated on the south flank of Hawai'i Island can reach Hilo Bay four to five minutes after the earthquake, faster than any warning can be issued [F-49].

That gradient explains the shape of the record. The two events that killed large numbers of people — 1946 and 1960 — were not the largest waves in the table by every measure; they were the events where available time was not converted into evacuation [H-05] [H-06]. The comparable events with zero deaths, 1952 and 1957, differ in exactly that respect [H-10] [H-12].

5.3 The events that set policy

1868, KA'Ū

The April 1868 Ka'ū sequence is the largest historical Hawaiian earthquake and the deadliest local event in the record [H-20]. The USGS Hawaiian Volcano Observatory places the main shock at M7.9 on April 2, 1868; the ITIC local-source table dates the resulting tsunami to April 3 and assigns M7.5 [H-20] [H-19]. A foreshock on March 28 had toppled four or five stone churches and destroyed Captain Brown's stone house at Kahuku [H-20].

The casualty accounting differs by category. HVO records that "the subsequent tsunami and mud flow took the lives of 77 Hawaiians," treating the water and the landslide as one disaster [H-20]. The 2023 synthesis review separates them: 47 deaths from the tsunami and 34 from landslides, with 108 homes destroyed and waves of roughly 6 m [H-42]. The ITIC public-education compilation reports 47 deaths with a 46 ft runup near Halape [H-47], and the local-source catalog gives the maximum as 45 ft (13.7 m) at Keauhou Landing [H-19]. These are differently bounded rather than contradictory — the question is whether debris-flow deaths belong in a tsunami toll — but they cannot be added together.

Over 100 cattle were lost in the associated eruption, and Kamehameha V provided relief to approximately 800 people [H-20]. The event is eyewitness-driven rather than instrumental and carries no runup survey in the modern sense [H-20]. What it set was a boundary condition rather than a policy: Hawai'i's most lethal single tsunami source is Hawai'i itself [H-19].

1946, UNIMAK

The Aleutian tsunami of April 1, 1946 created the United States tsunami warning system.

The foundational field survey was published in *Pacific Science* by Macdonald, Shepard and Cox in January 1947, reporting over 150 deaths, primarily by drowning, at least 161 injured, and about \$25,000,000 in 1946-dollar property damage [H-01]. Its central scientific finding was not the casualty total but a pattern: wave heights and destructive intensity varied sharply between *adjacent* coastal locations, in ways that contradicted the tsunami literature of the day [H-01]. That observation is the origin of the modern understanding that local bathymetry and shoreline configuration control runup — and therefore of the practice of mapping evacuation zones shoreline segment by segment rather than by a single contour [H-01].

Two later surveys extended the picture in both directions. The 2002 far-field re-survey confirmed the Hawai'i maximum runup of 16 m and added 54 measurements across six inhabited Marquesas islands, where overland runup averaged 6.6 m and the maximum reached 14.6 m at Tahauku Bay on Hiva Oa [H-02]. Its conclusion was that 1946 was anomalously destructive in the far field relative to its seismic moment [H-02].

The near-field survey explains why. Okal, Plafker, Synolakis and Borrero measured a maximum runup of 42 m at the Scotch Cap lighthouse on Unimak Island — a reinforced-concrete structure whose base stood about 90 feet above sea level, destroyed with all five crew killed — with 30–40 m along the southwest coast between Scotch Cap and Cape Lutke [H-03]. On aspect-ratio grounds, and by analogy with the 1998 Papua New Guinea landslide tsunami, they concluded that a slow seismic rupture triggered a submarine landslide of roughly 200 km³ at Davidson Bank, and that the landslide rather than the earthquake produced the extreme near-field amplitudes [H-03]. Reprocessed marine geophysical lines later imaged the slide mass, an independent test of that hypothesis

[H-04]. The consequence for Hawai‘i is a parameterisation problem: if the near-field extreme was landslide-driven and the far-field wave seismic, the Hawai‘i runups constrain a different component of the source than the Unimak runups do [H-04].

The operational number from 1946 is the travel time: the tsunami arrived at Hilo 4.9 hours after generation [H-05]. Per-island maxima on the ITIC chart are 17 m on Hawai‘i Island, 10 m on Maui, 11 m on O‘ahu and 14 m on Kaua‘i [H-46]; the ITIC/Walker compilation gives 54 ft at Waikolu Valley on Moloka‘i, 45 ft at Hā‘ena and 27 ft in Hilo [H-47].

The death toll is unsettled and should be quoted with its scope attached. ITIC states 96 deaths in Hawai‘i, its Hilo-area figure [H-05]; USGS Circular 1187 fixes the Hilo-only toll at 98 [H-08]. The ITIC chart and the state's Tsunami Awareness Month release give 158 statewide [H-46] [S-41]; the 2023 synthesis review, the ITIC essentials brochure and the HI-EMA hazard page give 159 [H-42] [H-47] [S-33]. The reconcilable reading is 96–98 for Hilo alone against 158 or 159 statewide, but no source here reconciles them explicitly [H-05] [H-08] [S-41] [H-42]. Damage was \$26 million in 1946 dollars [H-05], approximately \$370 million in 2023 dollars [H-42].

ITIC frames what changed in a single sentence: "There was no Tsunami Warning Center in 1946 but if people would have been educated on the tsunami hazard and understood tsunami natural cues, loss of life in Hilo would have been minimal to none" [H-05].

1952, KAMCHATKA

November 4, 1952 was the first major test of the system created after 1946, and the demonstration case for everything Hawai‘i does now [H-10].

The source was a Mw 9.0 earthquake off Kamchatka [H-10]. In the near field it was catastrophic: 18.4 m runup on Paramushir and 15 m at Severo-Kurilsk, with a travel time to Olga Bay of about 42 minutes [H-10]. In Hawai‘i it was substantial but is reported three different ways. ITIC gives 6.1 m on the Island of Hawai‘i and 4.5 m on the O‘ahu north shore [H-10]; the peer-reviewed Big Island survey gives a maximum of 12 ft at Coconut Island, about 11.5 ft in Hilo and 11 ft at Reed's Bay [H-09]; the ITIC historical-effects chart gives per-island maxima of 4 m, 1 m, 1 m and 3 m [H-46]. Those accounts of the same event's Hawai‘i Island maximum do not agree, and the discrepancy is live for anyone tabulating 1952 [H-09] [H-10] [H-46]. Damage was \$800,000 to \$1,000,000 in 1952 dollars — beached boats, damaged houses, destroyed piers, scoured beaches [H-09] [H-10] [H-55]. Deaths: zero [H-09] [H-10].

That is the finding. A Mw 9.0 source producing metre-scale runup across islands that had lost more than 150 people to a comparable event six years earlier killed nobody, because this time the waves were forecast and the coast was cleared — warning plus evacuation converting a lethal tsunami into a property-loss tsunami [H-10].

1957, ANDREANOF

The March 9, 1957 Aleutian tsunami left Hawai‘i with a runup nobody could explain for six decades [H-11].

The source was assigned Mw 8.3, south of the Andreanof Islands [H-12]. Hawai‘i runups were 16 m on Kaua‘i near Hā‘ena Point, 3.9 m at Hilo, and 2–3 m on average elsewhere; Coconut Island was covered by a metre of water and its footbridge destroyed [H-12]. No lives were lost, and damage was about \$5 million in 1957 dollars — bridges destroyed, highways flooded, houses washed away [H-12]. The 2023 synthesis review records 54 homes destroyed and a damage figure of \$300,000, an order of magnitude below the ITIC number [H-42] [H-12]. The primary field survey by Fraser, Eaton and Wentworth remains the classic reference for Hilo Bay resonance and for the anomalous distribution of 1957 runup [H-11].

The anomaly: 16 m on Kauaʻi is far larger than a Mw 8.3 source should produce at that distance, and no seismic-only model could reproduce it [H-11][H-13].

It was resolved in 2024. Yamazaki, Lay, Cheung, Witter, La Selle and Jaffe found 12 to 26 m of shallow slip over a 600 km section of the *eastern* Aleutians — a tsunami-earthquake component of Mw 8.3–8.6 embedded inside an overall rupture of Mw 8.6–8.8 spanning about 1,200 km [H-13]. Only that eastern shallow slip explains the 6–12 m (20–40 ft) waves observed in Hawaiʻi [H-13]. The USGS statement of the result puts it plainly: the eastern Aleutian slip "now accounts for the documented tsunami heights" in Hawaiʻi [H-14].

This raises the Hawaiʻi design hazard rather than settling it. The eastern Aleutian segment is aimed squarely at the islands, and 1957 is now the empirical proof that it slips shallowly and tsunamigenically — the behaviour that generates disproportionate far-field waves [H-13][H-14]. The extreme-zone modelling in Section 5.5 assumes exactly this mechanism at larger scale [H-35].

1960, CHILE

May 23, 1960 is the event that governs Hawaiʻi evacuation policy, because it is the event in which the warning worked and the people did not move.

The Chilean earthquake generated a tsunami that crossed the Pacific at 440–445 mph [H-06]. An official warning was issued at 6:47 p.m. Hawaiian time [H-08]. The tsunami was detected in Hilo Bay at 0007 HST and on the Honolulu tide gauge at 0033 HST — roughly 15 hours from Chile, and more than five hours after the warning went out [H-06][H-08].

The wave sequence in Hilo is the part every survivor account turns on. The first wave was about 4 feet, the second 9 feet above normal, the largest roughly 20 feet [H-08]; observers on the ground recorded the third as the destructive one, arriving as a bore [H-07]. Statewide runup ranged from 2 to 17 ft with a maximum of 35 ft near the Hilo waterfront, island averages running about 9 ft on Hawaiʻi Island, 10 ft on Maui, 7 ft on Oʻahu and 5 ft on Kauaʻi [H-06]. The synthesis review gives the Hilo bore height as 10.7 m [H-42], and roughly 240 hectares were inundated [H-46].

Sixty-one people were killed, all of them in Hilo [H-06][H-08]. The injury figure differs by source: Cox and Mink and USGS Circular 1187 both report 282 [H-06][H-08], while the NCEI record gives 43 injuries alongside the same 61 deaths and \$23.5 million in damage [H-25]. Set against Chile's more than 2,000 dead and Japan's 122, Hawaiʻi's 61 is small in absolute terms and enormous in policy terms [H-08].

NOTE

A warning was issued more than five hours before the first wave reached Hilo, and 61 people died anyway [H-06][H-08]. That gap between a correct warning and a lethal outcome is the single most important fact in Hawaiʻi evacuation policy, and it is why the state's messaging targets behaviour rather than detection.

What Hilo did afterwards was structural. The county did not rebuild the inundated bayfront, and that decision is perpetuated in current law through Chapter 5 of the County of Hawaiʻi General Plan, which states tsunami land-use goals, policies and standards district by district, so that South Hilo and Hilo Bay carry standards distinct from Puna, Kaʻū, Kona or Hāmākua [C-25]. The open space on the Hilo bayfront today is the 1960 casualty list expressed as zoning [C-25][H-07].

1975, KALAPANA

November 29, 1975 is the local-source case, and it is the reason Hawai‘i teaches shaking as a warning in its own right.

A M7.2 earthquake struck 2.5 miles southwest of Kalapana with onset at 0448 HST [H-17]. It followed a magnitude-5.7 foreshock, generated hundreds of aftershocks, and was succeeded by a summit eruption of Kilauea roughly 45 minutes after the main shock [H-18]. The maximum runup reported contemporaneously was 20 ft at Kamoamoa Campground [H-17]; the USGS geologic report gives the higher figure now standard in the literature, 12.2 to 14.6 m above sea level on the southeastern coast [H-18], and the local-source catalog lists 47 ft (14.3 m) at Keauhou [H-19].

The mechanism was compound, and this is the technically important part. Kilauea's south flank subsided by up to 3.5 m — coconut palms were left standing in seawater and near-shore islands submerged [H-18]. Loomis attributes the initial water rise of 3 ft at Kalapana and more than 6 ft at Halape partly to that coseismic subsidence rather than to wave arrival [H-17]. The observed water level was therefore the sum of a wave and a permanent drop in the land [H-17] [H-18].

The wave itself behaved unlike a distant tsunami. Periods were 2 to 3 minutes crest to crest, with 10-to-15-second oscillations reported at Halape; five or six discernible waves arrived, the second being the largest [H-17]. Two of the 36 campers at Halape were killed [H-17]. Damage totalled about \$3.75 million, roughly \$1.5 million of it attributable to the tsunami alone, with about 12 dwellings and 12 boats destroyed or severely damaged [H-17]; Hawai‘i Civil Defense put the total at \$4.1 million [H-18], and the 2023 review gives approximately \$5.2 million in 2023 dollars [H-42].

Local-source events differ qualitatively from distant ones on three counts, all visible in 1975: the warning interval is minutes rather than hours, so no centralised alert can precede the wave [F-49]; wave periods are minutes rather than the tens of minutes measured for distant events, so the water arrives and withdraws faster than an evacuation can be completed [H-17] [H-16]; and the ground itself moves, so the shoreline that was safe before the earthquake may be lower afterwards [H-18]. None of these can be managed by improving detection.

2010, CHILE

February 27, 2010 is the over-evacuation lesson, and the National Research Council's Hawai‘i case study is the authoritative forecast-versus-observed record for it [H-21].

The M8.8 Maule earthquake occurred at 8:34 p.m. HST on February 26; PTWC issued its first warning 15 minutes later; sirens sounded around 6:00 a.m. on February 27; the first waves arrived roughly 14.5 hours after the earthquake; and the warning was lifted by 2:00 p.m. the following day [H-21].

The forecast-versus-observed comparison is the number that matters. PTWC forecast 2.5 m crest-to-trough at Hilo, 2.2 m at Kahului and 0.5 m at Honolulu; observed amplitudes were approximately 1 m at Hilo, 0.98 m at Kahului and 0.28 m at Nāwiliwili — roughly a factor-of-two over-forecast at the key sites [H-21]. Timing was better than amplitude: NOAA's MOST propagation run produced a 9-minute early arrival for Hawai‘i and the West Coast, a 0.8-to-1-percent error over the full ocean crossing [H-22].

The review also documented failures unrelated to the model: officials made public misstatements about sheltered coastlines that contradicted tsunami physics, and shelter protocols were unclear to the public receiving them [H-21]. A statewide evacuation was executed correctly against a forecast twice too large, and the cost was counted not in dollars but in the credibility available for the next warning [H-21].

2011, TŌHOKU

March 11, 2011 changed the maps.

The definitive modelling study of what the tsunami did around Hawai'i is Cheung, Bai and Yamazaki, which used the NEOWAVE model with the authors' own finite-fault Tōhoku source to reproduce the observed surges island by island [H-23]. Its contribution is the explanation of persistence: dangerous currents lasted for days because wave energy was trapped in standing-wave and shelf-resonance modes around the island chain — the mechanism behind the Kona destruction and the harbour damage that occurred hours after the first wave, and the technical basis for every all-clear decision that refuses to be rushed [H-23].

The official field survey is USGS Open-File Report 2012-1229, carrying a machine-readable table of site-by-site runoff and inundation measurements for the Island of Hawai'i, and documenting that East Hawai'i coastlines were affected as well as the heavily damaged Kona side — correcting the impression that 2011 was a west-side-only event [H-24]. Per-island maxima on the ITIC chart are 5 m on Hawai'i Island, 2 m on Maui, 5 m on O'ahu and 5 m on Kaua'i [H-46]; the ITIC essentials brochure gives 17 ft on the Kaua'i and O'ahu north shores and at Kealahou [H-47]; Honolulu's plan records 5.2 m at Camp Erdman [C-09].

Damage figures for 2011 vary more widely than for any other modern event, and the variation is one of scope. NCEI gives \$30 million for Hawai'i [H-25] and the ITIC chart \$38 million [H-46]. HI-EMA's ten-year retrospective gives approximately \$7.5 million across Honolulu, Maui and Hawai'i counties [S-43]; the 2023 review gives approximately \$8.7 million in 2023 dollars [H-42]; Honolulu's plan reports \$3.4 million in costs to the City plus \$1 million at Ke'ehi and \$300,000 at Hale'iwa small boat harbours [C-09]. State and county figures appear to count public-agency repair costs while federal figures count total losses, but no source states the reconciliation [S-43] [H-25]. A Presidential Major Disaster declaration followed on April 8, 2011, with \$6.4 million in federal repair assistance; more than 200 waves were recorded [S-43].

What 2011 changed is the single most consequential item in this Part after 1946. The state's 2018 Hazard Mitigation Plan documents that the Tōhoku event proved the 2010 evacuation maps had underestimated flooding — and identifies that finding as the origin of the 2014 remapping that produced Hawai'i's current zone products [S-13]. That the finding survives only in a superseded plan section is itself worth noting; the 2023 update does not restate it [S-13] [S-12].

2022, HUNGA TONGA

January 15, 2022 broke the assumptions the warning system was built on.

The International Tsunami Information Center's institutional assessment identifies multiple simultaneous generating processes: submarine explosion, caldera collapse, pyroclastic flows, and "acoustic pressure waves that generate coupled air-sea waves" travelling faster than water waves, with PTWC reporting amplitudes up to 2 m [H-26]. Its statement is unusually direct: "This is the first time that the PTWS has had to respond to a destructive volcanic event of these characteristics as the PTWS has primarily focused on earthquake-generated tsunamis" [H-26].

The physics is now characterised. Atmospheric Lamb waves radiated from the eruption at about 710 mph, circling the globe three and a half times [H-27]. The coupling rule of thumb is that one millibar of pressure change generates about one centimetre of vertical change in the ocean surface [H-27]. The amplifier is Proudman resonance, operating where the atmospheric wave speed matches the shallow-water wave speed — over trenches deeper than roughly six miles [H-27]. Waves arrived in Japan more than two hours ahead of the classical travel time [H-27], and the peer-reviewed analysis established that the globally observed early arrivals were air-sea coupled waves driven by the Lamb wave rather than a conventional water-borne tsunami [H-28].

Hawai‘i’s experience was a warning failure. The eruption occurred around 6 p.m. Hawai‘i time on Friday; the first waves reached West Hawai‘i at about 2 a.m. Saturday as a roughly 3-foot surge [H-29]. Hawai‘i County Civil Defense sent its advisory at 2:03 a.m. — after the waves had already arrived — and no sirens sounded in West Hawai‘i [H-29]. Damage was itemised: a 288-gallon propane tank thrown 30 feet into the Sea Quest retail space; a destroyed picnic table and debris at Kahalu‘u Beach Park; flooding at King Kamehameha’s Kona Beach Hotel and at Kai Eats and Drinks; canoes pushed into the rockwall at Kamakahonu Bay [H-29]. The 2023 review puts Kailua-Kona losses at approximately \$75,000 [H-42]; the 2023 Hazard Mitigation Plan records \$3.32 million in Honolulu County with a maximum wave of 0.86 m at Makapu‘u Point [S-12], and NCEI notes amplitudes above 1 m at Hawaiian tide gauges [H-25].

What it changed is a category. A volcanic-atmospheric source is not a seismic source: it can arrive ahead of the computed travel time, it produces no magnitude to threshold against, and an alert sequence that assumes an earthquake first has nothing to trigger on [H-26][H-28][H-29].

2025, KAMCHATKA

The July 29, 2025 Kamchatka earthquake produced the most recent statewide Hawai‘i evacuation; Part Six covers the response, and the source and observations belong here.

The earthquake was Mw 8.8 at 52.512°N, 160.324°E, at 23:24:52 UTC on July 29, 2025, followed by more than 100 aftershocks of Mw 5 or greater within two days, five of them exceeding Mw 6 [H-30]. The final tsunami source was modelled as Mw 8.7-equivalent over a 500 by 150 km rupture south of the epicentre, inverted from three DART records and propagated globally with MOST [H-30].

The DART record includes a benchmark. Station 21416 recorded a peak of 0.85 m at about 35 minutes — the second-largest DART amplitude ever measured, exceeded only by the 1.9 m from the 2011 Japan tsunami [H-30]. Stations 21419 and 21415 recorded 31 cm and 25 cm at about one hour [H-30]. The archived water-level package covers 25 DART buoys plus four Hawai‘i tide-gauge series [H-31].

Observed Hawai‘i amplitudes above normal sea level were 5.7 ft at Kahului, the highest in the state; 4.9 ft at Hilo; 4.0 ft at Hale‘iwa; and 3.0 ft at Hanalei, with roughly 11 ft crest-to-trough at the first three [C-59]. USGS gives the state maximum as 1.7 m (5.7 ft) at Kahului and records that PTWC issued the warning 1 hour 19 minutes after detection, with waves arriving just after 7:00 p.m. HST [F-49].

2026, SANRIKU

The contrasting negative case is April 2026. A M7.7 earthquake — initially reported as 7.4 — occurred off Sanriku in northern Japan at about 20 km depth, around 4:53 p.m. local time on April 20, 2026 [H-33]. Japan forecast waves up to 10 ft in Iwate; observed values were about 2.6 ft at Kuji port [H-33]. PTWC was unambiguous: "Based on all available data, a destructive Pacific-wide tsunami is not expected and there is no tsunami threat to Hawaii" [H-33]. No Hawai‘i action followed. Set against the M8.8 of July 2025 that emptied Waikiki, it is the cleanest illustration that magnitude class, not the fact of a large Japanese earthquake, determines whether Hawai‘i moves [H-33][H-30].

5.4 Local-source tsunamis

Every confirmed locally generated tsunami in the Hawaiian Islands is listed below, with magnitude, maximum runup and deaths as compiled by Walker and reissued through ITIC from the Lander and Lockridge catalog and the NCEI Global Historical Tsunami Database [H-19].

DATE	MAGNITUDE	MAXIMUM RUNUP (LOCATION)	DEATHS
1868-04-03	M7.5	45 ft / 13.7 m (Keauhou) [H-19]	47 from the tsunami [H-42]
1908-09-21	M6.8	4 ft (Hilo)	0 [H-19]
1919-10-02	Not stated	14 ft / 4.3 m (Ho'opūloa)	Not stated [H-19]
1951-08-21	M6.9	4 ft (Ho'okena)	0 [H-19]
1952-03-17	M4.5	10 ft (Kalapana)	0 [H-19]
1975-11-29	M7.2	47 ft / 14.3 m (Keauhou)	2 [H-19]
1989-06-26	M6.5	0.29 m (Honu'apo)	0 [H-19]
2006-10-15	M6.7	0.1 m (Kawaihae)	0 [H-19]
2018-05-04	M6.9	0.4 m (Kapoho)	0 [H-19]

Two features govern local-source doctrine. The destructive entries cluster on Hawai'i Island's south and west coasts — Keauhou twice, Kalapana, Ho'okena, Ho'opūloa, Honu'apo — because the tsunamigenic structure is Kilauea's mobile south flank [H-19] [H-18]. And both M7-and-above events produced runups above 13 m while the M6-class events produced decimetre-scale water [H-19].

The timing is the operative fact. A tsunami generated from the south flank of the Island of Hawai'i can wrap around and reach Hilo Bay four to five minutes after the earthquake — faster than any warning can be issued [F-49]. USGS states the instruction without qualification: when strong shaking occurs, residents should not wait for sirens or phone alerts [F-49]. In a local event the earthquake is the warning, and the only one that will arrive in time.

The Department of Education has converted that into a measurable standard. Thirteen schools statewide lie inside primary tsunami evacuation zones, and those schools must be able to evacuate within ten minutes, because a locally generated tsunami can arrive in 15 to 30 minutes; separate guidance applies to distant tsunamis, where more warning time exists [S-36]. Tsunami is one of five mandatory statewide drill types, alongside lockdown, shelter in place, evacuation and earthquake [S-36]. Ten minutes is the only published operational deadline in Hawai'i tsunami practice derived directly from local-source travel time [S-36].

One limitation is easy to miss: the mapped evacuation zones do not model a locally generated tsunami at all. The state's metadata and caution document for both zone products states that "these maps do not consider the destructive effects of a locally generated tsunami. If you feel shaking, move inland immediately, well away from the evacuation zone" [S-25] [H-53]. The zones are expressly a minimum safe evacuation distance, not a boundary of expected inundation [S-25]. For the events above, the instruction is not to reach the edge of the yellow zone; it is to keep going.

5.5 The extreme scenario and the evidence for it

The extreme zone exists because of a hole in the ground on Kaua'i.

Butler, Burney and Walsh reported marine sediment — coral fragments, mollusc shells and beach sand — approximately 2 m (6.5 ft) below the surface inside the Makauwahi sinkhole on Kaua'i's south coast, 100 m (328 ft) from shore and behind walls 7 m (23 ft) high, radiocarbon-dated 350 to 575 years before publication [H-34]. Modelling Aleutian–Alaska scenarios from Mw 9.0 to 9.6, the authors found that only a rupture above magnitude

9.0 reproduces the observed inundation, producing water levels of 8 to 9 m (26 to 30 ft) at that site against roughly 2.5 m there in 1946 — at least three times the size of the largest event in Hawai‘i’s historical record [H-34]. Recurrence was estimated at roughly once per thousand years, about a 0.1 percent annual probability, with corroborating deposits of the same age at Sedanka Island in Alaska and on the western Canadian and U.S. coasts [H-34].

A follow-up study refined the date. Using U-series and radiocarbon dating of coral from the deposit, Butler, Burney, Rubin and Walsh linked the Makauwahi sediment to the "orphan" Sanriku tsunami recorded in Japan in 1586 — a specific dated Aleutian event rather than an undated window [H-37]. An event with an assignable date has an assignable position in a recurrence sequence, which a two-century window does not [H-37].

The recurrence sequence itself now exists. Yamazaki, Cheung, Lay, La Selle, Witter and Jaffe modelled stratigraphic tsunami deposits to identify three eastern Aleutian ruptures — 18th century at about Mw 8.4, 15th century at about Mw 7.9, 14th century at about Mw 8.7 — giving intervals of roughly 200 to 300 years across 700 years of record [H-15]. The finding that bears directly on Hawai‘i is that the 14th-century event could have exceeded the inundation of 1957, with modelled waves crossing more than 3,910 km of Pacific — the strongest published argument that Hawai‘i’s historical record alone understates the hazard [H-15].

The modelled envelope is the design basis. Butler, Walsh and Richards ran 40 scenarios from Mw 8.6 to Mw 9.6 through two independent codes — NOAA’s operational SIFT/SIM and the University of Hawai‘i research model NEOWAVE — including cases such as Mw 9.25ab with 50 m of shallow slip, Mw 9.43 on a 1,000 km fault and Mw 9.6 on a 1,400 km fault [H-35]. Forecast maximum runups exceed the historical record by factors of two to ten: 30 to 35 m at Hilo, comparably extreme values at Kahului and Hale‘iwa, and over 40 m on the cliffs at Hanalei, Kaua‘i [H-35]. The chain began with the post-Tōhoku re-examination of whether the Aleutian arc can host a Mw 9-plus rupture aimed at Hawai‘i [H-36]; the reason the Hawai‘i numbers are so large relative to open-ocean wave height is drawdown-and-runup amplification of N-waves over the islands’ narrow insular shelves, which is also why Hawai‘i cannot be assessed with continental-shelf assumptions [H-59].

NOTE

The governing conclusion for zone design is that "maximal tsunami inundations everywhere in the Hawaiian Islands cannot be generated by a single large earthquake" [H-35]. The extreme zone is an envelope of 40 modelled scenarios, not the footprint of one event. No single earthquake will ever fill it, and that is by construction.

There is a larger and far rarer class above this, and it must be kept separate.

Moore and Moore reported the limestone-bearing Hulopoe Gravel on the coastal slopes of Lāna‘i at elevations up to 326 m [H-38]. Dated submerged corals and tide measurements show the southeastern Hawaiian Islands are subsiding rapidly, placing former high sea stands *below* present sea level and eliminating the competing explanation that the deposit records an ancient high stand [H-38]. The authors concluded that it was laid down during the Pleistocene by a giant wave generated by a submarine landslide on a sea scarp south of Lāna‘i [H-38].

The landslide inventory is at ridge scale. GLORIA sonar mapping documented submarine mass wasting over approximately 100,000 km² of the Hawaiian Ridge, with individual debris avalanches exceeding 200 km in length and 5,000 km³ in volume, and distinguished slow slumps from fast debris avalanches — the fast avalanches being the tsunamigenic class [H-39]. The synthesis inventory counts at least 68 major landslides more than 20 km long along 2,200 km of ridge from Midway to Hawai‘i Island, one every 32 km on average [H-40]. Two are named in the Hawai‘i hazard literature: the Nu‘uanu debris avalanche northeast of O‘ahu, about 3.6 Ma, and the Wailau

slide off north Molokaʻi [H-40], mapped in detail with the transported blocks — Tuscaloosa Seamount among them — that demonstrate the violence of emplacement [H-41]. The synthesis states these avalanches "are believed to have produced major tsunamis" but supplies no runup estimates [H-40].

State this plainly, because the two are constantly conflated: the giant-landslide class is *not* what the yellow zone models. The extreme tsunami evacuation zone is built on eastern Aleutian megathrust scenarios in the Mw 8.6 to 9.6 range, recurrence roughly one per thousand years, Hawaiʻi arrival in four to five hours [H-35][H-34][H-52]. The Lānaʻi-class events are Pleistocene [H-38], the named Oʻahu and Molokaʻi slides older still at roughly 1.5 to 3.6 Ma [H-40][H-41], they originate inside the island chain rather than at a subduction zone across the Pacific, and they have no modelled inundation footprint in any Hawaiʻi evacuation product [H-38][H-39][H-40]. A yellow zone boundary is not a statement about a 326 m wave.

5.6 Where the record is thin

Several gaps are worth knowing about before a claim is built on this record.

The primary runup catalogs are not fully accessible. The definitive statewide 1960 catalog by Cox and Mink is available in full text only through a Japanese Tsunami Digital Library mirror, the publisher's copy being paywalled [H-06]. Cox's later technical reports for the Hawaii Institute of Geophysics and the UH Environmental Center — the documents that would extend the catalog beyond the 1963 paper — do not appear online at all and are likely held only in the UH Mānoa Hamilton Library Hawaiian Collection and the Water Resources Research Center archive [H-06]. That is the largest bibliographic gap in the Hawaiʻi tsunami literature. A smaller one: the authorship of the peer-reviewed 1952 Big Island survey could not be confirmed from any accessible index [H-09].

There is no published probabilistic tsunami hazard assessment for Hawaiʻi as such. What exists is a deterministic scenario envelope — the 40-scenario modelling that underpins the extreme zone [H-35] — plus recurrence constraints from two independent lines of evidence: roughly one per thousand years for a Mw greater than 9.0 eastern Aleutian event [H-34], and 200 to 300 years for the Mw 8-to-8.7 class [H-15]. The nearest probabilistic product is an engineering one: the state's Probabilistic Tsunami Design Zone maps, built to a 2,500-year return period under ASCE 7-16 Chapter 6 for Risk Category III and IV structures [S-37]. Those are building-code maps and must not be read as evacuation maps.

Two warning-era events survive as operational history rather than science. No post-event scientific assessment specific to Hawaiʻi was located for the 1994 East Rat Island or 1996 Andreanof events; they persist mainly in the ITIC's contemporaneous record of the Pacific warning system, which documents the warnings, responses and false-alarm debates as they happened [H-49]. The 1877 Iquique event has the same problem at the other end of the record: no dedicated Hawaiʻi post-event study exists, and it survives only inside the synthesis catalogs [H-42].

One number in circulation should be recomputed rather than cited. Tabulated Hawaiʻi maxima for the July 2025 Kamchatka event were not found in any published compilation. The archived tide-gauge series for Nāwiliwili, Kahului Harbor, Honolulu and Hilo Bay are downloadable at 15-minute, 1-minute and 15-second resolution, and any authoritative Hawaiʻi maximum for that event should be derived from them [H-31].

Two resources close the gap between the numbers and what happened to people. The Pacific Tsunami Museum in Hilo holds over 600 interviews and written accounts from people who survived or witnessed a Pacific tsunami, together with original 1946 event footage, historic photographs of Hilo town, and image collections indexed by event year [H-50]. Nothing in the federal or state catalogs substitutes for it. The standard narrative history is Dudley and Lee's *Tsunami!*, second edition, by the UH Hilo oceanographer who co-founded that museum [H-51].

29 July 2025

- 6.1 The day
 - 6.2 What each county actually did
 - 6.3 What the ocean did
 - 6.4 The after-action findings
 - 6.5 What has and has not changed since
-

6.1 The day

The earthquake occurred at 23:24:52 UTC on 29 July 2025 at 52.512°N, 160.324°E, off the Kamchatka Peninsula, and was assigned Mw 8.8 [H-30]. In Hawai‘i standard time that origin is 1:24:52 p.m. on the same day. What followed was the largest coastal evacuation in modern Hawai‘i history, executed in daylight, on a Tuesday afternoon, with roughly six hours between the shock and the first wave.

Four separate records document the day, and they were compiled for four different purposes. The Hawai‘i Department of Transportation prepared a minute-by-minute timeline for a House informational briefing four weeks later, which is the only official state chronology of a real Hawai‘i tsunami evacuation [S-40]. Maui Emergency Management Agency issued a contemporaneous press release fixing its own activation and evacuation times [C-34]. Kaua‘i’s actions were reconstructed in local reporting that names every closure point and refuge area [C-48][C-49]. Statewide operational detail — siren cadence, bus service, shelter rosters, observed wave heights — survives principally in contemporaneous reporting by Hawai‘i Public Radio, Honolulu Civil Beat, Maui Now and Government Technology [C-58][C-59][C-61][C-17].

Those records do not agree on when the Tsunami Warning was issued. HDOT’s timeline gives 2:43 p.m. [S-40]; Kaua‘i reporting gives 2:44 p.m. [C-49]; MEMA’s own release gives 2:45 p.m. [C-34]. The spread is two minutes and it is not resolvable from the published record. It is reproduced in the table below rather than resolved, because every downstream interval — county reaction time, siren lead, road-clear margin — inherits it.

A second anomaly sits at the top of the timeline. The seismic origin converts to 1:24:52 p.m. HST [H-30], and HDOT records the Tsunami Watch at 1:25 p.m. [S-40]. One minute is shorter than any warning centre’s analysis cycle; the U.S. Geological Survey’s own account of the event states that the Pacific Tsunami Warning Center issued the warning one hour nineteen minutes after detection [F-49]. Detection is not origin, and the published sources do not say how far apart the two were. Use the 1:25 p.m. watch time as HDOT recorded it, and do not derive an issuance interval from it.

The master timeline below assembles every time in the record with a named actor. Times are Hawai‘i standard time on 29 July 2025 unless noted.

TIME (HST)	EVENT	ACTOR
1:24:52 p.m.	Mw 8.8 earthquake off Kamchatka (23:24:52 UTC) [H-30]	—
1:25 p.m.	Tsunami Watch issued for Hawai‘i [S-40][C-49]	PTWC
2:30 p.m.	MEMA full activation [C-34]	MEMA
2:43 / 2:44 / 2:45 p.m.	Tsunami Warning — three times in the record [S-40][C-49][C-34]	PTWC
2:56 p.m.	State employees released [S-40]	State of Hawai‘i
3:00 p.m.	Kaua‘i evacuation notices issued [C-49]	KEMA
3:15 p.m.	Kolekole Pass opened as evacuation route [S-40][C-17]	Military / HDOT
3:22 p.m.	Maui County evacuations by siren, EAS and WEA [C-34]	MEMA
3:25 p.m.	Sirens sounded on Kaua‘i [C-49]	HI-EMA / KEMA
3:30 p.m.	Nānākuli contraflow shutdown directed [S-	HDOT

TIME (HST)	EVENT	ACTOR
	40]	
3:30 p.m.	Likelike Highway townbound reopened (Wilson Tunnel) [S-40]	HDOT
3:30 p.m.	Gridlock reported across urban O‘ahu [C-59]	—
3:42 p.m.	Tsunami warnings posted on freeway variable message signs [S-40]	HDOT
~3:50 p.m.	Hanalei Bridge westbound halted; eastbound left open [C-48] [C-49]	KEMA / HDOT Kaua‘i
4:15 p.m.	Nine Kaua‘i refuge areas opened [C-49]	KEMA
5:10 p.m.	First statewide siren sounding [C-61]	HI-EMA
6:00 p.m.	O‘ahu bus service stopped [C-59]	City and County of Honolulu
6:10 p.m.	Second statewide siren sounding [C-61]	HI-EMA
6:10 p.m.	Kaua‘i coastal roads and bridges closed [C-48] [C-49]	KEMA / County of Kaua‘i
6:30 p.m.	Maui Bus ended operations [C-61]	Maui County
6:40 p.m.	Third statewide siren sounding [C-61]	HI-EMA
7:00 p.m.	All evacuation-zone roads confirmed clear [S-40]	HDOT
7:17 p.m.	Estimated first wave [S-40] [C-34]	—
~8:00 p.m.	Kahului Harbour drawdown of about 15 feet [C-61]	—
after 11:00 p.m.	Maui County evacuation orders lifted on downgrade to advisory [C-61]	MEMA
11:15 p.m.	Kaua‘i all-clear [C-49]	KEMA

The single number to carry out of that table is seventeen minutes. HDOT confirmed all evacuation-zone roads clear at 7:00 p.m. and the estimated first wave was 7:17 p.m. [\[S-40\]](#). That is the margin the state actually achieved on a day with roughly six hours of warning, a distant source, daylight, and a working alert chain — and it was produced only because HDOT opened Kolekole Pass, shut down the Nānākuli contraflow, reopened the Likelike townbound tubes and pushed messages onto the freeway variable message signs across the preceding three and a half hours [\[S-40\]](#). The margin is not slack; it is what was left after every available traffic lever had been pulled. Against the four to five hours of warning an eastern Aleutian extreme event would give [\[F-46\]](#)[\[H-52\]](#), or the four to five minutes a south-flank Hawai‘i Island source would give Hilo Bay [\[F-49\]](#), seventeen minutes is the measured headroom in the current system.

6.2 What each county actually did

On O‘ahu the City and County of Honolulu opened sixteen tsunami assembly areas — outdoor parking lots and fields rather than staffed indoor shelters, consistent with standing county doctrine [\[C-08\]](#)[\[C-58\]](#). The published roster names McKinley High School, Hāhā‘ione Valley Neighborhood Park, Waimānalo District Park and Niu

Valley Middle School explicitly, with the remaining twelve described as district parks and community facilities [C-58]. The county also closed three makai-bound access points on Fort Weaver Road [C-58], and stopped bus service at 6 p.m. [C-59]. In 'Ewa the Asian Pacific International School site at Hau'ula was opened and took 600 to 700 vehicles [C-59]. Gridlock set in by 3:30 p.m., within an hour of the warning [C-59]. The measured travel times are the most quoted figures from the day: Hawai'i Kai to Pearl City took over two hours; Ala Moana to Kalihi took ninety minutes with minimal movement; typical commutes ran one and a half to three hours [C-17]. Kolekole Pass, opened by the military at 3:15 p.m. as an emergency route across the Wai'anae range, took roughly 400 vehicles before it closed — the only quantified throughput figure published for any bypass used that day [S-40] [C-17].

Hawai'i County opened ten shelters — Ka'ū District Gym, Kea'au Armory, Kealahou High School Gym, Nā'ālehu Community Center, Pāhoa Neighborhood Facility, Panaewa Park, Pu'ueo Community Center, Waimea Community Center, Waikoloa Elementary and Yano Hall — all staffed indoor facilities, in contrast with O'ahu's parking lots [C-58]. The county's tactics that afternoon were the most physically direct of the four. Civil Defense blocked the entrances to downtown Hilo outright [C-59]. Helicopters flew the beaches broadcasting evacuation instructions over loudspeakers [C-59]. A crew hiked into Waipi'o Valley to move people who could not be reached any other way [C-59]. And Keaukaha residents were evacuated across the runway of the closed Hilo airport [C-59]. Mayor Kimo Alameda led the county response [C-59].

Maui County opened seven shelters, including Moloka'i High School, Kihei Community Center, the Velma McWayne Santos Center, Lahainaluna High School, Hāna High School and the Mayor Hannibal Tavares Community Center [C-58]. MEMA itself issued the evacuations at 3:22 p.m. by siren, Emergency Alert System and Wireless Emergency Alert — the county agency, not the mayor, is the evacuation-ordering body on Maui [C-34]. Maui Police Department announced the closure of all access points to Kahului Beach Road [C-58]. The county then took a class of protective action no other county took: it proactively closed water valves in Wailuku, Kahului and Lahaina and shut down wastewater pump stations ahead of the wave [C-59]. Staff evacuated the Maui Beach Hotel door to door [C-59]. On the neighbour islands of Maui County, Kalaupapa Airport staff prepared to move to the lighthouse and water service was shut down in Moloka'i coastal areas — the only Moloka'i and Lāna'i operational detail in the published record for the day [C-61].

Kaua'i's controlling action was road and bridge management. At 6:10 p.m. the county activated ten named closure points: Kaumuali'i Highway at Fort Elizabeth; Kaumuali'i west of Lele Road; Kaumuali'i at Waialo Road; the Po'ipū Road roundabout; Ala Kinoiki at Weliweli; Nāwiliwili at Lala; Rice at Mōkoi; Kūhiō at Kapule; Kūhiō at Kāmole; and Kūhiō at Hanalei Plantation Road [C-48]. The parallel account of the same 6:10 p.m. action describes eleven bridges closed along with the coastal roads [C-49]. Ten closure points and eleven bridges are not the same count of the same thing, and the record does not reconcile them; treat the itemised list of ten as the closure-point roster and the eleven as a bridge count, and confirm both with KEMA. Earlier, at about 3:50 p.m., westbound traffic over the Hanalei Bridge was halted while eastbound remained open, converting the north shore's single lifeline into a one-way outbound route [C-48] [C-49]. Hanalei itself was blocked to vehicular entry as the county's highest-risk coastal town [C-59]. That configuration is a direct consequence of geography recorded elsewhere in the county's own planning: there is no refuge area on the Hanalei side of the bridge, the nearest being Kilauea [C-45]. Nine refuge areas opened at 4:15 p.m. and took approximately 1,800 people, with about 150 staying overnight — the only per-county occupancy figures located for the event [C-48] [C-49]. The Office of the Mayor issued an emergency proclamation, making Kaua'i the only county with a documented proclamation that day [C-48].

NOTE

Four counties ran four different playbooks on the same afternoon under the same federal warning. Honolulu

opened parking lots and moved traffic; Hawai‘i County blocked a downtown and flew loudspeakers; Maui shut utilities and evacuated a hotel door to door; Kaua‘i closed a bridge in one direction [C-58][C-59][C-61][C-48].

6.3 What the ocean did

Observed amplitudes above normal sea level, by station: Kahului 5.7 ft, the highest in the state; Hilo 4.9 ft; Hale‘iwa 4.0 ft; Hanalei 3.0 ft [C-59]. At the first three the crest-to-trough range was roughly 11 ft [C-59]. The federal account of the event gives the state maximum as 1.7 metres at Kahului, which is the same 5.7 ft in metric [F-49]. At Kahului Harbour the water drew down approximately 15 feet at around 8 p.m., some forty minutes after the estimated first wave [C-61].

The source was modelled from the deep-ocean network. The final tsunami source was resolved as Mw 8.7-equivalent over a rupture approximately 500 by 150 km south of the epicentre, inverted from three DART buoys and propagated globally with the MOST model, including inundation estimates at selected Hawai‘i locations [H-30]. Buoy 21416 peaked at 0.85 m about 35 minutes after the earthquake — the second-largest amplitude ever recorded on a DART buoy, exceeded only by the 1.9 m recorded from the 2011 Tōhoku event [H-30]. Buoy 21419 reached 31 cm at about an hour and 21415 reached 25 cm at about an hour [H-30]. The aftershock sequence was substantial: over one hundred Mw 5 and greater events within two days, five of them exceeding Mw 6 [H-30].

The archived water-level package for the event holds 25 DART buoys across the Pacific with raw observations, fitted tidal components and residuals at 15-minute, 1-minute and 15-second intervals, together with four Hawai‘i tide-gauge series — Nāwiliwili, Kahului Harbour, Honolulu and Hilo Bay — with plots and downloadable data [H-31]. That is where the Hawai‘i observed amplitudes for 29 July 2025 actually live. No published tabulation of Hawai‘i maxima for this event was located; the amplitudes in the first paragraph above come from press reporting [C-59][H-31]. Anyone preparing a figure of record for this event should recompute the per-station maxima from the archived NCEI series rather than propagate the press numbers [H-31].

The timing figure that matters for doctrine is the warning latency. PTWC issued the warning one hour nineteen minutes after detection, with waves arriving just after 7:00 p.m. HST [F-49]. That is the distant-source regime working as designed. The same source states the local regime for contrast: a tsunami generated on the south flank of Hawai‘i Island can wrap around and reach Hilo Bay four to five minutes after the earthquake, faster than any warning can be issued [F-49].

6.4 The after-action findings

Honolulu produced the only published county after-action report for 29 July 2025 [C-12][C-60].

A sourcing caveat governs everything in the next three paragraphs. The report — filed as CCH_DEM_07-25Tsunami_AAR, prepared by the Department of Emergency Management with the consultant Ascenttra and released 15 July 2026 — has a confirmed public URL, but the PDF could not be fetched directly during this research [C-12]. Its contents as summarised here come from two independent secondary accounts, Hawai‘i Public Radio and Honolulu Civil Beat, which agree on the substance [C-12][C-60]. Every finding below should be verified against the document itself before it is quoted in a formal setting.

The headline finding is that 92 percent of the vehicle trips made during the O‘ahu evacuation were unnecessary, a figure the report draws from an initial State Department of Transportation congestion study [C-12]. On the organisational side, the report states that Department of Emergency Management staff relied on institutional

knowledge rather than documented protocols, and that new employees had no tsunami-specific training [C-12]. The structural finding underneath both is that tsunami-specific protocols were not in the City Emergency Operations Plan at all and must be added [C-12]. The department ran 24/7 operations at 15.5 positions at the time of the event [C-12][C-60]; thirteen new positions were subsequently funded by the City Council, eight of them requested by the department [C-12].

The recommendation set follows from those findings. Add tsunami-specific protocols to the City Emergency Operations Plan [C-12]. Expand training [C-60]. Develop emergency response reserve personnel — which is a recommendation, not a programme that exists [C-60]. Promote vertical evacuation [C-12]. And redesign the evacuation maps so that a resident sees only the zone that applies to them, steering the public to the O’ahu Hazard Explorer, the multi-hazard address-lookup tool that overlays tsunami evacuation zone with flood, dam and wildfire risk and prints a result sheet for a household plan [C-12][C-60][C-05].

The state side of the review is HDOT's. Its briefing identifies gaps in public understanding of the difference between a Watch, an Advisory and a Warning, and commits the department to a Hawai’i Tsunami Traffic Mitigation Plan targeted for November 2025 [S-40]. That plan fills a documented hole: the state’s transportation annex establishes HDOT's authority to close roads, bridges, tunnels, harbours and airports but contains no contraflow procedure [S-05][S-40].

Both transportation principals arrived at the same revised public doctrine, and it is a reversal of the instinct the day produced. HDOT Director Ed Sniffen: next time, if you are safe, stay there [C-17]. City Transportation Director Roger Morton, in the same period: if you're in a safe place, stay there [C-16]. The message is not that evacuation is optional inside the zone; it is that people outside the zone drove, and their trips were what filled the roads.

The structural constraint that turned unnecessary trips into gridlock is single-egress communities — Lanikai, East Honolulu and Windward O’ahu are named — where one road carries everyone and a small volume of through traffic saturates it [C-17].

None of this was unforeseen. A University of Hawai’i agent-based model published in 2022 simulated short-notice pedestrian, bicycle and vehicle evacuation of Waikiki, and is the only Hawai’i-specific agent-based evacuation model located in this research [H-58]. Its scenario is 18,000 residents plus roughly 29,000 hotel-room occupants with 30 minutes of warning [C-16]. Its findings sort cleanly by mode: car evacuation produces roughly 40 percent fatality among vehicle evacuees, on the order of 11,000 deaths; vertical evacuation clears all evacuees to safety within 22 minutes; bicycle evacuation yields a 0.02 percent fatality rate [C-16]. The same research line, reported after the 2025 event, gives whole-scenario figures on a different basis — approximately 38,760 deaths with no intervention, vertical evacuation saving over 55,000 lives, a proposed Ala Wai Canal pedestrian bridge saving about 13,860, and cutting alert time from 10 minutes to 5 minutes saving more than 4,500 [H-32][S-47]. The two sets are not the same quantity — one counts deaths among vehicle evacuees in a modelled population, the other counts lives lost or saved across the whole scenario — and they should be cited separately rather than combined [C-16][H-32].

NOTE

The only published county after-action report from the largest evacuation in modern Hawai’i history found that the City Emergency Operations Plan contained no tsunami-specific protocols, and that 92 percent of the vehicle trips made during the evacuation were unnecessary [C-12][C-60].

6.5 What has and has not changed since

Documented as changed: thirteen new positions funded for Honolulu's Department of Emergency Management [C-60]. Kaua'i's migration of ALERT Kaua'i from Inspiron to the Everbridge platform on 5 May 2026, which adds Resident Connect reach beyond the opt-in roster and brings three of the four counties onto the same vendor [C-42][C-43]. And a current signed State Emergency Operations Plan base plan dated February 2026, carrying the record of changes through Change #54 of 5 June 2025 [S-02].

Not documented as done: the Hawai'i Tsunami Traffic Mitigation Plan, targeted for November 2025 and not published as of this compilation [S-40]. A published O'ahu tsunami annex — the after-action report recommends adding tsunami protocols to the City Emergency Operations Plan, and no annex has appeared [C-12]. After-action reports from Hawai'i County, Maui County and Kaua'i County; KEMA's administrator publicly committed to a post-incident review, and none of the three has published one [C-49]. And Maui County's tsunami evacuation zone data, still dated August 2013 in the state layer — twelve years older than the other three counties' data, in the county with the highest proportional population exposure in the state [C-50][S-27][C-30].

Legal Authorities

- 7.1 Federal
 - 7.2 Hawai'i Revised Statutes Chapter 127A
 - 7.3 Proclamation mechanics
 - 7.4 Shelter law
 - 7.5 What the alerting rules require
-

7.1 Federal

The statutory foundation is **33 U.S.C. Chapter 45, Tsunami Warning and Education**, sections 3201 through 3208, originally enacted 12 January 2007 as a codification of P.L. 109-479 Title VIII [F-27]. Its requirements of NOAA are specific and quantified:

- Maintain the detection buoy array at **not less than 80 percent operational capacity** [F-27].
- Operate **two primary warning centers, specifically in Alaska and Hawai‘i**, with fail-safe backup capability [F-27]. The Hawai‘i warning centre is therefore a statutory obligation, not an administrative arrangement.
- Develop **uniform operational procedures** across the centres [F-27].
- Provide forecasting that incorporates tsunami inundation models and maps [F-27].
- Allocate a **minimum of 27 percent to mitigation and a minimum of 8 percent to research**, with authorisations of \$25–29 million annually for FY2008–2012 and \$25.8 million annually for FY2016–2021 [F-27].

The current reauthorisation is Title V of the Weather Research and Forecasting Innovation Act of 2017, the **Tsunami Warning, Education, and Research Act of 2017** (P.L. 115-25, enacted 18 April 2017) [F-28]. What it added: "research" to the programme's statutory mission; the **National Tsunami Warning Center (Alaska) and Pacific Tsunami Warning Center (Hawaii) named explicitly in statute**; a restatement of the 80 percent DART operational-capacity floor; a requirement for standardised warning products and uniform software across the centres; a direction that forecast models incorporate ocean observing systems, seismic networks and satellite detection; and creation of the **Tsunami Science and Technology Advisory Panel** [F-28]. This is the law NTHMP cites as identifying NOAA as lead agency [F-28].

Two features of that statutory scheme deserve emphasis for a Hawai‘i reader. First, the requirement to operate a warning centre **in Hawai‘i** is not a siting preference but a statutory command, restated and hardened by the 2017 Act, which names the Pacific Tsunami Warning Center explicitly [F-27][F-28] — the alert function that governs Hawai‘i evacuation cannot be relocated or consolidated away by administrative action alone. Second, the 80 percent DART operational-capacity floor is a *statutory* floor [F-27][F-28], which makes buoy availability a compliance question rather than an operational preference, and gives Hawai‘i a legal handle on a detection network the state depends on but does not control.

One federal absence is worth recording as a finding in its own right. The **National Response Framework, Fourth Edition** — the federal response doctrine that would govern post-impact operations in Hawai‘i — **contains no tsunami-specific provision** [F-47]. It addresses "major hurricanes or earthquakes" and natural disasters generically; its fourth edition's substantive change was the introduction of ESF #14, Cross-Sector Business and Infrastructure, bringing the total to 15 ESFs [F-47]. Tsunami-specific federal response detail therefore lives in state and regional annexes rather than in national doctrine [F-47]. For Hawai‘i that means the operative response document is the state Tsunami Incident Annex, not anything at the national level.

7.2 Hawai‘i Revised Statutes Chapter 127A

Chapter 127A, Emergency Management, is the complete state statutory architecture, running to 35 sections in the 2024 replacement volume [S-19]. Fifteen of them are directly load-bearing for tsunami operations.

SECTION	WHAT IT DOES
127A-3	Creates HI-EMA [S-19]
127A-5	Requires each county to have an emergency management agency

SECTION	WHAT IT DOES
	[S-19]
127A-7	Establishes the State Warning Point [S-19]
127A-11	On whom powers are conferred, and delegation [S-19]
127A-12	Emergency management powers in general — the everyday, no-proclamation set [S-19] [S-21]
127A-13	Additional powers in an emergency period — proclamation required [S-19] [S-20]
127A-14	State of emergency: who proclaims, findings, 60-day termination [S-19] [S-22]
127A-15	Service of the proclamation [S-19]
127A-16	Major Disaster Fund [S-19]
127A-18 / -18.5	Mitigation, and the Hazard Mitigation Special Fund [S-19]
127A-19	Shelters [S-19]
127A-20	Immunity for private shelter owners [S-19]
127A-25	Rules and orders [S-19]
127A-29	Emergency-period offenses [S-19]
127A-30	Price controls during an emergency period [S-19]

The hinge of the whole chapter, for tsunami purposes, is the boundary between §127A-12 and §127A-13.

§127A-12 is the everyday power set, available with no proclamation of any kind. It is also the statutory basis for the siren system: the Governor and mayors may direct or control "alerts, warnings, notifications, activations, exercises, drills, and tests," and may control "any type of warning device, system, or method" [\[S-21\]](#). HI-EMA's own plain-language crosswalk of the chapter is the only official state document that expressly lists "operate the Statewide Outdoor Siren Warning System" as a chapter 127A power [\[S-23\]](#). Section 127A-12 also authorizes control of the cessation of pedestrian and vehicular movement and restriction of public congregation in dangerous areas [\[S-21\]](#). Critically, the evacuation power conferred by §127A-12 is limited to directing and controlling the **non-compulsory** evacuation of the civilian population [\[S-21\]](#). HI-EMA's crosswalk presents "direct non-compulsory evacuations" as a shared mayor-and-Governor power [\[S-23\]](#).

§127A-13 is the emergency power set, and it opens only after a state of emergency is proclaimed. Subsection (a) confers **twelve** powers on the Governor, of which (a)(7) is the authority to "direct and control the mandatory evacuation of the civilian population" [\[S-20\]](#). The other eleven include shutting off water mains, gas mains and electric power connections; suspending laws impeding emergency functions; assuming direct operational control; and regulating hoarding and rationing [\[S-20\]](#). Subsection (b) gives mayors five comparable county-level powers, including mandatory evacuation [\[S-20\]](#). Reserved to the Governor alone, per HI-EMA's crosswalk, are federal disaster requests, suspension of laws, assumption of direct operational control, and suspension of state holidays [\[S-23\]](#).

Two further sections shape how those powers reach the ground. **§127A-11** governs on whom the powers are conferred and how they may be delegated [\[S-19\]](#) — the provision that determines whether an agency administrator, as opposed to the Governor or a mayor, may exercise a given authority. **§127A-5** requires each

county to have an emergency management agency [S-19], which is why the four county agencies exist as statutory creatures rather than as administrative conveniences, and why their existence does not depend on county ordinance. §127A-25 authorises rules and orders [S-19]; no Hawai'i Administrative Rules chapter for emergency management could be located in the research supporting this compendium, so whether the rulemaking authority has been exercised is an open question [S-19].

NOTE

Without a proclamation there is no compulsory evacuation power in Hawai'i [S-20]. Everything a county or the state can do to move people before a proclamation issues is, as a matter of statute, non-compulsory [S-21]. Compliance with a tsunami evacuation order in the absence of a proclamation is voluntary, and every operational plan that assumes otherwise is assuming a power the statute does not confer until the proclamation exists.

7.3 Proclamation mechanics

The mechanics are set by §127A-14 and are short enough to state completely [S-22].

Who may proclaim. The Governor proclaims a state of emergency statewide; a mayor proclaims a local state of emergency in their own county [S-22][C-57]. The mayoral authority is independent of, and does not diminish, the Governor's [C-57]. Note that this authority sits in *state* statute, not county ordinance, which is why the county codes contain comparatively little on the subject [C-57].

The finding required. The declaring official must find that an emergency or disaster has occurred, or that there is imminent danger or threat of one [S-22][C-57].

The sole-judge language. The declaring official "shall be the sole judge of the existence of the danger, threat, or circumstances" [S-22]. For a mayor, the same formulation applies to whether circumstances warrant the local proclamation [C-57]. This is a discretionary standard with no stated evidentiary threshold and no built-in review.

Automatic termination. Every proclamation **terminates automatically 60 days after issuance** unless ended sooner by a separate proclamation [S-22][C-57]. The 60-day sunset is stated in §127A-14 and nowhere else in the chapter [S-22].

One discontinuity must be observed by anyone reading older Hawai'i tsunami material. **HRS Chapter 128, the Civil Defense and Emergency Act — the statute under which "State Civil Defense" operated — was repealed by Act 111 of 2014, §24, and replaced by Chapter 127A [S-24].** The same Act renamed State Civil Defense to the Hawai'i Emergency Management Agency [S-24]. Any pre-2014 publication citing chapter 128 authority is no longer legally operative [S-24]. This is not a formality: unrevised references survive in current state documents, including a standing Department of Education emergency procedures guide that still directs schools outside inundation zones to remain open unless directed otherwise by "State Civil Defense," an entity abolished in 2014 [S-35].

7.4 Shelter law

The controlling fact is a negative, and the state states it flatly: **"the state is not a shelter provider" [S-08].** Counties and the American Red Cross open and run shelters; the state coordinates resources only on county request [S-08]. That single sentence in the SESF #6 annex is the decisive authority answer for tsunami refuge

areas — it resolves who opens what, and it explains why shelter doctrine varies so sharply between counties without any state instrument reconciling them.

Within Chapter 127A, two sections carry the shelter architecture. **§127A-19** governs shelters [S-19]. **§127A-20** grants immunity to private shelter owners, and is the statutory basis that makes vertical evacuation into private hotels legally feasible at all [S-19]. As set out in 3.4, that immunity removes a disincentive without creating an obligation: it protects an owner who opens a building, and says nothing about an owner who does not [S-19][C-15].

Because the state neither opens shelters nor sets a shelter standard, the doctrine that governs a tsunami refuge is entirely a county matter, and it is not uniform: Honolulu's tsunami product is an outdoor **assembly area** — parking lots and fields, minimally staffed, no services, open only while the warning is in effect — while the other three counties open staffed indoor facilities such as gyms, armouries and community centres [C-08][C-58]. Nothing in Chapter 127A requires those to converge, and §127A-19 supplies no definition that would force them to [S-19].

The state planning factor for demand is that **11 to 35 percent of residents may need emergency shelter, feeding and sanitation after a disaster** [S-08]. The same annex carries ADA and access-and-functional-needs requirements and pet and service-animal shelter requirements [S-08]. Note that the planning factor is expressed as a proportion of residents and contains no visitor component — a material limitation in a state whose largest tsunami evacuation problem is concentrated in a visitor district.

7.5 What the alerting rules require

The binding alerting rules are federal and are covered in Part Two: 47 CFR Part 10 for Wireless Emergency Alerts, including the Imminent Threat classification thresholds, the 360-character standard with a 90-character fallback, and the requirement to deliver to 100 percent of the target area with no more than 0.1 mile of overshoot [F-40]; and 47 CFR §11.31 for the EAS protocol, including event codes TSW for Tsunami Warning and TSA for Tsunami Watch, with **no EAS event code for a Tsunami Advisory** [F-41]. FEMA's IPAWS is the aggregator between the warning centre and the public, and the Collaborative Operating Group is the unit of alerting authority — meaning HI-EMA and the four county agencies, not PTWC, originate the alerts that actually move Hawai'i residents [F-42].

One legal gap is worth restating here because it sits at the seam between three federal agencies and has not closed. GAO's 2023 audit of the tsunami alerting chain made two recommendations. The first — that NOAA assess and publish the extent to which NOAA Weather Radio coverage reaches populated tsunami-risk areas — was **closed as implemented in 2024** [F-24]. The second remains **open**: that **NOAA work with the FCC and FEMA to establish clear responsibilities and procedures for using IPAWS to deliver tsunami alerts to the EAS** [F-24]. That is the definitive statement of the unresolved IPAWS/EAS authority ambiguity, and until it is closed, the handoff between the federal body that issues the tsunami alert and the federal system that carries it to broadcast has no agreed division of responsibility [F-24].

The source register

Before 1980

1980–2009

2010–2016

2017–2022

2023–2026

Every bracketed identifier in this document resolves to an entry below. Entries are in date order, oldest first, matching the order in which the record was built. Each gives the issuing body, the publication or current-revision date, the source location, and the unique content that earned the source its place.

A source found independently by more than one research pass carries its alternate identifiers after the primary one; both resolve to the same entry.

Before 1980

H-01 · 1947-01 · **The Tsunami of April 1, 1946, in the Hawaiian Islands**

Gordon A. Macdonald, Francis P. Shepard, Doak C. Cox — Pacific Science (Univ. of Hawai'i Press). Survey, 17. <https://scholarspace.manoa.hawaii.edu/items/7a685b2a-d932-444d-8413-47efe991ab29>

The foundational post-event field survey of the event that created the U.S. warning system. Reports "over 150 deaths" (primarily drowning), at least 161 injured, and ~\$25,000,000 in 1946-dollar property damage.

H-09 · 1954 · **The tsunami of November 4, 1952, on the Island of Hawaii**

Bulletin of the Seismological Society of America (author attribution unconfirmed — see GAPS). Survey, 12. <https://pubs.geoscienceworld.org/ssa/bssa/article-abstract/44/3/463/115713/The-tsunami-of-November-4-1952-on-the-Island-of>

The peer-reviewed Big Island survey of the first major test of the warning system created after 1946 — the event where the system worked and nobody died. Complements the runup record (max 12 ft at Coconut Island, ~11.5 ft in Hilo, 11 ft at Reed's Bay) against \$800,000–\$1,000,000 in 1952-dollar damage with zero fatalities.

H-11 · 1959-01 · **The tsunami of March 9, 1957, on the Island of Hawaii**

G. D. Fraser, J. P. Eaton, C. K. Wentworth — Bulletin of the Seismological Society of America. Survey, 29. <https://pubs.geoscienceworld.org/ssa/bssa/article/49/1/79/115893/The-tsunami-of-March-9-1957-on-the-Island-of>

The primary field survey for the 1957 event on Hawai'i Island, the classic reference for Hilo Bay resonance and the anomalous distribution of 1957 runup.

H-07 · 1961-04 · **The tsunami of May 23, 1960, on the Island of Hawaii**

J. P. Eaton, D. H. Richter, W. U. Ault — Bulletin of the Seismological Society of America. Survey, 23. <https://pubs.geoscienceworld.org/ssa/bssa/article-abstract/51/2/135/116019/The-tsunami-of-May-23-1960-on-the-Island-of-Hawaii>

The USGS/HVO Big-Island-specific companion to Cox & Mink, written by observers on the ground.

H-06 · 1963-12 · **The Tsunami of 23 May 1960 in the Hawaiian Islands**

Doak C. Cox and John F. Mink — Bulletin of the Seismological Society of America; Hawaii Institute of Geophysics Contribution No. 20. Catalog, 19. <https://tsunami-dl.jp/document/069>

The definitive statewide runup catalog for 1960 and the anchor document of the warning-failure record. Tsunami detected in Hilo Bay at 0007 HST and on the Honolulu tide gauge at 0033 HST; ocean-crossing velocity 440–445 mph. Statewide runup 2–17 ft, with a 35 ft maximum near the Hilo waterfront**.

H-49 · 1968 · **ITIC Tsunami Newsletter (archive, 1960s–2014)**

International Tsunami Information Center, Honolulu. Public education, hundreds (multi-decade run). https://legacy.itic.ioc-unesco.org/legacy.itic.ioc-unesco.org/index3fdc.html?option=com_content&view=category&layout=blog&id=1081&Itemid=1081

The continuous institutional record of the Pacific warning system from Honolulu, organized by decade (1960–69, 1970–79, 1980–89, 1990–99, 2000–09, 2010–14).

H-17 · 1975-12 · **The Tsunami of November 29, 1975 in Hawaii (NOAA-JTRE-152 / HIG-75-21)**

Harold G. Loomis — Hawaii Institute of Geophysics, Univ. of Hawai'i; Joint Tsunami Research Effort, NOAA/PMEL. Report, 29. <https://www.pmel.noaa.gov/pubs/PDF/loom150/loom150.pdf>

The definitive contemporaneous report on Hawai'i's most important LOCAL-source tsunami — the one that gives minutes, not hours.* M7.2 at 19°20'N, 155°01'45"W, 2.5 mi SW of Kalapana, onset 0448 HST. Maximum runup 20 ft at Kamoamoa Campground.

H-18 · 1976 · **Earthquakes and related catastrophic events, Island of Hawaii, November 29, 1975: A preliminary report (USGS Circular 740)**

R. I. Tilling, R. Y. Koyanagi, P. W. Lipman, J. P. Lockwood, J. G. Moore, D. A. Swanson — U.S. Geological Survey. Report, 33. <https://pubs.usgs.gov/publication/cir740>

The USGS geologic counterpart to Loomis, and the source of the higher runup figure now standard in the literature: 12.2–14.6 m above sea level on the southeastern coast.

1980–2009

H-38 · 1984–12 · **Deposit from a Giant Wave on the Island of Lanai, Hawaii**

James G. Moore and George W. Moore — Science. Paper, 4. <https://doi.org/10.1126/science.226.4680.1312>

The origin of the Hawaiian mega-tsunami hypothesis. The limestone-bearing Hulopoe Gravel on Lānaʻi's coastal slopes reaches elevations of up to 326 m*.

H-39 · 1989 · **Prodigious submarine landslides on the Hawaiian Ridge**

J. G. Moore, D. A. Clague, R. T. Holcomb, P. W. Lipman, W. R. Normark, M. E. Torresan — Journal of Geophysical Research: Solid Earth. Paper, 20. <https://doi.org/10.1029/JB094iB12p17465>

The GLORIA-sonar mapping paper that established the scale of the landslide tsunami source. Documents submarine mass wasting over approximately 100,000 km² of the Hawaiian Ridge, with individual debris avalanches exceeding 200 km in length and 5,000 km³ in volume — among the largest landslides known on Earth.

C-14 · 1993–08 · **Revised Ordinances of Honolulu, Article 25 — Department of Emergency Management (ROH §2-25.1 et seq.)**

City and County of Honolulu / American Legal Publishing (Honolulu). Ordinance, web page. <https://codelibrary.amlegal.com/codes/honolulu/latest/honolulu/0-0-0-2014>

The ordinance-level counterpart to the charter provision, codified at ROH §2-25.1 "Director of emergency management," carrying an editor's note dating the article's effectiveness to 13 August 1993 pursuant to Civil No. 88-1285-04.

H-40 · 1994 · **Giant Hawaiian Landslides**

James G. Moore, William R. Normark, Robin T. Holcomb — Annual Review of Earth and Planetary Sciences. Paper, 26. <https://doi.org/10.1146/annurev.ea.22.050194.001003>

The synthesis inventory: at least 68 major landslides more than 20 km long along 2,200 km of the Hawaiian Ridge from Midway to Hawaiʻi Island — an average of one every 32 km. Largest exceed 200 km length and several thousand km³ volume, with a maximum documented debris-avalanche length of 230 km.

H-08 · 1999 · **Surviving a Tsunami — Lessons from Chile, Hawaii, and Japan (USGS Circular 1187, v1.1)**

Brian F. Atwater, Marco Cisternas V., Joanne Bourgeois, Walter C. Dudley, James W. Hendley II, Peter H. Stauffer — U.S. Geological Survey. Report, 18. <https://pubs.usgs.gov/circ/c1187/>

The clearest published narrative of the 1960 warning failure with the timing spelled out: warning issued 6:47 p.m. Hawaiian time, waves arriving after midnight — ~15 hours transit from Chile. Gives the Hilo wave sequence explicitly: first wave 4 ft, second wave 9 ft above normal, largest wave ~20 ft.

H-41 · 2002 · **Mapping the Nuuanu and Wailau Landslides in Hawaii**

James G. Moore, David A. Clague — in Hawaiian Volcanoes: Deep Underwater Perspectives, AGU Geophysical Monograph 128, pp. 223–244. Paper, 22. <https://doi.org/10.1029/GM128p0223>

The only dedicated mapping treatment of the two specific slides named in the Hawaiʻi giant-landslide tsunami hazard — the Nuʻuanu slide off northeast Oʻahu and the Wailau slide off north Molokaʻi, including the transported blocks (such as Tuscaloosa Seamount) that demonstrate the violence of emplacement.

H-02 · 2002–07 · **A Field Survey of the 1946 Aleutian Tsunami in the Far Field**

E. A. Okal, C. E. Synolakis, G. J. Fryer, P. Heinrich, J. C. Borrero, C. Rusc, D. Arcas, G. Guille, D. Rousseau — Seismological Research Letters. Survey, 14. <https://pubs.geoscienceworld.org/ssa/srl/article-abstract/73/4/490/142766/A-Field-Survey-of-the-1946-Aleutian-Tsunami-in-the>

The only systematic far-field re-survey of 1946. Confirms Hawai'i maximum runup of 16 m, then adds 54 new measurements across six inhabited Marquesas islands: overland runup averaging 6.6 m (σ 2.7 m), riverbed runup averaging 10.0 m (σ 4.8 m), maximum 14.6 m at Tahauku Bay, Hiva Oa. Easter Island yielded 7.1 and 8.6 m.

H-03 • 2003-06 • **Near-Field Survey of the 1946 Aleutian Tsunami on Unimak and Sanak Islands**

Emile A. Okal, George Plafker, Costas E. Synolakis, José C. Borrero – Bulletin of the Seismological Society of America. Survey, 16 (preprint). <https://pubs.geoscienceworld.org/ssa/bssa/article/93/3/1226/147031/Near-Field-Survey-of-the-1946-Aleutian-Tsunami-on>

Measured maximum runup of 42 m at Scotch Cap lighthouse, Unimak Island — the destroyed reinforced-concrete lighthouse whose base sat ~90 ft above sea level, killing all five crew. Runup of 30–40 m along the SW coast between Scotch Cap and Cape Lutke, falling to 15–20 m in Unimak Bight.

C-25 • 2005-02 • **General Plan for the County of Hawai'i — Chapter 5: Flooding and Other Natural Hazards**

County of Hawai'i Planning Department (Hawai'i). Plan, 17 (pp. 5-1 to 5-17) within a 400+ page plan. https://hidot.hawaii.gov/harbors/files/2014/04/Plans_CtyHawaii-General.pdf

The county's binding land-use policy instrument for tsunami inundation.

F-26 • 2006-06 • **U.S. Tsunami Preparedness: Federal and State Partners Collaborate to Help Communities Reduce Potential Impacts, but Significant Challenges Remain (GAO-06-519)**

U.S. Government Accountability Office. Report, ~70. <https://www.gao.gov/products/gao-06-519>

The post-2004-Indian-Ocean baseline audit.

F-27 • 2007-01 • **33 U.S.C. Chapter 45 — Tsunami Warning and Education**

U.S. Congress (codification of P.L. 109-479 Title VIII as amended). Statute, web page (~25 printed). <https://uscode.house.gov/view.xhtml?path=/prelim@title33/chapter45&edition=prelim>

The statutory foundation, sections 3201–3208.

H-57 • 2007 • **Tsunami Warnings: Understanding in Hawai'i**

Chris E. Gregg, Bruce F. Houghton, Douglas Paton, David M. Johnston, Donald A. Swanson, Brian S. Yanagi – Natural Hazards. Paper, 17. <https://doi.org/10.1007/s11069-006-0005-y>

The foundational Hawai'i evacuation-behavior study, and its central number is devastating: only 13% of surveyed residents understood what the sirens meant — despite very high awareness that the sirens are tested monthly. Hilo residents showed only moderate awareness of natural tsunami warning signs.

F-37 • 2008-03 • **Deep-ocean Assessment and Reporting of Tsunamis (DART®) Description**

NOAA National Data Buoy Center. Dataset, web page. <https://www.ndbc.noaa.gov/dart/dart.shtml>

The operational specification of the buoy network Hawai'i depends on. It documents the growth from 6 buoys (2001) to a full network of 39 stations in March 2008.

F-33 • 2008-08 • **U.S. States and Territories National Tsunami Hazard Assessment: Historical Record and Sources for Waves**

NOAA NGDC (Dunbar) and U.S. Geological Survey (Weaver). Report, ~66. <https://nehrpsearch.nist.gov/static/files/USGS/PB2009104996.pdf>

Assigns Hawai'i the highest hazard classification, "Very High," and supplies the recurrence statement found nowhere else: "A tsunami with a runup greater than 3.0 m, irrespective of source distance, hits Hawaii on average about once every ten years." Its Hawai'i tallies — 114 recorded tsunami events, 18 with runup exceeding 3.0 m, 326 deaths, \$59 million damage, 1,592 runup observations, with the 1946 Hilo event alone producing over 400 runup records — are the standard federal citation for Hawai'i tsunami frequency.

F-13 • 2009-01 • **Operational Users Guide for the Pacific Tsunami Warning and Mitigation System (PTWS), IOC Technical Series No. 87** **SUPERSEDED**

IOC-UNESCO / operationalized by NOAA PTWC. Product guide, 141. https://www.unisdr.org/files/9505_180097e.pdf

The pre-2014 operational rulebook PTWC ran under, and still the only document giving PTWC's historical magnitude-triggered bulletin hierarchy in numbers: Information Bulletins for M6.5–7.5; Regional Fixed Warnings for M>7.5 within 1000 km; Regional Expanding Warnings for M>7.8; Pacific-Wide Warning upon tsunami confirmation.

F-30 · 2009-06 · **Vertical Evacuation from Tsunamis: A Guide for Community Officials (FEMA P-646A)**

UNVERIFIED

FEMA / Applied Technology Council. Guideline, ~40. <https://hdl.loc.gov/loc.gdc/gdcebookspublic.2023691874>

The non-engineering companion to P-646, written for mayors, county councils and emergency managers rather than structural engineers. It covers the siting, ownership, liability, funding and community-acceptance decisions that precede design — the questions a Hawai'i county would face before commissioning a refuge structure.

S-35 · 2009-10 · **Emergency Procedures Guide (RS 10-0431, revision of 99-1167)**

Hawai'i State Dept. of Education – Office of School Facilities & Support Services, Safety, Security & Emergency Preparedness Branch. Procedure, ~60. <https://www.hawaiipublicschools.org/DOE%20Forms/Emergency%20Procedures%20Guide.pdf>

The standing DOE school procedure.

2010–2016

F-25 · 2010-04 · **U.S. Tsunami Preparedness: NOAA Has Expanded Its Tsunami Programs, but Improved Planning Could Enhance Effectiveness (GAO-10-490)**

U.S. Government Accountability Office. Report, ~60. <https://www.gao.gov/assets/a303680.html>

The only source with warning-latency performance figures over time: average time to issue a warning for distant tsunamis fell from 24 minutes in 2005 to 15.7 minutes in 2009, with 100 percent detection since 2005; PTWC issued its initial bulletin within 12 minutes for the February 2010 Chile event.

C-15 · 2010 · **Evacuating Waikīkī**

Honolulu Magazine (Honolulu). Report, web page. <https://www.honolulumagazine.com/evacuating-waikiki/>

Preserves the earlier O'ahu vertical-evacuation standard — O'ahu Civil Defense then recommended climbing "three stories or higher, in a steel-reinforced building at least six stories tall," against today's fourth-floor-of-ten-stories rule. This is the only source documenting that doctrinal shift.

H-22 · 2010 · **NOAA Center for Tsunami Research — February 27, 2010 Chile Tsunami Event**

NOAA/PMEL Center for Tsunami Research. Dataset, 4. <https://nctr.pmel.noaa.gov/chile20100227/>

The MOST-model propagation and DART-inversion archive for 2010, with the model-skill statement relevant to Hawai'i: the model produced a 9-minute early arrival for Hawai'i and the U.S. West Coast, a 0.8–1% timing error accumulated over propagation. First waves reached Valparaíso ~34 minutes after the earthquake.

S-26 · 2010 · **Tsunami Evacuation Zones for Oahu (tsunevac_oahu) — GIS metadata** **SUPERSEDED**

Hawai'i Statewide GIS Program / Honolulu Land Information System (HoLIS). Dataset, ~4.

https://files.hawaii.gov/dbedt/op/gis/data/tsunevac_oahu.pdf

The pre-2014 O'ahu evacuation-zone dataset — the maps the 2018 SHMP says the 2011 Tohoku event proved inadequate. Preserves the original single-attribute schema (ZONE = 1/0 binary, no extreme-zone class at all), the HoLIS source lineage, and the reprojection from State Plane Zone 3 to UTM Zone 4 NAD 83.

H-21 · 2011 · **Appendix J — Response to the Chilean-Earthquake Generated Tsunami: The Hawaii Case Study (in *Tsunami Warning and Preparedness: An Assessment of the U.S. Tsunami Program and the Nation's Preparedness Efforts*)**

National Research Council / National Academies Press. Report, 12.

<https://nap.nationalacademies.org/read/12628/chapter/19>

The authoritative forecast-vs-observed record for the 2010 over-evacuation lesson. M8.8 Chile at 8:34 p.m. HST Feb 26; first PTWC warning 15 minutes later; sirens ~6:00 a.m. Feb 27; first waves ~14.5 hours after the earthquake; warning lifted by 2:00 p.m. the following day.

H-36 · 2012-01 · **Re-examination of the Potential for Great Earthquakes along the Aleutian Island Arc with Implications for Tsunamis in Hawaii**

Rhett Butler — Seismological Research Letters. Paper, 10. <https://pubs.geoscienceworld.org/ssa/srl/article-abstract/83/1/29/143906/>

The post-Tōhoku seismological argument that opened the extreme-zone program: re-examines whether the Aleutian arc can host a Mw 9+ rupture aimed at Hawai'i, motivated by the observation that Tōhoku exceeded every prior assessment for that margin. This is the earliest citable step in the chain that runs Butler 2012 — Butler et al.

C-37 · 2012 · **Maui County General Plan 2030, Maui Island Plan — Chapter 3: Natural Hazards** **UNVERIFIED**

County of Maui Department of Planning (Maui). Plan, ~30.
<https://www.mauicounty.gov/DocumentCenter/View/84678/Chapter-3>

The binding Maui Island land-use policy chapter addressing tsunami among natural hazards — the instrument through which Kahului and Lahaina shoreline development standards are set. Distinct from the hazard mitigation plan in that its policies are enforceable through zoning and permitting rather than advisory.

H-24 · 2012 · **Tohoku-Oki Earthquake Tsunami Runup and Inundation Data for Sites Around the Island of Hawai'i (USGS Open-File Report 2012-1229)**

F. Trusdell, A. Chadderton, G. Hinchliffe, A. Hara, B. Patenge, T. Weber — U.S. Geological Survey / Hawaiian Volcano Observatory. Survey, 36 + data spreadsheet. <https://pubs.usgs.gov/publication/ofr20121229>

The official field survey of measured runup and inundation for Hawai'i Island after 2011**, with a machine-readable Table 1 of site-by-site measurements — the ground-truth dataset behind every 2011 Hawai'i inundation figure.

S-34 · 2013-03 · **Tsunami Emergency Plan (DOBOR)**

Dept. of Land and Natural Resources, Division of Boating and Ocean Recreation (DLNR/DOBOR). Procedure, ~8.
<https://files.hawaii.gov/dlnr/dobor/contacts/Plan-TSUNAMI.pdf>

The only state small-boat-harbor tsunami procedure, and the source of Hawai'i's harbor timing standard. Level One Alert begins "a minimum of three hours prior to the arrival of the first wave"; roadblocks are established "one hour before the expected arrival of the first wave".

H-23 · 2013 · **Surges around the Hawaiian Islands from the 2011 Tohoku tsunami**

Kwok Fai Cheung, Yefei Bai, Yoshiki Yamazaki — Journal of Geophysical Research: Oceans. Paper, 17.
<https://doi.org/10.1002/jgrc.20413>

The definitive modeling study of what the 2011 tsunami actually did around Hawai'i.** Uses NEOWAVE with the authors' finite-fault Tohoku source to reproduce observed surges island-by-island, and explains the multi-day persistence of dangerous currents through trapped standing-wave/shelf-resonance modes around the island chain — the mechanism behind the Kona destruction and the harbor damage that occurred hours after the first wave.

C-33 · 2013-08 · **Maui County tsunami evacuation map sheet series (e.g., "Maui Eleven — Kahakuloa Bay")** **UNVERIFIED**

Maui County / Maui Emergency Management Agency (Maui). Map, 1 per sheet (numbered series).
<https://www.mauicounty.gov/DocumentCenter/View/85127/Maui-Eleven-Kahakuloa-Bay>

Confirms Maui County maintains its own numbered PDF evacuation sheet series in DocumentCenter, each printing the three-band legend (Safe Zone / Tsunami Evacuation Zone / Extreme Tsunami Evacuation Zone).

F-34 · 2013-09 · **Alaska Earthquake Source for the SAFRR Tsunami Scenario (USGS Open-File Report 2013-1170, Chapter B / CGS Special Report 229)**

U.S. Geological Survey (Kirby, Scholl, von Huene, Wells). Report, 40.
<https://pubs.usgs.gov/of/2013/1170/b/index.html>

The federal source-characterization study for the Alaska-Aleutian megathrust segment that dominates Hawai'i's far-field hazard.

C-18 · 2014 · **New extreme tsunami evacuation zone maps indicate far greater impact**

Hawaii News Now (Honolulu). Report, web page. <https://www.hawaiinewsnow.com/story/27411586/new-extreme-tsunami-evacuation-zone-maps-indicate-far-greater-impact/>

The origin record for O'ahu's extreme zone. States the modeled scenario as an M9.0+ Aleutian event producing a ~30-foot surge, and that the new XTEZ extends roughly 2–3 times deeper inland than the 2010 maps — in Waikiki reaching the H-1 where the prior line ended above the Ala Wai.

F-12 · 2014 · **NOAA/NWS Pacific Tsunami Warning Center User's Guide: PTWC Tsunami Warning Center Products for Guam and CNMI**

NOAA / NWS Pacific Tsunami Warning Center. Product guide, ~40 (estimate; direct fetch blocked by robots.txt, listed on [tsunami.gov product-guides index](https://www.tsunami.gov/product-guides/index)). <https://www.tsunami.gov/operations/GuamCNMIUserGuide.pdf>

One of only four PTWC domestic user's guides published; together with the American Samoa guide it shows how PTWC tailors the same product suite for each Pacific jurisdiction it serves directly.

H-04 · 2014 · **The destructive 1946 Unimak near-field tsunami: New evidence for a submarine slide source from reprocessed marine geophysical data**

Roland von Huene et al. — Geophysical Research Letters. Paper, 8.
<https://agupubs.onlinelibrary.wiley.com/doi/full/10.1002/2014GL061759>

Reprocesses legacy marine geophysical lines across the Aleutian margin to image the slide mass invoked by Okal et al., providing the independent geophysical test of the landslide-source hypothesis for 1946.

S-24 · 2014 · **HRS Chapter 128 — Civil Defense and Emergency Act (Repealed)** **SUPERSEDED**

Hawai'i State Legislature. Statute, web page. <https://law.justia.com/codes/hawaii/title-10/chapter-128/>

Confirms the legal discontinuity: Chapter 128, the Civil Defense and Emergency Act under which "State Civil Defense" operated, was repealed by Act 111 of 2014 §24 and replaced by Chapter 127A.

F-14 · 2014-08 · **Users Guide for the Pacific Tsunami Warning Center Enhanced Products for the Pacific Tsunami Warning System, IOC Technical Series 105 (Rev. 2)** **UNVERIFIED**

IOC-UNESCO / NOAA PTWC. Product guide, ~90 (listed at 4.4 MB on the ITIC index; direct fetch returned 404 at time of check). https://legacy.itic.ioc-unesco.org/images/stories/about_warnings/what_are_they/ts105-Rev2_eo_220368E.pdf

The definitive description of the post-2014 PTWC "enhanced products," including the wave-height threat forecast bands PTWC now transmits to national warning centers in lieu of issuing warnings directly, and the message templates for threat messages and information statements.

F-08 · 2014-08 · **Service Change Notice 14-43 (Corrected), New Domestic Tsunami Products for Guam and the Commonwealth of the Northern Mariana Islands**

NOAA / NWS. Rule, 1. https://www.weather.gov/media/notification/pdfs/scn14-43tsunami_cca.pdf

Documents the PTWC domestic-product architecture that Hawai'i's products mirror: the three-family structure of Tsunami Information Statements (TIB), *Tsunami Watch/Warning/Advisory messages (TSU)*, and Tsunami Seismic Information Statements (EQI*), each with its own WMO header and AWIPS identifier.

F-07 · 2014-08 · **Service Change Notice 14-45, Changes to the Tsunami Threat Message**

NOAA / NWS (NOUS41 KWBC, PNSWSH). Rule, 1. https://www.weather.gov/media/notification/pdfs/scn14-45tsunami_ptwc_ww.pdf

The primary source for the October 1, 2014 product break. It records that PTWC eliminated the alerting terms "watch" and "warning" from its international WEPA40 PHEB Pacific product and moved to issuing Watch/Warning/Advisory only under separate headers for U.S.

H-34 · 2014-10 · **Paleotsunami evidence on Kaua'i and numerical modeling of a great Aleutian tsunami**

Rhett Butler, David Burney, David Walsh — Geophysical Research Letters. Paper, 8.
<https://doi.org/10.1002/2014GL061232>

The empirical discovery that reset Hawai'i's evacuation policy and produced the yellow/extreme zone. Marine sediment — coral fragments, mollusc shells, beach sand — found ~2 m (6.5 ft) below the surface inside the Makauwahi sinkhole on Kaua'i, 100 m (328 ft) from shore and behind 7 m (23 ft) walls.

C-03 · 2015-04 · **Map 1 – Waikīkī, Tsunami Evacuation Map**

City and County of Honolulu DEM (Honolulu). Map, 1 (large-format sheet). <https://www.honolulu.gov/dem/wp-content/uploads/sites/64/2025/09/Waikiki-map-1-waikiki.pdf>

This sheet carries the actual printed official vertical-evacuation legend text for Waikīkī — the authoritative wording the user asked for: "Structural steel or reinforced concrete buildings of ten or more stories provide increased protection on or above the fourth floor.

F-22 · 2015 · **Final Approved TsunamiReady® Guidelines (2015)**

NOAA / National Weather Service. Guideline, 9.

<https://www.weather.gov/media/tsunamiready/resources/2015TRguidelines.pdf>

The checklist a Hawai'i county must actually satisfy, organized as MIT-1 through MIT-3, PREP-1 through PREP-4, RESP-1 through RESP-7. Specific thresholds found only here: communities with a year-round population of 15,000 or more must operate their own EOC (RESP-3).

S-11 · 2015 · **2015 Hawaii Catastrophic Hurricane Plan / FEMA Region IX Hawaii Catastrophic Hurricane Annex, Version 1.0**

HI-EMA and FEMA Region IX. Plan, ~100+. https://dod.hawaii.gov/hiema/files/2016/03/2015Hawaii_Cat_Plan.pdf

Hawai'i's only published catastrophic-scale plan; contains no tsunami analysis, which is itself the finding — there is no state catastrophic tsunami plan.

F-50 · 2015-11 · **The U.S. Tsunami Program: A Brief Overview (CRS Report R41686)** **UNVERIFIED**

Congressional Research Service. Report, ~20.

https://www.congress.gov/crs_external_products/R/PDF/R41686/R41686.13.pdf

The congressional-analyst synthesis of program structure, appropriations history and reauthorization debate across NOAA, FEMA and USGS lines — the only source that assembles the tsunami program's budget trajectory alongside its statutory history in one place, and the framing document Congress used when writing the 2017 reauthorization.

C-38 · 2016-01 · **Kaua'i Island and Ni'ihau Tsunami Evacuation Maps (with disclaimer) — extreme tsunami evacuation zone map book**

County of Kaua'i / Kaua'i Emergency Management Agency (Kaua'i). Map, 22 map sheets plus overview.

https://www.kauai.gov/files/assets/public/v/1/emergency-management/documents/finalwithdisclaimer_kauaicountyextremetsunami_2016_compressed.pdf

Kaua'i's complete two-tier evacuation map book in a single downloadable PDF — the only county of the four that publishes its entire extreme-zone map book as one consolidated file. 22 sheets cover Kaua'i and Ni'ihau from Līhu'e/Nāwiliwili through Waimea, Port Allen, Po'ipū, and the Nā Pali Coast.

H-51 · 2016-06 · **Tsunami! (Second Edition)**

Walter C. Dudley and Min Lee — University of Hawai'i Press (Latitude 20). Book, 380.

<https://uhpress.hawaii.edu/title/tsunami-second-edition/>

The standard authoritative popular-scientific history of Hawai'i tsunamis**, by the UH Hilo oceanographer who co-founded the Pacific Tsunami Museum.

F-31 · **S-37** · 2016 · **ASCE/SEI 7 Chapter 6, Tsunami Loads and Effects, and the Probabilistic Tsunami Design Zone Maps for the State of Hawai'i**

American Society of Civil Engineers (standard) / Hawai'i Office of Planning and Sustainable Development Coastal Zone Management Program (Hawai'i maps), referenced into federal codes. Standard, web page (standard chapter ~40 printed pages). <https://planning.hawaii.gov/czm/probabilistic-tsunami-design-zone-maps-for-hawaii/>

ASCE 7-16 Chapter 6 was the first national consensus standard for tsunami-resistant design and is the code basis referenced by FEMA P-646 and by the NTHMP modeling guidelines (source of the $n = 0.025$ friction value).

F-32 · 2016-06 · **Community Exposure to Tsunami Hazards in Hawai'i (Scientific Investigations Report 2016-5053)**

U.S. Geological Survey (Jones, J.L., Jamieson, M.R., Wood, N.J.). Report, 32.

<https://pubs.usgs.gov/publication/sir20165053>

The only federal quantification of who and what sits inside Hawai'i's extreme tsunami inundation zone.

F-09 · 2016-10 · **Service Change Notice 16-45, Combination of NTWC and PTWC Products on a Single Website**

NOAA / NWS. Rule, 1. https://www.weather.gov/media/notification/pdfs/scn16-45twc_websites.pdf

Records the consolidation of the two warning centers onto a single tsunami.gov, with NTWC's site assuming the tsunami.gov URL and a six-month parallel-operations period during which the legacy PTWC site remained live.

H-35 · 2016-11 · **Extreme tsunami inundation in Hawai'i from Aleutian-Alaska subduction zone earthquakes**

Rhett Butler, David Walsh, Kevin Richards – Natural Hazards. Paper, 29. <https://doi.org/10.1007/s11069-016-2650-0>

THIS IS THE MODELING BASIS FOR THE HAWAII EXTREME ("YELLOW") TSUNAMI EVACUATION ZONE — the single most important entry for that purpose. Runs 40 distinct scenarios from Mw 8.6 to 9.6 through two independent codes, NOAA's operational SIFT/SIM and the University of Hawai'i research code NEOWAVE.

2017–2022

F-28 · 2017-04 · **Public Law 115-25, Weather Research and Forecasting Innovation Act of 2017, Title V — Tsunami Warning, Education, and Research Act of 2017**

U.S. Congress. Statute, 30 (131 Stat. 91–120). <https://www.congress.gov/115/plaws/publ25/PLAW-115publ25.pdf>

The current reauthorization text.

S-04 · 2017-05 · **State of Hawaii Emergency Operations Plan (May 2017)** **SUPERSEDED**

HI-EMA. Plan, ~180. https://dod.hawaii.gov/hiema/files/2017/08/HI-EOP.FINAL_.Version-May-2017.pdf

Historical baseline showing the 16-SESF structure and listing "Tsunami watch, warning or advisory" as a named triggering event for state notification. Only value now is documenting the pre-2021 architecture for change tracking.

H-37 · 2017 · **The orphan Sanriku tsunami of 1586: new evidence from coral dating on Kaua'i**

Rhett Butler, David Burney, Ken Rubin, David Walsh – Natural Hazards. Paper, 20.

<https://doi.org/10.1007/s11069-017-2902-7>

Refines the dating of the Makauwahi paleotsunami using U-series/radiocarbon coral dating and links the Kaua'i deposit to the "orphan" Sanriku tsunami recorded in Japan in 1586 — i.e. proposes a specific dated Aleutian event rather than an undated window.

H-47 · 2017 · **Tsunami Essentials: Knowledge needed to save Your life and the lives of others**

Daniel A. Walker; issued via UNESCO/IOC-NOAA International Tsunami Information Center. Public education, 6.

https://www.weather.gov/media/itic-car/hawaii_information/TsunamiEssentialsbrochure.pdf

The best compact source pairing runup with travel time by source region — exactly the table a compendium needs. Fourteen Pacific-wide events: Chile source — 1960 highest, 35 ft in Hilo, 17 ft at Honu'apo, 61 deaths all in Hilo, travel time 14–15 hours.

F-36 · 2017-07 · **Advanced National Seismic System — Current Status, Development Opportunities, and Priorities for 2017–2027 (USGS Circular 1429, v1.1)**

U.S. Geological Survey. Plan, 32. <https://pubs.usgs.gov/circ/1429/circ1429.pdf>

Documents the seismic backbone that feeds tsunami warning decisions, stating that NOAA tsunami monitoring depends on the Global Seismographic Network partnership among USGS, NSF and IRIS.

H-20 · 2018-04 · **Volcano Watch — Disaster strikes Ka'ū in 1868: The rest of the story**

USGS Hawaiian Volcano Observatory. Report, 2. <https://www.usgs.gov/observatories/hvo/news/volcano-watch-disaster-strikes-kau-1868-rest-story>

The HVO account of the largest historical Hawaiian earthquake: the M7.9 (or M7.5, per the ITIC table) Ka'ū event of April 2, 1868, in which "the subsequent tsunami and mud flow took the lives of 77 Hawaiians." Records the March 28, 1868 foreshock that toppled four or five stone churches and destroyed Captain Brown's stone house at Kahuku, over 100 cattle lost in the eruption, and relief provided by Kamehameha V to ~800 people.

F-35 · 2018 · **Pedestrian evacuation modeling to reduce vehicle use for distant tsunami evacuations in Hawai'i**

U.S. Geological Survey (Wood, N.J., Jones, J., Peters, J., Richards, K.), International Journal of Disaster Risk Reduction v.28. Report, 13 (pp. 271–283). <https://pubs.usgs.gov/publication/70196715>

The only federal analysis of whether Hawai'i residents can physically walk out in time. It finds 98–76 percent of residents in the standard evacuation zone can walk clear in under 15 minutes at reasonable speeds, but 76 percent of hotel visitors in the extreme zone would need more than 15 minutes.

H-59 · 2018 · **Amplification of drawdown and runup over Hawaii's insular shelves by tsunami N-waves from mega Aleutian earthquakes**

Yefei Bai, Yoshiki Yamazaki, Kwok Fai Cheung — Ocean Modelling. Paper, 14.

<https://doi.org/10.1016/j.ocemod.2018.02.005>

The mechanism paper explaining why Hawai'i's extreme-scenario runups are so large relative to open-ocean wave height: N-waves from mega-Aleutian sources undergo drawdown-and-runup amplification over Hawai'i's narrow insular shelves. This is the hydrodynamic justification for the 30–40 m extreme-zone figures in Butler et al.

S-13 · 2018 · **State of Hawai'i 2018 Hazard Mitigation Plan — Section 4.13 Tsunamis** **SUPERSEDED**

HI-EMA. Report, 28 (pp. 4-271 to 4-298). <https://dod.hawaii.gov/hiema/files/2018/06/Draft-Section-4.13-Tsunamis.pdf>

Holds the long-run statistical baseline that the 2023 update dropped: since 1812 there have been more than 160 tsunamis in the state (135 confirmed, 26 unconfirmed) with over 2,000 runup observations; nine confirmed events caused 294 deaths and over \$600 million in damage.

S-38 · 2018-12 · **High-Resolution Probabilistic Tsunami Design Zone Maps for O'ahu — Kick-off Meeting**

OPSD CZM Program / University of Hawai'i. Report, 20.

<https://files.hawaii.gov/dbedt/op/czm/tsunami/oahumappingkickoffmeeting20181207.pdf>

The only published technical specification for Hawai'i's tsunami modeling program. Names NEOWAVE, developed with Kwok Fai Cheung (UH Ocean and Resources Engineering) — the same modeling lineage behind the extreme evacuation zones.

H-48 · 2019 · **Tsunami Glossary (IOC Technical Series 85, Rev. 3, 2019 edition)**

UNESCO Intergovernmental Oceanographic Commission / International Tsunami Information Center. Public education, 48. https://legacy.itic.ioc-unesco.org/legacy.itic.ioc-unesco.org/index4284.html?option=com_content&view=article&id=1328&Itemid=1142&lang=en

The internationally-agreed definitional authority for every technical term a Hawai'i compendium will use — runup, inundation, amplitude, tsunami magnitude vs intensity, advisory vs watch vs warning — plus the intergovernmental coordination-group structure.

S-22 · **C-57** · 2019 · **HRS § 127A-14 — State of emergency**

Hawai'i State Legislature. Statute, web page.

<https://law.justia.com/codes/hawaii/title-10/chapter-127a/section-127a-14>

Sets the declaration mechanics: the Governor proclaims a state of emergency statewide, a mayor a local state of emergency in their county, upon finding an emergency exists or is imminent; the declaring official "shall be the sole judge of the existence of the danger, threat, or circumstances".

F-29 · 2019-08 · **Guidelines for Design of Structures for Vertical Evacuation from Tsunamis, Third Edition (FEMA P-646)**

FEMA / Applied Technology Council (ATC-64 project), with NOAA. Guideline, ~200.

https://www.weather.gov/media/itic-car/vertical_evac/FEMAP646_ThirdEdition_508.pdf

The central federal engineering document for Hawai'i vertical evacuation, since much of urban Honolulu has no reachable high ground.

S-23 · 2019-08 · **Overview of Hawai'i Revised Statutes Chapter 127A**

HI-EMA. Guideline, 1. <https://dod.hawaii.gov/hiema/files/2019/08/Reference.Overview-of-127A.pdf>

HI-EMA's own one-page plain-language crosswalk of which powers belong to mayors versus the Governor.

F-47 · 2019-10 · **National Response Framework, Fourth Edition**

FEMA / U.S. Department of Homeland Security. Plan, ~60.

https://www.jcs.mil/Portals/36/Documents/Doctrine/Interorganizational_Documents/nrf_4th_2019.pdf

The federal response doctrine that would govern post-impact operations in Hawai'i. Its fourth edition introduced ESF #14, Cross-Sector Business and Infrastructure, bringing the total to 15 ESFs.

S-15 · 2019-11 · **Hawai'i Emergency Management Agency Five Year Strategic Plan 2020–2025**

HI-EMA. Plan, 31 plus appendices. <https://dod.hawaii.gov/hiema/files/2022/04/2020-HI-EMA-Strategic-Plan.pdf>

The only document stating the siren program's own performance targets.

F-19 · 2019-11 · **NTHMP Warning Coordination Subcommittee Terms of Reference**

NTHMP Warning Coordination Subcommittee. Procedure, 2–3.

https://www.weather.gov/media/nthmp/WCS/WCSTermsofReference_2019.pdf

The only document describing the formal channel by which Hawai'i emergency managers can change PTWC products. It establishes that WCS consensus recommendations "represent the collective will" of NTHMP partners.

C-23 · 2020-05 · **County of Hawai'i Multi-Hazard Mitigation Plan (2020 Public Review Draft)** **UNVERIFIED; SUPERSEDED**

County of Hawai'i / Hawai'i County Civil Defense Agency (Hawai'i). Plan, several hundred (>30 MB PDF). https://records.hawaiicounty.gov/WebLink/1/edoc/104769/2020-05-18_HawaiiCountyHMP_PublicReviewDraft.pdf

The predecessor plan of record for Hawai'i Island tsunami risk, containing the county's own tsunami hazard profile, Hilo Bay inundation history, and exposure/loss estimates. Now superseded in substance by the 2025 update but still the last version with a confirmed public URL.

C-31 · 2020 · **2020 Maui County Hazard Mitigation Plan (Final) — and Parts 1 and 2** **SUPERSEDED**

Maui Emergency Management Agency (Maui). Plan, several hundred (48 MB; split versions at DocumentCenter/View/135090 and /135089). <https://www.mauicounty.gov/DocumentCenter/View/125977/2020-Maui-County-Hazard-Mitigation-Plan-Final>

The plan in force during the 2023 Lahaina fire and the 2025 tsunami, so it is the baseline against which the 2025 update's changes must be read.

C-47 · 2020-07 · **Kaua'i Emergency Management Agency Fiscal Year 2021 Annual Report**

County of Kaua'i, Office of the Mayor (Kaua'i). Report, 7 (pp. II-1 to II-7).

https://www.kauai.gov/files/assets/public/v/1/office-of-the-mayor/documents/annual-reports/fy21/2_kema_ar-fy21.pdf

Documents KEMA's capacity trajectory in hard numbers: 6 positions in FY2020 (2 grant-funded) → 18 in FY2021 (14 grant-funded) → 26 projected FY2022 (22 grant-funded), on a FY2021 program expenditure of ~\$2.23M (\$996,886 salaries; \$122M operations).

F-16 · 2021-01 · **Tsunami Modeling and Mapping: Guidelines and Best Practices, Part I: Tsunami Inundation Modeling**

NTHMP Mapping and Modeling Subcommittee. Guideline, 4.

<https://www.weather.gov/media/nthmp/MMS/1inundationmodelingguidelines.pdf>

Carries the actual numeric modeling standards Hawai'i's inundation products must meet: nearshore grids fine enough that a significant coastal feature spans more than 3 cells; DEM cell sizes under 3 arc-seconds (~90 m, "Type 1"); a bottom friction coefficient with $n = 0.025$ cited as the ASCE 7 reference value.

F-17 · 2021-01 · **Tsunami Modeling and Mapping: Guidelines and Best Practices, Part II: Tsunami Inundation Maps**

NTHMP Mapping and Modeling Subcommittee. Guideline, 4.

<https://www.weather.gov/media/nthmp/MMS/2inundationmapguidelines.pdf>

Defines the three map types by data resolution (Type 1 >90 m; Type 2 ~10 m).

F-18 · 2021-01 · **Tsunami Modeling and Mapping: Guidelines and Best Practices, Part III: Tsunami Inundation Determination for Non-Modeled Regions**

NTHMP Mapping and Modeling Subcommittee. Guideline, 3.

<https://www.weather.gov/media/nthmp/MMS/3nonmodeledregionguidelines.pdf>

The fallback rule set for coastline without a numerical model — relevant to Hawai'i's remote and unmodeled shorelines.

S-43 · 2021-03 · **2011 Hawaii Tsunami 10 Year Anniversary**

HI-EMA. Report, 1. <https://dod.hawaii.gov/hiema/files/2021/03/2011-Hawaii-Tsunami-10-Year-Anniversary.pdf>

The state's own accounting of what the 2011 Tohoku tsunami changed in Hawai'i. Damage across Honolulu, Maui and Hawai'i counties ~\$7.5 million (~\$8.725 million in 2021 dollars); Presidential Major Disaster declaration April 8, 2011; \$6.4 million in federal repair assistance; over 200 waves recorded.

S-39 · 2021-04 · **State Building Code — 2018 IBC Amendments, Errata and Addenda (Section 1615 Tsunami Loads)**

Hawai'i State Building Code Council / Dept. of Accounting and General Services. Standard, 70.

https://ags.hawaii.gov/wp-content/uploads/2021/05/2018SBCErrataandAddenda_20210518.pdf

Hawai'i's binding tsunami construction law. Amended IBC Section 1615 requires Risk Category III and IV buildings, and Risk Category II buildings meeting all three tests, to be designed to ASCE 7-16 Chapter 6 when located in a Tsunami Design Zone.

F-10 · 2021-07 · **Service Change Notice 21-69, Change to Pacific Tsunami Warning Center City Location in the Mass News Disseminator (MND) Header Block**

NOAA / NWS. Rule, 1. https://www.weather.gov/media/notification/pdf2/scn21-69change_ptwc_mnd_header.pdf

The only document that dates and explains the header change from "NWS PACIFIC TSUNAMI WARNING CENTER EWA BEACH HI" to "NWS PACIFIC TSUNAMI WARNING CENTER HONOLULU HI," with the explicit note that tsunami services were not otherwise affected.

S-01 · 2021-08 · **State of Hawai'i Emergency Operations Plan — Tsunami Incident Annex (Part 1, signed)**

Hawai'i Emergency Management Agency (HI-EMA), Dept. of Defense. Plan, ~80.

<https://dod.hawaii.gov/hiema/files/2021/09/FINAL-Tsunami-Incident-Annex-8.19.2021-part-1-signed.pdf>

The single authoritative state tsunami playbook. Contains the four-level alert decision matrix with actual magnitude/runup thresholds: Information Statement (local M4.0–6.8 / distant M6.5–7.8), Watch (distant M≥7.9, ETA 3–6 hrs), Advisory (M≥6.9 with runup 0.3–1.0 m), Warning (M≥6.9 with runup ≥1.0 m = full evacuation).

S-07 · 2021-11 · **HI-EOP State Emergency Support Function #5 — Planning and Information Annex**

HI-EMA. Plan, ~6 plus attachments. <https://dod.hawaii.gov/hiema/files/2022/01/HI-EOP-SESF-5-Annex-Nov2021-part-1-signed.pdf>

The only annex that formally seats the Pacific Tsunami Warning Center and the Hawaiian Volcano Observatory as SESF support agencies alongside NWS.

S-10 · 2021-12 · **HI-EOP State Emergency Support Function #13 — Public Safety and Security Annex**

HI-EMA / State Law Enforcement Coalition. Plan, ~30. <https://dod.hawaii.gov/hiema/files/2022/01/ESF-13-Annex-part-1-signed.pdf>

The enforcement half of evacuation authority: SESF #13 promotes compliance with gubernatorial emergency proclamations and handles traffic control and evacuated-area security.

F-02 · 2022-01 · **NWS Instruction 10-701, Tsunami Warning Center Operations**

NOAA / National Weather Service, Analyze Forecast and Support Office. Procedure, 23 (plus Appendix A).

https://www.weather.gov/media/directives/010_pdfs/pd01007001curr.pdf

The single most important operational document for Hawai'i. It carries the actual numeric alert thresholds: Tsunami Warning when forecast/observed wave height exceeds 1 meter or widespread inundation is possible or impact is unknown; Tsunami Advisory when maximum forecast height is 0.3–1.0 m (or observed 0.5–1 m).

H-29 · 2022-01 · **"It could have been worse": Tsunami triggered by volcanic eruption in Tonga causes minor damage in West Hawaii**

West Hawaii Today. Report, 3. <https://www.westhawaiiitoday.com/2022/01/15/hawaii-news/it-could-have-been-worse-tsunami-triggered-by-volcanic-eruption-in-tonga-causes-minor-damage-in-west-hawaii/>

The only detailed on-the-ground damage record for Hawai'i from 2022, and a documented warning failure. ~3-foot surge in West Hawai'i; first waves ~2 a.m. Saturday, from an eruption ~6 p.m. Hawai'i time Friday. Hawai'i County Civil Defense sent its advisory at 2:03 a.m.

H-26 · 2022-02 · **15 January 2022, Hunga-Tonga Hunga-Ha'apai Volcanic Eruption and Tsunami (TsuInfo Alert v.24 no.1)**

International Tsunami Information Center, published in TsuInfo Alert (Washington DNR / Geological Survey). Report, 21. https://dnr.wa.gov/sites/default/files/2025-03/ger_tsuinfo_2022_v24_no1.pdf

The ITIC's own institutional assessment of the mechanism that broke the warning system's assumptions. Identifies the multiple generating processes — submarine explosion, caldera collapse, pyroclastic flows, and "acoustic pressure waves that generate coupled air-sea waves" travelling faster than water waves.

S-06 · 2022-02 · **HI-EOP State Emergency Support Function #2 — Communications Annex**

HI-EMA / Office of Enterprise Technology Services (ETS). Plan, ~25.

<https://dod.hawaii.gov/hiema/files/2022/04/22-0412-State-Emergency-Support-Function-SESF-2-Communications-Annex.pdf>

Names ETS (not HI-EMA) as coordinating agency for communications restoration and identifies Hawai'i's single-provider fragility for local telephone and cable, plus dependence on AT&T FirstNet, Hawaiian Telcom, the DoD Statewide Interoperability Coordinator, the PUC and RACES volunteers.

S-03 · 2022-04 · **State of Hawai'i Emergency Operations Plan — Basic Plan (April 2022)** **SUPERSEDED**

HI-EMA. Plan, ~200. <https://dod.hawaii.gov/hiema/files/2022/07/22-0228-State-of-Hawaii-Emergency-Operations-Plan-Basic-Plan.pdf>

The version in force during the 2022 Tonga and 2025 Kamchatka events; useful only as the baseline the 2026 plan changed. Contains the "all incidents begin and end locally, and county authorities maintain operational control" formulation and the Adjutant General-as-Director-of-Emergency-Management construction.

S-42 · 2022-04 · **Hawai'i Emergency Management Agency Expands Outreach With Translated Tsunami PSA (Release No. 2022-020)**

HI-EMA. Report, 2. https://www.weather.gov/media/itic-car/hawaii_tsunami_awareness_month/TAM_2022/HI-EMA_NewsRelease_PSA_14apr22.pdf

Establishes the state's language-access planning factor for tsunami warning: one in nine persons in Hawai'i has Limited English Proficiency. Documents the addition of Japanese and Tagalog captioning to the animated tsunami PSA as the state's response.

F-03 · 2022-06 · **NWS Instruction 10-702, International Tsunami Information Center**

NOAA / National Weather Service. Procedure, 5.

https://www.weather.gov/media/directives/010_pdfs/pd01007002curr.pdf

Defines ITIC (co-located with PTWC in Honolulu) as the entity that runs tsunami training and TsunamiReady recognition support across the U.S. Pacific and Caribbean, monitors international warning activity under IOC coordination, and archives event data with the World Data System.

F-05 · 2022-06 · **NWS Instruction 10-704, The TsunamiReady® Recognition Program**

NOAA / National Weather Service. Procedure, 24 (including appendices).

https://www.weather.gov/media/directives/010_pdfs/pd01007004curr.pdf

The governing instruction for TsunamiReady, distinct from the guidelines themselves. It sets the four-year recognition cycle, defines the roles of WFOs, Tsunami Warning Centers, and Regional TsunamiReady Program Managers in the application chain, establishes the fundamental vs.

H-27 · 2022 · **In depth: Surprising tsunamis caused by explosive eruption in Tonga**

U.S. Geological Survey, Pacific Coastal and Marine Science Center. Report, 4.

<https://www.usgs.gov/centers/pcm/sc/news/depth-surprising-tsunamis-caused-explosive-eruption-tonga>

The clearest quantitative explanation of the meteotsunami mechanism. Lamb waves radiated at about 710 mph, circling the globe 3.5 times.

H-28 · 2022 · **Global fast-traveling tsunamis driven by atmospheric Lamb waves on the 2022 Tonga eruption**

T. Kubota, T. Saito, K. Nishida — Science. Paper, 6. <https://doi.org/10.1126/science.abo4364>

The peer-reviewed physics paper establishing that the globally-observed early arrivals were air-sea coupled waves driven by the Lamb wave rather than a conventional water-borne tsunami — the citation that a Hawai'i compendium needs to justify treating volcanic/atmospheric sources as a distinct warning problem from seismic ones.

H-58 · 2022 · **An agent-based model of short-notice tsunami evacuation in Waikiki, Hawaii**

Karl Kim, Farnaz Kaviari et al. — Transportation Research Part D: Transport and Environment. Paper, 16.
<https://doi.org/10.1016/j.trd.2022.103239>

The peer-reviewed model behind the 2025 UH casualty figures (H-32) — simulating pedestrian, bicycle and vehicle evacuation of Waikiki's dense resident-plus-visitor population under short notice, and quantifying the marginal life-saving value of vertical evacuation, added Ala Wai Canal crossings, and reduced warning lead time.

F-04 · 2022-07 · **NWS Instruction 10-703, Post-Tsunami and Warning Effectiveness Surveys**

NOAA / National Weather Service. Procedure, 5.
https://www.weather.gov/media/directives/010_pdfs/pd01007003curr.pdf

Contains the only federal clock for post-event evaluation: the public feedback survey link must be posted on tsunami.gov within one day of a significant Warning or Advisory and removed after two weeks; the emergency-management questionnaire goes out within one week; final compiled results are due within ten weeks.

2023-2026

F-01 · 2023-02 · **National Weather Service Policy Directive 10-7, Tsunami Warning Services**

NOAA / National Weather Service. Procedure, 5 (plus Appendix A).
https://www.weather.gov/media/directives/010_pdfs/pd01007curr.pdf

The top-level policy instrument that legally splits the two warning centers' areas of responsibility: NTWC (Palmer, AK) covers "coastal regions of all U.S. states (except Hawaii)" plus Pacific/Atlantic Canada, while PTWC (Honolulu) covers "Hawaii and all U.S. territories" plus Pacific and Caribbean nations.

C-62 · **H-46** · 2023-03 · **Hawai'i Historical Tsunami Effects 1812-2022 (wall chart)** **UNVERIFIED; SUPERSEDED**

NOAA NWS International Tsunami Information Center. Public education, 1 (24x36 wall chart).
https://www.weather.gov/media/itic-car/hawaii_tsunamis/HIHistoricalTsunamiEffects_1812-2022_24x36_20230320.pdf

The reference chart against which all four counties' public education materials are built, compiling every recorded tsunami effect in Hawai'i from 1812 to 2022 in a single 24x36 layout with per-island effects.

S-41 · 2023-03 · **NEWS RELEASE: Do You #KnowTheSigns? Meeting, Proclamation Mark the Start of Tsunami Awareness Month in Hawai'i**

HI-EMA / Office of the Governor. Report, web page. <https://dod.hawaii.gov/hiema/news-release-do-you-knowthesigns-meeting-proclamation-mark-the-start-of-tsunami-awareness-month-in-hawaii/>

Documents the annual gubernatorial proclamation designating April as Tsunami Awareness Month, presented at NOAA's Inouye Regional Center on Ford Island to assembled emergency managers. Uses the state's alternate casualty figure of 293 killed since 1900 (vs.

F-24 · 2023-05 · **Emergency Alerts: NOAA Should Take Additional Actions to Help Ensure Tsunami Alerts Reach Those at Risk (GAO-23-105961)**

U.S. Government Accountability Office. Report, ~50. <https://www.gao.gov/products/gao-23-105961>

The most recent independent audit of the tsunami alerting chain. It makes two recommendations with tracked status: (1) NOAA should assess and publish the extent to which NOAA Weather Radio coverage reaches populated tsunami-risk areas — closed as implemented in 2024.

H-42 · 2023 · **A qualitative review of tsunamis in Hawai'i**

Scott Fisher, James Goff, Andrew Cundy, David Sear — Natural Hazards. Paper, 36.
<https://doi.org/10.1007/s11069-023-06076-w>

The best single modern synthesis of the whole Hawai'i record, with inflation-adjusted damage. Event-by-event: 1812 first recorded, minimal damage; 1837 (Chile) 14 deaths in Hilo, 66 homes destroyed, 2.4 m waves on O'ahu; 1860 homes destroyed at Māliko.

S-12 · 2023 · State of Hawai'i Hazard Mitigation Plan 2023 — Section 4.13 Tsunami

HI-EMA. Report, ~40. https://dod.hawaii.gov/hiema/files/2023/01/Draft_Section-4.13-D_Tsunami-508-Check.pdf

The current statewide tsunami risk-assessment numbers. State-owned exposure under the Great Aleutian Tsunami scenario: 1,204 state buildings worth \$4.8 billion (Honolulu 801 buildings / \$3.38 billion), 146 miles of state roads, 386 critical facilities, and \$47.2 billion total economic loss including business interruption.

S-18 · 2023-10 · NEWS RELEASE: Hawai'i Emergency Management Agency Launches Siren Status Map

HI-EMA. Report, web page. <https://dod.hawaii.gov/hiema/news-release-hawaii-emergency-management-agency-launches-siren-status-map-offering-visual-tool-to-show-latest-statewide-test-results/>

The only official statewide siren-readiness figures published by the state. Inventory of 418 alert and warning sirens; from the October 2, 2023 test, 326 fully operational (78%), 29 needing HI-EMA in-house maintenance (6.9%), 37 needing contracted maintenance (8.9%), and 26 inoperable/beyond repair (6.2%).

S-14 · 2023-11 · 2023 Hawai'i State Hazard Mitigation Plan — Executive Summary

HI-EMA. Plan, ~20. https://dod.hawaii.gov/hiema/files/2023/01/2023_Hawaii_SHMP_0_ExecutiveSummary-5.pdf

Establishes the plan's frame — 15 natural and non-natural hazards assessed, 84 mitigation actions organized under 7 goals — and is the entry point that maps which numbered section file holds each hazard chapter. Needed to cite the SHMP as an adopted whole rather than as loose section PDFs.

F-11 · 2024-04 · PTWC Tsunami Products Users' Guide for Puerto Rico, the U.S. Virgin Islands, and the British Virgin Islands, Version 1.22

NOAA / NWS Pacific Tsunami Warning Center with ITIC. Product guide, ~145. https://www.weather.gov/media/itic-car/PRVI%20User's%20Guide%20-%20Version%201.22_042824.pdf

The most complete published example of a PTWC domestic product user's guide, and therefore the structural template for what a Hawai'i guide would contain: WMO/AWIPS product IDs, UGC code tables, preliminary earthquake parameter block, evaluation section, recommended-action wording, forecast tables with ETAs and wave heights, sea-level observation tables, and impact statements.

C-26 · 2024 · Up to 10% of Big Island tsunami warning sirens inoperable

Honolulu Star-Advertiser (via Yahoo News), reporting HCCDA Administrator Talmadge Magno (Hawai'i). Report, web page. <https://news.yahoo.com/10-big-island-tsunami-warning-132336065.html>

The only source giving Hawai'i County's siren inventory and failure rate: 92 sirens installed island-wide, 9 non-functional during an October 1 monthly test (~10%).

C-28 · 2024 · 2025–2030 MEMA Strategic Plan: "Always Preparing, Stronger Together: Building a Resilient Maui Nui"

Maui Emergency Management Agency (MEMA) (Maui). Plan, 37.

<https://www.mauicounty.gov/DocumentCenter/View/152876/MEMA-Strategic-Plan-2025-2030>

The only county strategic plan in Hawai'i explicitly restructured around post-Lahaina alerting lessons. States MEMA was funded for 15 positions with an opportunity for 7 more in FY25 (to 22).

F-15 · 2024 · United States National Tsunami Hazard Mitigation Program Strategic Plan for 2024–2029

NOAA / NWS on behalf of NTHMP (NOAA, FEMA, USGS and 28 coastal states and territories). Plan, 38.

<https://www.weather.gov/media/nthmp/NTHMP-Strategic-Plan-2024-2029.pdf>

The current governing strategy for the grant program that funds Hawai'i's tsunami mapping, evacuation zones and outreach. It sets the four strategic themes (Hazard and Risk Assessment; Education and Preparedness; Mitigation and Recovery).

H-13 · 2024 · A great tsunami earthquake component of the 1957 Aleutian Islands earthquake

Y. Yamazaki, T. Lay, K. F. Cheung, R. Witter, S. La Selle, B. E. Jaffe — Earth and Planetary Science Letters. Paper, 14. <https://doi.org/10.1016/j.epsl.2024.118691>

Resolves the 67-year-old 1957 puzzle and directly raises the Hawai'i design hazard. *Finds 12–26 m of shallow slip over a 600 km section of the eastern Aleutians* — a tsunami-earthquake component of Mw 8.3–8.6 embedded in an overall Mw 8.6–8.8 rupture spanning ~1,200 km.

H-14 • 2024 • **Revisiting the 1957 Aleutian Earthquake: New Insights into Tsunami Hazards for Hawai'i**

U.S. Geological Survey, Pacific Coastal and Marine Science Center. Report, 2.

<https://www.usgs.gov/centers/pcmsc/news/revisiting-1957-aleutian-earthquake-new-insights-tsunami-hazards-hawaii>

The plain-language USGS explanation of H-13, useful as the citable agency statement that the eastern Aleutian slip "now accounts for the documented tsunami heights" in Hawai'i. Restates the 12–26 m slip / 600 km / Mw 8.6–8.8 numbers in a form suitable for a public compendium.

S-19 • 2024 • **Hawai'i Revised Statutes Chapter 127A — Emergency Management (full chapter)**

Hawai'i State Legislature. Statute, web page (35 sections).

https://data.capitol.hawaii.gov/hrscurrent/Vol03_Ch0121-0200D/HRS0127A/HRS_0127A-.htm

The complete statutory architecture.

S-20 • 2024 • **HRS § 127A-13 — Additional powers in an emergency period**

Hawai'i State Legislature. Statute, web page.

<https://law.justia.com/codes/hawaii/title-10/chapter-127a/section-127a-13/>

The mandatory-evacuation authority.

S-21 • 2024 • **HRS § 127A-12 — Emergency management powers, in general**

Hawai'i State Legislature. Statute, web page.

<https://law.justia.com/codes/hawaii/title-10/chapter-127a/section-127a-12/>

The everyday (no-proclamation-needed) power set, and the statutory basis for the siren system: the Governor and mayors may direct or control "alerts, warnings, notifications, activations, exercises, drills, and tests" and may control "any type of warning device, system, or method." Critically, evacuation power here is limited to directing and controlling the non-compulsory evacuation of the civilian population — mandatory evacuation requires 127A-13.

F-21 • 2024-07 • **TsunamiReady® Program Recommendations**

NTHMP Mitigation and Education Subcommittee (Tiger Team), for the National Weather Service. Report, ~11 (core) plus 6 attachments. <https://www.weather.gov/media/nthmp/MES/NTHMP%20MES%20TsunamiReady%20Recommendations-final-July2024.pdf>

23 numbered recommendations in three categories (6 on guidelines and forms, 11 on NWS Directive 10-704, 8 general).

S-09 • 2025-02 • **HI-EOP SESF #8 — Public Health and Medical Services Annex**

HI-EMA / Hawai'i Dept. of Health (DOH). Plan, ~6. <https://dod.hawaii.gov/hiema/files/2025/07/SESF-8-Public-Health-Medical-Services-FEB-2025.pdf>

Assigns DOH the specific post-tsunami tasks of testing air, potable water sources and near-shore waters for contamination and issuing warnings, and of issuing certified death records and disposition-of-body permits.

C-20 • 2025-03 • **Hawai'i County Tsunami Evacuation Zone Lookup (interactive)** **UNVERIFIED**

Hawai'i County Civil Defense Agency / Hawai'i County GIS (Hawai'i). Map, web page (application).

<https://hawaiicountygis.maps.arcgis.com/apps/instant/lookup/index.html?appid=d196b8925d534c1d9c4b0375110f5838>

The official Hawai'i Island zone-determination tool, named as such by HI-EMA and NWS/ITIC.

S-30 • 2025-03 • **Tsunami Safe Zones**

Hawai'i Statewide GIS Program, OPSD. Dataset, web page. <https://opendata.hawaii.gov/dataset/tsunami-safe-zones>

The least-known of the three zone products — an explicitly mapped safe (destination) zone rather than an evacuation zone, covering seven islands (Ni'ihau, Kaua'i, O'ahu, Kaho'olawe, Moloka'i, Lāna'i, Maui) and notably excluding Hawai'i Island.

F-46 · C-54 · H-52 · 2025-04 · Hawai'i Tsunami Evacuation Zone Maps

NOAA / NWS International Tsunami Information Center. Map, web page.

https://www.weather.gov/itic-car/hawaii_tsunami_evacuation_zone_maps

The federal description of Hawai'i's two-tier evacuation zone system: Tier 1 standard zones based on historical events, and Tier 2 "Extreme" zones representing "a worst case, extreme, once in a thousand years tsunami event" with roughly 4–5 hours of evacuation time.

H-19 · 2025-04 · All Reported and Confirmed Locally Generated Tsunamis in the Hawaiian Islands (local-source event table)

D. A. Walker, *Science of Tsunami Hazards* 17(2), p.77 (1999); reissued by UNESCO-IOC/NOAA International Tsunami Information Center, drawing on Lander & Lockridge (1989) and NCEI Global Historical Tsunami Database (March 2025). Catalog, 2.

https://www.weather.gov/media/itic-car/hawaii_tsunamis/local_eq_causing_tsu_hawaii_20250403.pdf

The single most useful compact table for the local-source hazard, listing every confirmed Hawai'i-generated tsunami with magnitude, runup, and deaths: 1868-04-03 M7.5, 45 ft (13.7 m) Keauhou; 1908-09-21 M6.8, 4 ft Hilo, 0 deaths; 1919-10-02, 14 ft (4.3 m) Ho'opūloa; 1951-08-21 M6.9, 4 ft Ho'okena, 0.

C-36 · 2025-04 · MEMA announces new evacuation planning and notification platform: Genasys Protect

UNVERIFIED

Maui Emergency Management Agency (Maui). Procedure, web page. <https://www.mauicounty.gov/CivicAlerts.aspx?AID=16315>

The county's own announcement of the Genasys Protect zone-naming and real-time evacuation-status system, which is the current mechanism through which Maui issues zone-specific evacuation orders — a structurally different approach from the other three counties, which order evacuation by tsunami zone color rather than by named evacuation zone.

C-22 · H-45 · 2025-04 · Tsunami Facts — Hawai'i Island (TsuFacts tri-fold, April 2025)

Hawai'i County Civil Defense Agency with NWS International Tsunami Information Center (ITIC) (Hawai'i). Public education, 2 (11x17 tri-fold).

https://www.weather.gov/media/itic-car/hawaii_information/TsuFacts_11x17_tri-fold_ITIC_Hawaii_FINAL_apr2025_20250428.pdf

The current Hawai'i County public-facing doctrine sheet. Contains the county-specific siren interpretation used on Hawai'i Island — "each ring equals 1 hour of tsunami travel time coming to Hawai'i" — a convention not used in Maui County's equivalent brochure.

C-29 · 2025-04 · Tsunami Facts — Maui County (TsuFacts tri-fold, April 2025)

Maui Emergency Management Agency with NWS/ITIC (Maui). Public education, 2 (11x17 tri-fold).

https://www.weather.gov/media/itic-car/hawaii_information/TsuFacts_11x17_tri-fold_ITIC_Maui_FINAL_apr2025_20250428.pdf

Maui County's siren doctrine differs materially from Hawai'i County's and Kaua'i's in this same brochure family: on Maui, sirens sounding means evacuation is necessary and "significant and widespread land flooding is expected" — not the "one ring per hour of travel time" convention used on Hawai'i Island and Kaua'i.

C-40 · 2025-04 · Tsunami Facts — Kaua'i County (TsuFacts tri-fold, April 2025)

Kaua'i Emergency Management Agency with NWS/ITIC (Kaua'i). Public education, 2 (11x17 tri-fold).

https://www.weather.gov/media/itic-car/hawaii_information/TsuFacts_11x17_tri-fold_ITIC_Kauai_FINAL_apr2025_20250428.pdf

The current Kaua'i edition, updated with a 1819–2025 map showing 33 tsunamis affecting Hawai'i — a higher count than the Hawai'i Island edition's 24, reflecting different inclusion criteria between county brochures in the same series.

C-10 · 2025-05 · City and County of Honolulu 2025 Local Hazard Mitigation Plan — Executive Summary

City and County of Honolulu DEM (Honolulu). Plan, ~30.

<https://www.honolulu.gov/dem/wp-content/uploads/sites/64/2025/06/Executive-Summary.pdf>

Establishes the plan's legal standing (adopted July 2025, valid through 1 July 2030) and the 20-hazard scope within which tsunami is ranked, plus the mitigation-strategy framing that governs which tsunami actions are fundable under FEMA HMA programs.

C-53 · 2025-05 · **Tsunami Vertical Evacuation Guidance**

NOAA NWS International Tsunami Information Center (ITIC). Guideline, web page. https://www.weather.gov/itic-car/vertical_evacuation_guidance

The technical basis behind the counties' "4th floor of a 10-story building" rule. States that all Hawai'i counties adopted by reference IBC section 1615, Tsunami Loads and Effects, effective 13 November 2018 — the single most important county-level building code fact for vertical evacuation.

C-01 · 2025 · **Tsunami (O'ahu hazard guidance page)**

City and County of Honolulu, Department of Emergency Management (DEM) (Honolulu). Guideline, web page. <https://www.honolulu.gov/dem/tsunami/>

This is the only official O'ahu page that states the activation criterion for the Extreme Tsunami Evacuation Zone (XTEZ) in plain terms: "If an earthquake happens in the Eastern Aleutian Islands with a magnitude 9.0 or greater, it will cause a rare, more extreme tsunami event." It defines the standard TEZ as based on historical impacts over the past 100 years (red) versus the XTEZ (yellow), and gives the operative vertical-evacuation rule — "proceed to the fourth floor or higher of a building that is 10 stories or taller." It also states the safe-condition test differs by zone: TEZ evacuees are safe on reaching yellow OR green.

C-04 · 2025 · **O'ahu Tsunami Evacuation Zones (interactive address-lookup web map)**

City and County of Honolulu DEM / CCH GIS (Honolulu). Map, web page (application). <https://cchnl.maps.arcgis.com/apps/webappviewer/index.html?id=39a9e07068a14d01a85b437adcf50beb>

The authoritative parcel-level zone-determination tool for O'ahu, cited as the official O'ahu source by both HI-EMA and NWS/ITIC. It renders both the standard and extreme zones as separate toggleable layers, which is how a resident or hotel operator resolves an ambiguous address.

C-06 · 2025 · **HNL Alert (O'ahu mass notification system)**

City and County of Honolulu DEM (Honolulu). Procedure, web page. <https://www.honolulu.gov/dem/hnl-alert/>

Documents O'ahu's opt-in mass-notification architecture: full registration at hnlalert.gov for topic-selectable alerts, or zero-registration SMS-only enrollment by texting "HNLALERT" to 888777. Delivery is by SMS, email, and push through the Public Safety by Everbridge app.

C-07 · 2025 · **Get Alerts / Stay Informed (O'ahu alert and warning channels)**

City and County of Honolulu DEM (Honolulu). Public education, web page. <https://www.honolulu.gov/dem/stay-informed/>

Gives the O'ahu monthly test timing that differs from the generic statewide description — sirens and EAS are tested on the first business day of each month at 11:45 a.m.

C-08 · 2025 · **Emergency Shelters (O'ahu tsunami assembly areas vs. hurricane refuge areas)**

City and County of Honolulu DEM (Honolulu). Procedure, web page. <https://www.honolulu.gov/dem/shelter/>

The single clearest statement of O'ahu's doctrinal split — for tsunami, the county opens assembly areas (outdoor parking lots or fields, minimal staffing, no services, bathrooms only if available), active only while the warning is in effect; for hurricane, it opens Hurricane Refuge Areas (pre-engineered buildings, hours to days).

C-19 · 2025 · **Hawai'i County Civil Defense Agency — Alerts**

Hawai'i County Civil Defense Agency (HCCDA) (Hawai'i). Procedure, web page. <https://hawaii-county-civil-defense-agency-hawaii-countygis.hub.arcgis.com/pages/alerts>

Documents Hawai'i County's opt-in enrollment keyword — text HAWAIIALERTS to 888777 (distinct from O'ahu's HNLALERT) — and confirms the county runs Civil Defense Alerts and separate Hawai'i Police Department alerts on the same platform.

C-24 · 2025 · **County of Hawai'i 2025 Hazard Mitigation Plan (update of the 2020 MHMP)**

Hawai'i County Civil Defense Agency, prepared by Tetra Tech (Hawai'i). Plan, web page (portal to the plan). <https://hawaii-county-civil-defense-agency-hawaii-countygis.hub.arcgis.com/pages/mhmp>

Confirms the existence, authorship, and scope of the current Hawai'i County plan: prepared by Tetra Tech, led by HCCDA, with over 25 stakeholder organizations participating. This is the current governing mitigation document for Hawai'i Island tsunami risk and supersedes the 2020 draft.

C-39 · 2025 · **Tsunami Facts: Frequently Asked Questions — Important Information You Need to Know (Kaua'i)**

Kaua'i Emergency Management Agency (KEMA) with NWS/ITIC (Kaua'i). Public education, 1.

https://www.kauai.gov/files/assets/public/v/1/emergency-management/documents/tsufacts_11x17_2-fold-itic_kauai_nonbr_final.pdf

Contains a numeric threshold present in no other county document reviewed: for an Extreme Tsunami Warning it states a 3.5-hour window may be available.

C-52 · 2025 · **Hawai'i Tsunami Information (ITIC county resource hub)**

NOAA NWS International Tsunami Information Center. Public education, web page.

<https://weather.gov/itic-car/hawaii>

The single index tying each county emergency management agency to its current public brochure and to its county tsunami runup observation map — a set that exists nowhere else: Kaua'i (Kauai_2013_11x17.pdf), O'ahu (Oahu_2013_11x17.pdf), Maui (Maui_2013_11x17.pdf), Moloka'i & Lāna'i (MolokaiLanaiRunup_apr17.pdf — the only dedicated Moloka'i/Lāna'i tsunami product found in this research), and Hawai'i Island (Hawaii_2013_11x17.pdf).

F-49 · 2025 · **Volcano Watch — Distant versus local earthquakes and tsunami response times in Hawaii**

U.S. Geological Survey Hawaiian Volcano Observatory. Report, web page.

<https://www.usgs.gov/observatories/hvo/news/volcano-watch-distant-versus-local-earthquakes-and-tsunami-response-times>

Gives the two timing regimes in concrete numbers. Distant: for the 29 July 2025 Kamchatka earthquake, PTWC issued the warning 1 hour 19 minutes after detection, with waves arriving just after 7:00 p.m. HST and a maximum measurement of 1.7 meters (5.7 feet) at Kahului, Maui.

H-15 · 2025 · **A 700-year rupture sequence of great eastern Aleutian earthquakes from tsunami modeling of stratigraphic records**

Y. Yamazaki, K. F. Cheung, T. Lay, S. La Selle, R. C. Witter, B. E. Jaffe — Nature Communications. Paper, 14.

<https://www.nature.com/articles/s41467-025-57802-w>

The recurrence backbone for Hawai'i PTHA. Models stratigraphic tsunami deposits to identify three eastern Aleutian ruptures — 18th century (Mw ~8.4), 15th century (Mw ~7.9), 14th century (Mw ~8.7) — giving ~200–300 year intervals over 700 years.

H-30 · 2025 · **NOAA Center for Tsunami Research — July 29, 2025 Kamchatka Tsunami**

NOAA/PMEL Center for Tsunami Research. Dataset, 5. <https://nctr.pmel.noaa.gov/kamchatka20250729/>

The source-inversion record for the most recent statewide Hawai'i evacuation. Mw 8.8 at 52.512°N, 160.324°E, 2025-07-29 23:24:52 UTC; over 100 Mw 5+ aftershocks within two days, five exceeding Mw 6.

H-31 · 2025 · **2025 July 29, Kamchatka Tsunami Event — DART and tide gauge data summary**

NOAA National Centers for Environmental Information. Dataset, 3. <https://www.ncei.noaa.gov/products/natural-hazards/tsunamis-earthquakes-volcanoes/tsunamis/recent-significant-events/kamchatka-jul-2025-tsunami-dart-summary>

The archived water-level data package for the 2025 event: 25 DART buoys across the Pacific with raw observations, fitted tidal components and residuals at 15-minute, 1-minute and 15-second intervals, plus the four Hawai'i tide-gauge series — Nāwiliwili, Kahului Harbor, Honolulu, and Hilo Bay — with plots and downloadable data.

H-60 · 2025 · **Hawai'i Maximum Tsunami Runups (1900–2025) and Tsunami Deaths and Damage (1812–2022) — statewide summary graphics**

UNESCO/IOC-NOAA International Tsunami Information Center. Public education, 1 each.

https://www.weather.gov/images/itic-car/hawaii_information/Hawaii_MaxTsunamiRunups_1900-2025.jpg

The two single-image reference charts ITIC maintains for Hawai'i: the maximum-runup-by-location plot spanning 1900–2025 (including the 2025 Kamchatka event), and the deaths-and-damage series for every Hawai'i tsunami since 1812 causing over \$500,000 in losses.

C-09 · 2025-07 · **City and County of Honolulu 2025 Local Hazard Mitigation Plan — Chapter 17: Tsunami**

City and County of Honolulu DEM (Honolulu). Plan, 33 (pp. 17-1 to 17-33). <https://www.honolulu.gov/dem/wp-content/uploads/sites/64/2025/07/Chapter-17.pdf>

The richest quantitative tsunami source for any Hawai'i county. Standard tsunami inundation area: 40,026 residents (4.0%) and 10,186 buildings worth \$20.4B; extreme inundation area: 149,936 residents (14.8%) and 36,967 buildings worth \$72.2B. Evacuation-zone counts differ from inundation counts (TEZ 69,483 / 6.9%).

C-11 • 2025-07 • **Local Hazard Mitigation Plan (LHMP) landing page and chapter index**

City and County of Honolulu DEM (Honolulu). Plan, web page. <https://www.honolulu.gov/dem/lhmp/>

The authoritative index tying each LHMP chapter number to its PDF URL — Ch. 4 Risk Assessment, Ch. 5 Hazard Identification, Ch. 6 Climate Change & Sea Level Rise, Ch. 17 Tsunami, Ch. 23 Mitigation Strategy. Ch.

C-34 • 2025-07 • **Maui County evacuations issued at 3:22 p.m. as NWS upgrades to Tsunami Warning for Hawai'i (MEMA press release)**

Maui Emergency Management Agency (Maui). Report, web page. <https://www.mauicounty.gov/CivicAlerts.aspx?AID=17621>

The primary-source timeline for Maui County's 2025 activation, with times found nowhere else: MEMA full activation at 2:30 p.m., NWS Tsunami Warning at 2:45 p.m., MEMA-issued evacuations at 3:22 p.m., first wave expected 7:17 p.m.

C-58 • 2025-07 • **Tsunami warning: Here's where emergency shelters are open and roads are closed**

Hawai'i Public Radio. Report, web page. <https://www.hawaiipublicradio.org/local-news/2025-07-29/tsunami-warning-heres-where-emergency-shelters-are-open-across-the-islands>

The only consolidated county-by-county roster of what actually opened on 29 July 2025, and it exposes the doctrinal difference cleanly.

C-59 • 2025-07 • **Hawai'i Tsunami Warning: Here's How The Islands Fared**

Honolulu Civil Beat. Report, web page. <https://www.civilbeat.org/2025/07/hawai%CA%BBi-evacuates-coastal-areas-amid-tsunami-warning/>

The best single cross-county operational narrative of the Kamchatka event, with observed wave data by island: Kahului 5.7 ft amplitude above normal sea level (highest in the state), Hilo 4.9 ft, Hale'iwa 4.0 ft (~11 ft crest-to-trough at all three), Hanalei 3.0 ft.

C-49 • 2025-07 • **Tsunami Warning triggered mass evacuation on Kaua'i, resulting in some gridlock, visitor confusion**

Kauai Now (Kaua'i). Report, web page. <https://kauainownews.com/2025/07/30/tsunami-warning-triggered-mass-evacuation-on-kaua%CA%BBi-resulting-in-some-gridlock-visitor-confusion/>

The most complete Kaua'i timeline with counts: PTWC watch 1:25 p.m., warning 2:44 p.m., KEMA evacuation notices 3:00 p.m., sirens 3:25 p.m., Hanalei Bridge westbound closed before 4:00 p.m., nine refuge areas opened 4:15 p.m., coastal roads and 11 bridges closed 6:10 p.m., all-clear 11:15 p.m..

C-61 • 2025-07 • **Tsunami warning: first wave expected to hit state at 7:10 p.m. (Maui County response, incl. Moloka'i and Lāna'i)**

Maui Now (Maui). Report, web page. <https://mauinow.com/2025/07/30/tsunami-warning-first-wave-expected-to-hit-state-at-710-p-m-governor-warns-of-significant-damage-on-coast/>

Records the three statewide siren activations at 5:10 p.m., 6:10 p.m., and 6:40 p.m. — the actual siren cadence used, which no county document states. Documents that MEMA lifted evacuation orders after 11 p.m.

C-17 • 2025-08 • **Tsunami Warning Revealed Gaps in Hawaii Evacuation Plans**

Government Technology / Emergency Management (Honolulu). Report, web page. <https://www.govtech.com/em/preparedness/tsunami-warning-revealed-gaps-in-hawaii-evacuation-plans>

Records the measured O'ahu evacuation travel times of 29 July 2025: Hawai'i Kai to Pearl City over 2 hours; Ala Moana to Kalihi 90 minutes with minimal movement; typical commutes 1.5–3 hours.

C-30 • 2025-08 • **County of Maui, Hawai'i 2025 Hazard Mitigation Plan**

Maui Emergency Management Agency (Maui). Plan, 400+.

<https://www.mauicounty.gov/DocumentCenter/View/155657/2025-County-of-Maui-Hazard-Mitigation-Plan>

Uniquely assesses three separate tsunami inundation scenarios by recurrence interval — SOEST (400-year), GAT (1,500-year), and ASCE (3,500-year) — rather than the two-tier red/yellow framing used operationally.

C-16 · 2025-08 · Tuesday's tsunami warning confirms 2022 research on gridlock, vertical evacuations

Hawaii News Now (reporting University of Hawai'i Dept. of Urban and Regional Planning research by Farnaz Kaviari et al.) (Honolulu). Report, web page. <https://www.hawaiinewsnow.com/2025/08/02/tuesdays-tsunami-warning-confirms-2022-research-gridlock-vertical-evacuations/>

Only accessible account of the UH agent-based Waikīkī evacuation model: 18,000 residents plus ~29,000 hotel-room occupants, 30 minutes of warning. Modeled outcomes — car evacuation produces ~40% fatality among vehicle evacuees (~11,000 deaths); vertical evacuation clears all evacuees to safety within 22 minutes.

H-32 · S-47 · 2025-08 · Tsunami warning puts focus on Waikīkī evacuation plan modeled by UH

University of Hawai'i System News (reporting research by Karl Kim and Farnaz Kaviari, UH Dept. of Urban and Regional Planning). Report, 3. <https://www.hawaii.edu/news/2025/08/04/tsunami-evacuation-plan-waikiki/>

Ties the 2025 evacuation directly to modeled casualty numbers — the most alarming quantitative claim in the Hawai'i evacuation literature. Simulating pedestrian, bicycle and vehicle evacuation of Waikīkī under a catastrophic scenario: 38,760 projected deaths with no improvements; vertical evacuation could save over 55,000 lives.

C-35 · 2025-08 · Evacuation maps, new leadership, more staffing mark changes at Maui Emergency Management Agency after fires

Maui Now (Maui). Report, web page. <https://mauiNOW.com/2025/08/05/evacuation-maps-new-leadership-more-staffing-mark-changes-at-maui-emergency-management-agency-after-fires/>

The clearest account of Maui's post-Lahaina alerting doctrine change and its tsunami implications.

S-40 · 2025-08 · Lessons Learned and Evacuation Takeaways — July 29 Kamchatka Tsunami Warning (House Informational Briefing)

Hawai'i Dept. of Transportation (HDOT). Report, ~15 (slide deck).

<https://hidot.hawaii.gov/wp-content/uploads/2025/08/House-Informational-Briefing-Aug-28-2025-2.pdf>

The only minute-by-minute official state timeline of a real Hawai'i tsunami evacuation. Tsunami Watch 1:25 p.m.; Tsunami Warning 2:43 p.m.; government employees released 2:56 p.m.; Kōlekele Pass opened for evacuation 3:15 p.m.; Nānākuli contraflow shutdown directed 3:30 p.m.; Likeli townbound (Wilson Tunnel) reopened 3:30 p.m..

C-02 · 2025-09 · Tsunami Map Resources (O'ahu evacuation map book index — 43 regional map sheets)

City and County of Honolulu DEM (Honolulu). Map, web page indexing 43 PDF sheets.

<https://www.honolulu.gov/dem/tsunamimaps/>

The only complete, itemized index of O'ahu's tsunami evacuation map book, broken into four regions with 43 named inset sheets (Windward 14, South Shore 13, Leeward 7, North Shore 9), each a separate PDF with a stable honolulu.gov URL.

H-10 · 2025-09 · The 4 November 1952 Kamchatka Tsunami (event overview factsheet)

International Tsunami Information Center / UNESCO-IOC. Public education, 4.

<https://tsunami.ioc.unesco.org/sites/default/files/medias/fichiers/2025/09/1952.pdf>

Puts Hawai'i's 1952 experience in Pacific-wide context with matched numbers: Mw 9.0 source; runup 18.4 m on Paramushir, 15 m at Severo-Kurilsk, 13 m at Olga Bay (travel time ~42 min); 6.1 m on the Island of Hawai'i and 4.5 m on the O'ahu north shore; 1.4 m in Alaska/California, 1 m in New Zealand.

H-12 · 2025-09 · The 9 March 1957 Aleutian Islands Tsunami (event overview factsheet)

International Tsunami Information Center / UNESCO-IOC. Public education, 4.

<https://tsunami.ioc.unesco.org/sites/default/files/medias/fichiers/2025/09/1957.pdf>

The compact quantitative record for 1957 in Hawai'i: Mw 8.3 south of the Andreanof Islands; 16 m runup on Kaua'i near Hā'ena point, 3.9 m at Hilo, 2–3 m average elsewhere; Coconut Island covered by 1 m of water and its footbridge destroyed. No lives lost.

S-05 · 2025-09 · HI-EOP State Emergency Support Function #1 — Transportation Annex

HI-EMA / Hawai'i Dept. of Transportation (HDOT). Plan, ~20. <https://dod.hawaii.gov/hiema/files/2025/10/HI-EOP-SESF-1-Annex-September-2025-part-1-signed.pdf>

Establishes HDOT as Primary Agency with the authority to close state airports, roadways, bridges and tunnels, and to close commercial harbors — the statutory-operational link between HI-EMA and the three HDOT divisions. Divides responsibility explicitly by mode (Highways signage/barricades and damage assessment).

C-13 · 2025-09 · **Revised Charter of the City and County of Honolulu 1973 (Amended 2017 Edition) — Article VI, Chapter 19, Department of Emergency Management (§§ 6-1901 to 6-1904)**

City and County of Honolulu, Office of the City Clerk / Corporation Counsel (Honolulu). Ordinance, ~150. <https://www.honolulu.gov/cor/wp-content/uploads/sites/17/2025/09/Charter-FINAL-9-11-25.pdf>

The constitutive authority for O'ahu emergency management.

S-08 · 2025-09 · **HI-EOP SESF #6 — Mass Care, Emergency Assistance, Housing and Human Services Annex**

HI-EMA / Dept. of Human Services. Plan, 14. https://dod.hawaii.gov/hiema/files/2025/10/SESF6-Annex_30SEP25.pdf

States flatly that "the state is not a shelter provider" — counties and the American Red Cross open and run shelters, the state only coordinates resources on county request. This is the decisive authority answer for tsunami refuge areas.

S-27 · 2025-11 · **Extreme Tsunami Evacuation Zones (statewide GIS layer, Hazards MapServer ID 12)**

Hawai'i Statewide GIS Program, OPSD. Dataset, web page. <https://geodata.hawaii.gov/arcgis/rest/services/Hazards/MapServer/12>

The authoritative machine-readable extreme/yellow zone. Documents per-island provenance and currency exactly: Hawai'i Island from County of Hawai'i March 2025 with corrections applied November 2025; O'ahu from City and County of Honolulu April 2025.

S-28 · 2025-11 · **Tsunami Evacuation Zones (statewide GIS layer, Hazards MapServer ID 2)**

Hawai'i Statewide GIS Program, OPSD. Dataset, web page. <https://geodata.hawaii.gov/arcgis/rest/services/Hazards/MapServer/2>

The standard (red) evacuation zone as an authoritative statewide layer, covering all eight islands including Ni'ihau and Kaho'olawe, with the same per-island provenance/date stamps as S-27.

S-29 · 2025-11 · **Tsunami Evacuation — All Zones (combined layer, Hazards MapServer ID 11)**

Hawai'i Statewide GIS Program, OPSD. Dataset, web page. <https://geodata.hawaii.gov/arcgis/rest/services/Hazards/MapServer/11>

The single layer in which all three state zone classes coexist and are formally enumerated as a controlled vocabulary — Tsunami Evacuation Zone, Extreme Tsunami Evacuation Zone, and Tsunami Safe Zone — with distinct cartographic symbology (backward-diagonal, vertical, and square-marker fills) and 13 fields.

C-50 · **H-53** · **S-25** · 2025-11 · **Tsunami and Extreme Tsunami Evacuation Zone Maps – Cautions and Additional Information**

Hawai'i Statewide GIS Program, Office of Planning and Sustainable Development, State of Hawai'i. Guideline, ~3. <https://files.hawaii.gov/dbedt/op/gis/data/tsunevac.pdf>

The definitive provenance record for who made each county's zones and when — Kaua'i April 2025 (updated scientific techniques, in coordination with county officials); O'ahu April 2025 (based on peer review of UH researchers' inundation models plus responder operational input).

S-02 · 2026-02 · **State of Hawai'i Emergency Operations Plan (HI-EOP): Base Plan**

HI-EMA. Plan, ~200. <https://dod.hawaii.gov/hiema/files/2026/03/HI-EOP-Base-Plan-Final-Signed.pdf>

Current signed base plan (Approval #5, Gov. Green / MG Logan / Administrator Barros). Its Record of Changes is the only place the evolution of HI-EMA activation levels is documented by number and date — Change #23 (2/28/22), #41 (5/31/23), and #54 (6/5/2025) each revised the activation table.

S-17 · 2026-03 · **NEWS RELEASE: Monthly Siren and Emergency Alert System Test for April 2026**

HI-EMA. Procedure, web page. <https://dod.hawaii.gov/hiema/news-release-monthly-siren-and-emergency-alert-system-test-for-april-2026/>

Fixes the standing monthly test protocol: first business day of each month at 11:45 a.m., one-minute Attention Alert Signal (steady tone) on all statewide outdoor warning sirens, coordinated with the EAS Live Audio Broadcast test. Lists the four county siren-malfunction reporting numbers (Honolulu 808-723-8960; Maui 808-270-7285).

H-33 · 2026-04 · **No tsunami threat to Hawaii after large quake off Japan (19–20 April 2026 Sanriku M7.7)**

Honolulu Star-Advertiser; corroborated by Newsweek. Report, 3. <https://www.newsweek.com/japan-tsunami-april-2026-warning-updates-11852539>

The only 2026 event bearing on Hawai'i found in this survey.** M7.7 (initially 7.4) off Sanriku, northern Japan, ~20 km depth, ~4:53 p.m. local April 20, 2026. Japan forecast up to 10 ft in Iwate; observed ~2.6 ft at Kuji port and 1.3 ft elsewhere in Iwate.

C-42 · 2026-05 · **Notification Services — ALERT Kaua'i**

Kaua'i Emergency Management Agency (Kaua'i). Procedure, web page.

<https://www.kauai.gov/Government/Departments-Agencies/Emergency-Management-Agency/Notifications>

Documents ALERT Kaua'i on the Everbridge platform, delivering phone calls, text, and email — notably including voice phone calls, which the O'ahu and Hawai'i County descriptions do not emphasize.

C-43 · 2026-05 · **Kaua'i County switches to new emergency notification service**

Spectrum News Hawai'i (Kaua'i). Report, web page.

<https://spectrumlocalnews.com/hi/hawaii/news/2026/05/05/kauai-county-switches-to-new-emergency-notification-service>

Dates and explains Kaua'i's platform migration from Inspiron to Everbridge on 5 May 2026, selected by a county committee, and the operational reason it matters: Everbridge's Resident Connect database reaches on-island contacts beyond traditional opt-in lists — a materially broader reach than an opt-in-only roster.

F-20 · 2026-05 · **United States Tsunami Alerting Analysis 2026 (Public Version)**

Washington State Emergency Management Division Tsunami Program, on behalf of NOAA and NTHMP. Report, 91.

https://www.weather.gov/media/nthmp/WCS/260507_United%20States%20Tsunami%20Alerting%20Analysis%202026%20PUBLIC%20VERSION.pdf

The newest and most comprehensive cross-jurisdiction inventory of how tsunami alerts actually reach people, state by state.

C-46 · 2026 · **County of Kaua'i Multi-Hazard Mitigation and Resilience Plan, Volume 1 of 2 (2026)**

Kaua'i Emergency Management Agency (Kaua'i). Plan, several hundred (9 MB).

<https://www.kauai.gov/files/content/public/v/18/government/departments-agencies/emergency-management-agency/multi-hazard-mitigation-and-resilience-plan/2026-kauai-county-multi-hazard-mitigation-and-resilience-plan-final.pdf>

Section 7 is Kaua'i's tsunami hazard chapter, containing Table 7-2 (exposed population and property in the tsunami inundation zone), Table 7-3 (communities with high-or-above social vulnerability located in tsunami inundation area — the only county plan indexing tsunami exposure against a social vulnerability threshold by community), Figure 7-3 (critical facilities in tsunami inundation areas), and Table 7-4 (loss impact).

F-06 · 2026 · **Tsunami Message Definitions**

NOAA / NWS U.S. Tsunami Warning Centers (tsunami.gov). Product guide, web page. https://www.tsunami.gov/?page=message_definitions

The canonical public wording of the four domestic alert levels, verbatim: Warning — "A tsunami with the potential to generate widespread inundation is imminent, expected, or occurring"; Advisory — "...potential to generate strong currents or waves dangerous to those in or very near the water..."

F-23 · **C-51** · 2026 · **TsunamiReady Communities — Hawaii**

NOAA / National Weather Service. Dataset, web page. <https://www.weather.gov/tsunamiready/hi-tr>

The authoritative federal roster of Hawai'i recognitions: 17 TsunamiReady entities comprising 4 counties, 13 communities and 1 government site. Named communities include Aina Haina, Ewa Beach, Kailua, Hanapepe-Eleele, Hauula, Maili, Makaha, Manoa, Nanakuli, South Maui, Waianae, Wahiawa, and Marine Corps Base Hawaii.

F-38 · 2026 · **NCEI/WDS Global Historical Tsunami Database, 2100 BC to Present**

NOAA National Centers for Environmental Information / World Data Service for Geophysics. Dataset, web page (documentation). <https://www.nci.noaa.gov/products/natural-hazards/tsunamis-earthquakes-volcanoes/tsunamis/global-historical-data>

The authoritative event catalog: over 2,200 source events with validity rating above zero and more than 27,000 runup observations, distributed 70 percent Pacific, 15 percent Mediterranean, 9 percent Caribbean/Atlantic, 6 percent Indian Ocean.

F-39 • 2026 • **Tsunami Capable Tide Stations**

NOAA National Ocean Service, Center for Operational Oceanographic Products and Services (CO-OPS). Dataset, web page. <https://tidesandcurrents.noaa.gov/tsunami/>

The operational registry of coastal water-level gauges hardened and configured for tsunami detection, organized by region (West Coast, Alaska, Pacific, Caribbean, East Coast, Gulf Coast) and distinguishing active "Tsunami Capable Tide Station" from "Inactive Tsunami Tide Station." These are the instruments that produce the confirmed wave-height observations PTWC uses to upgrade, downgrade or cancel a Hawai'i alert, and the associated CO-OPS 1-Minute Tsunami Water Level Data product is the higher-rate feed used during events.

F-40 • 2026 • **47 CFR Part 10 — Wireless Emergency Alerts**

Federal Communications Commission. Rule, web page (~30 printed).
<https://www.ecfr.gov/current/title-47/chapter-I/subchapter-A/part-10>

The rules that determine whether a tsunami alert reaches a phone in Waikiki. § 10.400 establishes the four alert classes and sets the Imminent Threat threshold — Urgency must be Immediate or Expected, Severity Extreme or Severe, Certainty Observed or Likely (a tsunami warning qualifies; an advisory generally does not).

F-41 • 2026 • **47 CFR § 11.31 — EAS Protocol (Emergency Alert System)**

Federal Communications Commission. Rule, web page.
<https://www.ecfr.gov/current/title-47/chapter-I/subchapter-A/part-11/subpart-B/section-11.31>

Contains the actual event-code table rows: TSW for Tsunami Warning and TSA for Tsunami Watch — and notably no EAS event code exists for a Tsunami Advisory, a structural gap for Hawai'i advisory-level events.

F-42 • 2026 • **Integrated Public Alert and Warning System (IPAWS) — Frequently Asked Questions**

FEMA. Procedure, web page. <https://www.fema.gov/emergency-managers/practitioners/integrated-public-alert-warning-system/faqs>

Establishes the aggregator layer between PTWC and the public: IPAWS as FEMA's national local-alerting system distributing through WEA, EAS and NOAA Weather Radio, using CAP as the common digital format so one message reaches all channels simultaneously.

F-43 • 2026 • **NOAA Weather Radio All Hazards — Hawaii Transmitter Network**

NOAA / NWS Weather Forecast Office Honolulu. Dataset, web page. <https://www.weather.gov/hfo/nwr>

The only listing of the actual Hawai'i NWR broadcast infrastructure that carries tsunami alerts: KBA99 (Mt. Ka'ala, O'ahu, 162.550 MHz; Hawai'i Kai, O'ahu, 162.450 MHz) covering Kaua'i, O'ahu, Moloka'i, Maui, Lāna'i and parts of Hawai'i Island; WWG75 (Haleakalā, Maui, 162.400 MHz).

F-44 • 2026 • **Hawaii Tsunami Preparedness and Safety Information**

NOAA / NWS Weather Forecast Office Honolulu (WFO HFO). Product guide, web page.
https://www.weather.gov/hfo/tsunami_safety

The clearest federal statement of WFO Honolulu's actual role, which is narrower than commonly assumed: PTWC "has responsibility for tsunami monitoring, and the subsequent issuance of any necessary watches or warnings," and the WFO functions as an information conduit and educator, not the warning originator.

F-45 • 2026 • **Hawai'i Tsunami Warnings**

NOAA / NWS International Tsunami Information Center. Procedure, web page.
https://weather.gov/itic-car/hawaii_tsunami_warnings

The only federal page that states the federal-state-county authority handoff in Hawai'i explicitly: "The PACIFIC TSUNAMI WARNING CENTER (PTWC) provides the official tsunami warnings for the state of Hawai'i"; "EACH COUNTY is responsible for TSUNAMI EVACUATIONS, and issuing the ALL-CLEAR".

F-48 • 2026 • **NOAA Tsunami Forecasting (SIFT — Short-term Inundation Forecasting for Tsunamis)**

NOAA Pacific Marine Environmental Laboratory, NOAA Center for Tsunami Research. Procedure, web page.
<https://nctr.pmel.noaa.gov/tsunami-forecast.html>

Documents the forecast engine both warning centers run.

C-05 · 2026-06 · **O'ahu Hazard Explorer**

City and County of Honolulu DEM (Honolulu). Map, web page (application).
<https://experience.arcgis.com/experience/d44ac270b13b4bf893c7bc4ad7e22a58>

Multi-hazard successor tool that overlays tsunami evacuation zone with flood zone, dam/levee evacuation area, and wildfire risk for a single pinned address, and produces a printable result sheet intended for inclusion in a family or business disaster plan.

C-12 · 2026-07 · **City and County of Honolulu Department of Emergency Management After Action Report — July 2025 Tsunami (Final.CCH_DEM_07-25Tsunami_AAR)** **UNVERIFIED**

City and County of Honolulu DEM, with Ascenttra (consultant) (Honolulu). Report, unknown (PDF; direct fetch blocked). https://download.veoci.com/ZF0i6y4jRaAV1HfX/Final.CCH_DEM_07-25Tsunami_AARdocx.pdf

The single most important county document for the 2025 event. Finding that 92% of vehicle trips made during the O'ahu evacuation were unnecessary (drawn from an initial HDOT congestion study).

C-60 · 2026-07 · **New report lays out highs and lows of Honolulu tsunami response**

Hawai'i Public Radio (Honolulu). Report, web page.
<https://www.hawaiipublicradio.org/local-news/2026-07-16/new-report-lays-out-highs-and-lows-of-honolulu-tsunami-response>

The most detailed accessible account of the DEM after-action report's contents, including the file identifier (CCH_DEM_07-25Tsunami_AAR) and its download URL.

C-21 · current · **Tsunami Evacuation Map 01 — Hilo (Part 01)** **UNVERIFIED**

Hawai'i County Civil Defense Agency (Hawai'i). Map, 1 (large-format sheet; part of a numbered series).
[https://records.hawaiicounty.gov/weblink/1/edoc/73305/Tsunami%20Evacuation%20Map%2001%20Hilo%20\(Part%2001\).pdf](https://records.hawaiicounty.gov/weblink/1/edoc/73305/Tsunami%20Evacuation%20Map%2001%20Hilo%20(Part%2001).pdf)

Sheet 1 of Hawai'i County's numbered tsunami evacuation map series, covering Hilo — the single most tsunami-consequential locality in the state. The full series is browsable in the county's Laserfiche WebLink repository (folder startid=24604, dbid=1).

C-27 · current · **Hawai'i County Civil Defense Agency — Emergency Preparedness**

Hawai'i County Civil Defense Agency (Hawai'i). Public education, web page. <https://hawaii-county-civil-defense-agency-hawaiicountygis.hub.arcgis.com/pages/emergency-preparedness>

Hosts Hawai'i County's own preparedness instruments not published by any other county: Project 360 – 'Ohana Emergency Plan, a Business Emergency Evacuation Plan Template (Word), and a Community Emergency Response Plan Template (Word).

C-32 · current · **Mitigate Maui Nui — Tsunami Hazard Profile**

Maui Emergency Management Agency (FEMA-grant-funded planning portal) (Maui). Public education, web page.
<https://www.mitigatemauiinui.com/hazards/tsunami>

The most specific Maui County historical tsunami dataset available online. 61 tsunami events 1800–2020, 7 causing significant damage/injury/death.

C-41 · current · **Kaua'i Emergency Management Agency (agency page and document index)**

County of Kaua'i (Kaua'i). Guideline, web page.
<https://www.kauai.gov/Government/Departments-Agencies/Emergency-Management-Agency>

The authoritative index of KEMA's published instruments, and the only place linking the Emergency Refuge Area Status Page (a live ArcGIS app showing which refuge areas are currently open — no other county publishes real-time refuge status) and the Monthly Siren Reporting Tool (arcgis.com/arcgis/1riain5), a crowd-sourced siren-audibility reporting instrument unique to Kaua'i.

C-44 · current · **Kaua'i Siren Locations**

Kaua'i Emergency Management Agency (Kaua'i). Map, web page (with four regional sub-pages).
<https://www.kauai.gov/Government/Departments-Agencies/Emergency-Management-Agency/Kauai-Siren-Locations>

States plainly what the other counties leave implicit: Kaua'i's sirens are "owned and operated by the Hawai'i Emergency Management Agency (HI-EMA)," not by the county.

C-45 · current · **Potential Refuge Area List and Map for Kaua'i**

Kaua'i Emergency Management Agency (Kaua'i). Procedure, 2 (list plus map).

<https://www.kauai.gov/files/content/public/v/80/government/departments-agencies/emergency-management-agency/potential-refuge-area-list-and-map-for-kauai.pdf>

Lists 19 potential refuge facilities across three regions (North/East, Central, South/West), including the Kaua'i Humane Society.

C-48 · current · **TSUNAMI UPDATE: Additional bridges to close at 6:10 p.m.; additional shelters open**

The Garden Island (reporting County of Kaua'i / KEMA actions) (Kaua'i). Report, web page.

<https://www.thegardenisland.com/2025/07/29/hawaii-news/tsunami-watch-issued-for-hawaii-2/>

The only itemized record of Kaua'i's 2025 tsunami road-closure plan as executed. Names all ten closure points activated at 6:10 p.m. (Kaumuali'i Hwy at Fort Elizabeth; Kaumuali'i west of Lele Rd; Kaumuali'i at Waialo Rd; Po'ipū Rd roundabout; Ala Kinoiki at Weliweli; Nāwiliwili at Lala; Rice at Mōkoi; Kūhiō at Kapule.

C-55 · **S-32** · current · **Tsunami Evacuation Zones (state portal to county zone tools)**

Hawai'i Emergency Management Agency (HI-EMA), State of Hawai'i Department of Defense. Guideline, web page.

<https://dod.hawaii.gov/hiema/tsunami-evacuation-zones/>

The state's designation of which tool is authoritative for each county — and the finding that Maui County and Kaua'i County are both routed to NOAA's national viewer (tsunami.coast.noaa.gov) while Hawai'i County and Honolulu are routed to their own county GIS applications.

C-56 · **S-16** · current · **All-Hazard Statewide Outdoor Warning Siren System**

Hawai'i Emergency Management Agency (HI-EMA). Procedure, web page. <https://dod.hawaii.gov/hiema/all-hazard-statewide-outdoor-warning-siren-system/>

Establishes that the sirens all four counties rely on are a single state-operated system, described as "the largest single integrated Outdoor Siren Warning System for Public Safety in the world." Gives the engineering specification — 121 decibels, manufacturer radius 3,400 ft, battery power with photovoltaic charging — which is the number that determines whether a given coastal community is actually covered.

H-05 · 2026-08 · **1 April 1946, Mw 8.6, Aleutian Islands, USA — event page and 1946 Tsunami Overview factsheet**

International Tsunami Information Center / UNESCO-IOC, Honolulu. Public education, 3.

<https://tsunami.ioc.unesco.org/en/1-april-1946>

Gives the operational travel-time number used in Hawai'i preparedness messaging: the tsunami arrived at Hilo 4.9 hours after generation. States 96 deaths in Hawai'i (ITIC's Hilo-area figure, contrasting with the 159–173 statewide totals elsewhere), \$26 million in 1946 dollars, and >100 ft runup at Unimak.

H-16 · current · **The Effects of the March 27, 1964 Alaska Tsunami in the Hawaiian Islands**

George Pararas-Carayannis. Report, 6. <https://www.drgeorgepc.com/Tsunami1964Hawaii.html>

The only compiled Hawai'i-by-station record for 1964 with matched arrival times, runups, and wave periods: Midway arrival 4.9 hr / 0.1 m gauge / 15-min period; Honolulu 5.3 hr / 4.8 m max runup / 0.5 m gauge / 21-min period; Kahului 5.2 hr / 3.7 m max runup / 23-min period.

H-25 · current · **NCEI Global Historical Hazard Database — 11 March 2011 Japan (Honshu) Tsunami event record**

NOAA National Centers for Environmental Information. Dataset, 3.

<https://www.ngdc.noaa.gov/hazel/view/hazards/tsunami/event-more-info/5413>

The authoritative source of the \$30 million Hawai'i damage figure for 2011, together with the linked per-location runup records for Hawaiian stations. NCEI's parallel 1960 record independently gives 61 deaths, 43 injuries and \$23.5 million (USD) damage in Hawai'i, and its 2022 Tonga record notes >1 m at Hawaiian tide gauges.

H-43 · current · **NCEI/WDS Global Historical Tsunami Database, 2100 BC to Present**

NOAA National Centers for Environmental Information / World Data Service for Geophysics. Dataset, n/a (database). <https://doi.org/10.7289/V5PN93H7>

The canonical runup record and the numerical authority behind nearly every figure in this inventory. Over 2,400 tsunamis in two linked files.

H-44 · current · **NCEI Global Historical Hazard Database — Tsunami Runup Search (HazEL)**

NOAA National Centers for Environmental Information. Dataset, n/a (interface).

<https://www.ngdc.noaa.gov/hazel/view/hazards/tsunami/runup-search>

The live query interface for extracting the Hawai'i runup subset from H-43 — the practical tool for generating a per-island, per-event runup table for the compendium, with map viewers for tsunamis, earthquakes, volcanoes and runup observations.

H-50 · current · **Pacific Tsunami Museum — Collections and Oral History Archive**

Pacific Tsunami Museum, 130 Kamehameha Ave., Hilo, HI 96720. Museum/archive, n/a (archive).

<https://tsunami.org/collections-2/>

The irreplaceable human record — over 600 interviews and written accounts from people who survived or witnessed a Pacific tsunami. Holds original 1946 event footage (licensable), historic photographs of Hawai'i and particularly Hilo town, plus documents, artifacts and maps, with donations from Chile, Colombia, Japan and Russia.

H-54 · **S-31** · current · **Hawai'i State Tsunami Evacuation Maps (interactive viewer)**

Pacific Disaster Center, Kihei, Maui, for the State of Hawai'i. Dataset, 70 map sheets.

<https://static.pdc.org/tsunami/index.html>

The operational public map product referenced by HI-EMA as the downloadable evacuation zone maps. Sheet counts by island: Kaua'i 10, O'ahu 21 (with multiple insets), Moloka'i 7, Lāna'i 5, Maui 12, Hawai'i Island 15** — 70 sheets total.

H-55 · 2026-08 · **Extreme Tsunami Evacuation Zones (PacIOOS Voyager data layer)**

Pacific Islands Ocean Observing System, School of Ocean and Earth Science and Technology, University of Hawai'i at Mānoa. Dataset, 2 per layer.

https://www.pacioos.hawaii.edu/voyager/info/tsunami_extreme_zones.html

The SOEST-hosted delivery of the extreme zones with the provenance sentence: "Boundaries are based on peer review of inundation models provided by University of Hawai'i researchers," combined with county first-responder and emergency-management operational input.

H-56 · **S-33** · 2026-08 · **Tsunami — Hazard information, evacuation zones and warning systems**

Hawai'i Emergency Management Agency (HI-EMA), State of Hawai'i Department of Defense. Public education, 3.

<https://dod.hawaii.gov/hiema/tsunami/>

The official state definition of the two zones in the state's own words — Red Zones are "tsunami inundation zones that must be evacuated during any tsunami warning".

S-36 · 2026-08 · **Keeping Our Schools Safe**

Hawai'i State Dept. of Education (HIDOE). Guideline, web page. <https://hawaiipublicschools.org/school-services/keeping-our-schools-safe/>

Contains the two school numbers found nowhere else: thirteen schools statewide lie inside primary (red) tsunami evacuation zones, and those schools must be able to evacuate within 10 minutes because a locally generated tsunami can arrive in 15–30 minutes.

S-44 · 2026-08 · **About the Agency (HI-EMA)**

HI-EMA. Guideline, web page. <https://dod.hawaii.gov/hiema/about-the-agency/>

Defines the State Warning Point as a "state emergency communications center staffed 24 hours, 7 days a week" handling statewide communications with county emergency officials — the operational description matching HRS 127A-7.

S-45 · 2026-08 · **Natural Disasters (Office of Public Health Preparedness)**

Hawai'i State Dept. of Health. Guideline, web page. <https://health.hawaii.gov/prepare/natural-disasters/>

DOH's only public-facing tsunami content; establishes that the health department defers entirely to HI-EMA/county evacuation-zone guidance and contributes only natural-warning-sign recognition and family preparedness messaging, routing the public to preparenowhawaii.org.

S-46 · 2026-08 · **Hawai'i Visitor Emergency Guide**

HI-EMA. Guideline, web page. <https://dod.hawaii.gov/hiema/hawai%CA%BBi-visitor-emergency-guide/>

The state's designated tourism-facing tsunami product — filling the role HTA does not. Maps each county to its mass-notification vendor, which appears together nowhere else: Hawai'i County = Everbridge, Maui County = Genasys, O'ahu = HNLAlert, Kaua'i = WENS.

Documents to request directly

Seventeen documents central to this compendium exist, or are said to exist, but could not be obtained online during its compilation. Each entry below states what the document is, why it matters, and who to ask. Several are single points of failure for whole sections of the operational picture.

11. A Hawai'i PTWC product user's guide. No such guide appears to exist. The tsunami.gov product-guides index carries guides for Canada and the U.S. except Hawai'i, American Samoa, Guam/CNMI, Puerto Rico/USVI and the international Caribbean — Hawai'i is the only PTWC-served U.S. jurisdiction without one [F-12]. The 145-page Puerto Rico/USVI guide is the structural template for what a Hawai'i guide would contain: product IDs, UGC code tables, the earthquake parameter block, forecast tables with ETAs and wave heights, and recommended-action wording [F-11]. Ask PTWC and ITIC, both in Honolulu, whether one exists unpublished and whether one is planned.

12. The City and County of Honolulu Emergency Operations Plan and its tsunami annex. No public URL exists for either. The after-action report explains why: it recommends that tsunami-specific protocols *be added* to the City EOP, which implies the plan has no tsunami annex [C-12]. Request the current EOP, its base-plan and ESF structure, and confirmation of whether a tsunami annex now exists, from Honolulu DEM at 650 South King Street, Basement [C-06].

13. **The Hawai'i County, Maui County and Kaua'i County Emergency Operations Plans and tsunami annexes.** None of the three is published. Hawai'i County distributes documents through a cookie-gated records repository; Maui County's document tree is largely blocked to automated retrieval; KEMA's site carries no EOP. These are the documents that would show whether the evacuation decisions of 29 July 2025 followed written procedure or practice. Ask HCCDA at (808) 935-0031 or civildefense@hawaiicounty.gov [C-22]; MEMA at Emergency.Management@mauicounty.gov [C-29]; and KEMA at kema@kauai.gov or (808) 241-1800 [C-42].

14. Part 2 of the State of Hawai'i Tsunami Incident Annex. Only the file named as part 1 signed is published [S-01]. The naming convention matches the SESF annexes, which are also published as part 1 signed, so a Part 2 is strongly implied but is not linked from the state EOP page and no direct-URL variant resolves. Part 1 does contain the seven enclosures, so Part 2 may be distribution material only. Ask HI-EMA to confirm what Part 2 is and whether it is releasable [S-01].

15. **HI-EMA State Warning Point standard operating procedures, including the New Urgent Local Tsunami Warning Procedures Memorandum.** The memorandum is Enclosure 6 of the Tsunami Incident Annex and exists only inside that annex; the SWP's own SOPs are not published separately [S-01]. These procedures govern the one action the state takes unilaterally — sounding sirens in all counties without county concurrence following a local earthquake greater than M7.5 [S-01]. Request from HI-EMA.

16. The Hawai'i Tsunami Traffic Mitigation Plan. Committed by HDOT in its August 2025 legislative briefing with a November 2025 target, and not found in repeated searching [S-40]. It is the document that would fill the contraflow gap in the state transportation annex [S-05]. Request from HDOT, with a question about status and expected publication date.

17. The HDOT congestion study behind the 92 percent figure. The Honolulu after-action report cites it as an *initial* State DOT finding; the underlying study is not published [C-12]. The 92 percent unnecessary-trip figure is the most consequential single number produced by the 2025 event and it currently rests on a secondary characterisation of an unpublished study. Request the study, its method and its sample from HDOT.

18. Confirmation of whether Hawai'i County maps an extreme zone at all. The NWS/ITIC comparison of

the four counties lists two-tier standard-plus-extreme mapping for O'ahu, Maui and Kaua'i but attributes no extreme tier to Hawai'i County [C-54][C-20]. The county's own public brochure, however, prints the five-tier alert ladder including Extreme Warning [C-22]. This is potentially the single most important structural difference among the four counties and the record contradicts itself. Ask HCCDA directly at (808) 935-0031 or civildefense@hawaiiicounty.gov [C-22].

19. After-action reports from Hawai'i County, Maui County and Kaua'i County for July 2025. Only Honolulu published one [C-12]. KEMA Administrator Elton Ushio publicly committed to a post-incident review [C-49]; Maui's and Hawai'i County's are not evidenced either way. Ask each of the three whether an after-action report or improvement plan was produced and whether it is releasable.

20. Per-county siren counts. Only Hawai'i Island's inventory is public — 92 sirens installed with 9 non-functional at one October monthly test [C-26]. O'ahu, Maui and Kaua'i counts were not found. The state publishes a statewide figure of 418 sirens with an October 2023 breakdown of 326 fully operational, 29 needing in-house maintenance, 37 needing contracted maintenance and 26 inoperable [S-18], but no per-county split. HI-EMA owns the system and holds the roster [C-44][C-56].

21. The roster of the thirteen public schools inside primary tsunami evacuation zones. The count is published and the list is not [S-36]. Those thirteen schools operate under a 10-minute evacuation standard, initiated by the school administrator rather than by the county [S-35][S-36]. Request the list from the Hawai'i State Department of Education, Safety, Security and Emergency Preparedness Branch.

22. Recognition and expiry dates for the seventeen Hawai'i TsunamiReady designations. The NWS roster page names four counties, thirteen communities and one government site but publishes no dates [C-51][F-23]. Recognition runs on a four-year cycle, so without dates the roster cannot be checked for currency [F-05]. Request from the NWS Honolulu Forecast Office.

23. Hawai'i County's complete tsunami evacuation map series. Sheet 01, Hilo Part 01, resolves as a PDF; the full numbered series sits in the county's Laserfiche repository behind a cookie gate [C-21]. Hawai'i County is the only county that distributes its evacuation maps through a records-management system rather than a map library, which is why the series is hard to find [C-21]. Request the complete set as PDFs from HCCDA.

24. Kaua'i's standing traffic-control procedure for the Hanalei Bridge. The one-way, eastbound-only conversion at about 3:50 p.m. on 29 July 2025 was plainly a pre-planned action, but no written procedure was found [C-48]. Given that there is no refuge area on the Hanalei side of the bridge [C-45], this procedure is the county's decisive lever on its most constrained evacuation. Ask KEMA and the HDOT Highways Kaua'i District for the standing traffic-control plan.

25. Any county requirement that hotels hold a tsunami evacuation plan. No county in Hawai'i appears to impose one. The closest instruments found are Hawai'i County's voluntary Business Emergency Evacuation Plan Template [C-27] and the counties' adoption by reference of IBC section 1615, Tsunami Loads and Effects, effective 13 November 2018 [C-53]. Ask each county whether hotel evacuation plans are required under fire code, building code or a transient-accommodations condition, and ask the Hawai'i Hotel and Lodging Association what its members actually hold.

26. The Cox and Mink Hawai'i runup technical reports. The 1963 statewide runup catalogue for the

1960 tsunami is available only through a Japanese mirror; Doak Cox's later technical reports at the University of Hawai'i are not online at all and are likely held only in the Hamilton Library Hawaiian Collection and the Water Resources Research Center archive [H-06]. This is the largest single gap in the historical runup record. Request through UH Mānoa library services.

27. A formal probabilistic tsunami hazard assessment for Hawai'i. None appears to exist as such.

What exists instead is the deterministic scenario-envelope approach of the 40-scenario extreme inundation study [H-35], recurrence constraints of roughly one per thousand years for eastern Aleutian Mw greater than 9.0 [H-34], and 200–300 year intervals for the Mw 8-to-8.7 class [H-15]. A separate probabilistic product exists for engineering — the 2,500-year-return-period Tsunami Design Zone maps under ASCE 7 — but it is a building-code product, not an evacuation-planning hazard assessment, and covers only O'ahu, Maui and Kaua'i [S-37]. Ask HI-EMA and the OPSD Coastal Zone Management Program whether a Hawai'i PTHA exists in grey literature.

Contacts and channels

The table below gives the county-level enrolment and reporting channels for tsunami alerting. The sirens themselves are state infrastructure in all four counties, so the malfunction lines are county reporting points into a state-owned system [C-44] [C-56].

COUNTY	AGENCY	ENROLMENT	SIREN MALFUNCTION LINE	OTHER CHANNELS
Honolulu	Department of Emergency Management (DEM) [C-06]	hnlalert.gov, or text HNLALERT to 888777 [C-06]	(808) 723-8960 [S-17]	SMS, email and app push via Everbridge; @Oahu_DEM; WEA, EAS, sirens [C-06] [C-07]
Hawai'i	Hawai'i County Civil Defense Agency (HCCDA) [C-19]	Text HAWAIIALERTS to 888777 [C-19]	(808) 935-0031 [S-17] [C-22]	AM 670 plus 15 FM partner frequencies; police alerts on the same platform; civildefense@hawaiiicounty.gov [C-19] [C-22]
Maui	Maui Emergency Management Agency (MEMA) [C-28]	Genasys Protect / Genasys Evac zone alerting [C-28]	(808) 270-7285 [S-17] [C-29]	Sirens, EAS, WEA; Emergency.Management@mauicounty.gov [C-29] [C-34]
Kaua'i	Kaua'i Emergency Management Agency (KEMA) [C-41]	ALERT Kaua'i portal, (808) 241-1800, or kema@kauai.gov [C-42]	(808) 241-1800 [S-17]	Voice call, text, email on Everbridge; live Refuge Area Status page; monthly siren reporting tool [C-41] [C-42]

One caution on that table. The state's Visitor Emergency Guide maps Kaua'i County to WENS [S-46]; Kaua'i migrated to Everbridge on 5 May 2026 [C-42] [C-43]. Where a state page and a county page disagree on a vendor, the county page is the current one.

Federal and state entities sit above the county layer and do different things. The table below states what each is for.

ENTITY	WHAT IT IS FOR
Pacific Tsunami Warning Center (Honolulu)	Sole authority to issue official Watches, Advisories, Warnings and Information Statements for Hawai'i [F-45] [F-01]
NWS Honolulu Forecast Office	Relays and amplifies PTWC products, runs the NOAA Weather Radio transmitters, public education; not the warning originator [F-44] [F-43]
International Tsunami Information Center (Honolulu)	Training, TsunamiReady support, post-event survey coordination, county public-education products [F-03] [C-52]
Hawai'i Emergency Management Agency	Activates the SEOC, coordinates siren timing with counties, operates the statewide siren system; does not order evacuations [S-44] [F-45]
State Warning Point	24/7 state emergency communications centre; the entity that physically activates the sirens, unilaterally for a local quake above M7.5 [S-01] [S-44]

The standing monthly test is fixed and statewide. On the first business day of each month at 11:45 a.m., every outdoor warning siren in the state sounds a one-minute Attention Alert Signal — a steady tone — coordinated with the Emergency Alert System live audio broadcast test [S-17] [S-16] [C-07]. The test is run in collaboration with the four county emergency management agencies and with broadcast partners [C-56]. On O‘ahu the county states plainly what the steady tone instructs: tune to local radio, television or other official online media, not evacuate on the tone alone [C-07].

Two features of the tone regime should be stated explicitly because their absence causes error. There is one documented additional tone: a "whooping" HAZMAT tone tested near Campbell Industrial Park, covering Kalaeloa, Makakilo, Nānākuli, Kapolei and ‘Ewa Beach [S-17]. And the state publishes no tone-to-hazard decoding table — there is no distinct "tsunami tone" in any state publication, only the Attention Alert Signal and the localised HAZMAT tone [S-17] [S-16]. Any briefing that tells the public to listen for a tsunami-specific siren tone is asserting something the state does not publish.

April is Tsunami Awareness Month in Hawai‘i by annual gubernatorial proclamation, timed to the anniversary of the 1 April 1946 event and anchoring the state's public-education calendar [S-41].

Glossary and acronyms

ACRONYM	EXPANSION	WHAT IT IS IN ONE CLAUSE
ANSS	Advanced National Seismic System	USGS national seismic programme; Hawai'i is one of seven ANSS regions [F-36]
ASCE	American Society of Civil Engineers	Issuer of ASCE/SEI 7, whose Chapter 6 governs tsunami loads [F-31]
CAP	Common Alerting Protocol	The digital message format IPAWS uses to reach all channels at once [F-42]
CO-OPS	Center for Operational Oceanographic Products and Services	NOAA office running the tsunami-capable tide gauges [F-39]
COG	Collaborative Operating Group	The IPAWS unit of alerting authority held by HI-EMA and the counties [F-42]
DART	Deep-ocean Assessment and Reporting of Tsunamis	NOAA's deep-ocean buoy network, 39 stations since 2008 [F-37]
DBEDT	Department of Business, Economic Development and Tourism	State department housing the Office of Planning and Sustainable Development [S-25]
DEM	Department of Emergency Management	Honolulu's county emergency management agency [C-06]
DLNR	Department of Land and Natural Resources	State department covering harbours, parks and state lands [S-34]
DOBOR	Division of Boating and Ocean Recreation	DLNR division running the small-boat harbour tsunami plan [S-34]
DOE	Department of Education	State school system; owns the 10-minute school evacuation standard [S-35] [S-36]
DOH	Department of Health	State health department; SESF #8 lead [S-09]
EAS	Emergency Alert System	Broadcast alerting; carries event codes TSW and TSA [F-41]
EOC	Emergency Operations Center	The facility from which a jurisdiction runs an incident [S-07]
EOP	Emergency Operations Plan	A jurisdiction's governing response plan [S-02]
ETA	Estimated time of arrival	Forecast arrival time of the first wave at a location [F-11]
ETS	Office of Enterprise Technology Services	State agency coordinating communications restoration, SESF #2 [S-06]
FEMA	Federal Emergency Management Agency	Runs IPAWS, the NRF, and the P-646 vertical-evacuation guidance [F-42] [F-29]
GAT	Great Aleutian Tsunami	The state's design scenario for statewide risk assessment [S-12]
HCCDA	Hawai'i County Civil Defense Agency	Hawai'i Island's county emergency management agency [C-19]
HDOT	Hawai'i Department of Transportation	Closes state roads, bridges, harbours and

ACRONYM	EXPANSION	WHAT IT IS IN ONE CLAUSE
		airports; SESF #1 primary [S-05]
HI-EMA	Hawai'i Emergency Management Agency	State agency; operates the siren system, does not order evacuations [S-44]
HVO	Hawaiian Volcano Observatory	USGS observatory; local Hawai'i seismic detection into PTWC [F-36] [F-49]
IBC	International Building Code	Model code; section 1615 carries tsunami loads and effects [C-53]
IPAWS	Integrated Public Alert and Warning System	FEMA's aggregator feeding WEA, EAS and NOAA Weather Radio [F-42]
ITIC	International Tsunami Information Center	Honolulu-based training, TsunamiReady support and public education [F-03]
KEMA	Kaua'i Emergency Management Agency	Kaua'i's county emergency management agency [C-41]
LHMP	Local Hazard Mitigation Plan	A county's FEMA-recognised mitigation plan [C-09]
MEMA	Maui Emergency Management Agency	Maui County's agency; itself the evacuation-ordering body [C-34]
MMS	Mapping and Modeling Subcommittee	NTHMP body setting inundation modelling and mapping standards [F-16]
NCEI	National Centers for Environmental Information	NOAA archive holding the global historical tsunami database [F-38]
NDBC	National Data Buoy Center	NOAA centre operating the DART buoys [F-37]
NEOWAVE	Acronym not expanded in the state sources cited here	University of Hawai'i model code behind Hawai'i's extreme-zone modelling [S-38] [H-35]
NOAA	National Oceanic and Atmospheric Administration	Federal parent of NWS, the warning centres, NCEI, NDBC and PMEL [F-15]
NOS	National Ocean Service	NOAA line office containing CO-OPS [F-39]
NRF	National Response Framework	Federal response doctrine; contains no tsunami-specific provision [F-47]
NTHMP	National Tsunami Hazard Mitigation Program	Grant and standards programme funding Hawai'i's zones and outreach [F-15]
NTWC	National Tsunami Warning Center	Palmer, Alaska; covers all U.S. states except Hawai'i; PTWC's backup [F-01]
NWR	NOAA Weather Radio All Hazards	Broadcast channel; four Hawai'i transmitters carry tsunami alerts [F-43]
NWS	National Weather Service	NOAA line office operating both tsunami warning centres [F-01]
NWSI	National Weather Service Instruction	The directive series; 10-701 carries the alert thresholds [F-02]

ACRONYM	EXPANSION	WHAT IT IS IN ONE CLAUSE
OPSD	Office of Planning and Sustainable Development	State custodian of the authoritative tsunami zone GIS layers [S-25]
PDC	Pacific Disaster Center	Kihei-based centre hosting the 70-sheet state evacuation map viewer [S-31]
PMEL	Pacific Marine Environmental Laboratory	NOAA lab running the SIFT forecast system [F-48]
PTHA	Probabilistic tsunami hazard assessment	A hazard product Hawai‘i does not appear to have in published form [H-35]
PTWC	Pacific Tsunami Warning Center	Honolulu; sole issuer of official Hawai‘i tsunami alerts [F-45]
PTWS	Pacific Tsunami Warning and Mitigation System	The IOC-coordinated Pacific-wide system PTWC serves [F-13]
SEOC	State Emergency Operations Center	HI-EMA’s operations centre, with county desks [S-07]
SESF	State Emergency Support Function	Hawai‘i’s numbered functional annexes to the state EOP [S-05]
SHMP	State Hazard Mitigation Plan	The statewide mitigation plan; section 4.13 is tsunami [S-12]
SIFT	Short-term Inundation Forecasting for Tsunamis	NOAA forecast engine matching DART data to pre-computed scenarios [F-48]
SWP	State Warning Point	HI-EMA’s 24/7 communications centre; activates the sirens [S-01] [S-44]
TEZ	Tsunami Evacuation Zone	The standard red zone, evacuated on any Tsunami Warning [C-01]
WCS	Warning Coordination Subcommittee	NTHMP body through which states can request product changes [F-19]
WEA	Wireless Emergency Alerts	Cell-broadcast alerting under 47 CFR Part 10 [F-40]
WFO	Weather Forecast Office	NWS field office; Honolulu relays but does not originate warnings [F-44]
XTEZ	Extreme Tsunami Evacuation Zone	The yellow zone, evacuated only on an Extreme Tsunami Warning [C-01]

The terms below are defined against the IOC tsunami glossary and the federal message definitions where those govern, and against Hawai‘i practice where the usage is local [\[H-48\]](#) [\[F-06\]](#).

TERM	DEFINITION
All-clear	The declaration permitting return to an evacuated area; in Hawai‘i it is issued by the county, not the state or PTWC [F-45]
Amplitude	The height of a wave above the undisturbed sea level at that moment, distinct from crest-to-trough range

TERM	DEFINITION
Assembly area	Honolulu's tsunami destination: an outdoor lot or field, minimally staffed, no services, open only while the warning runs [C-08]
Crest-to-trough	The full vertical range from wave peak to following low; roughly double the amplitude at the 2025 Hawai'i gauges [C-59]
Drawdown	Withdrawal of water below normal sea level ahead of or between waves; Kahului Harbour drew down about 15 feet in 2025 [C-61]
Extreme Tsunami Evacuation Zone	Hawai'i's yellow zone — the modelled envelope of extreme Aleutian scenarios, not a single event footprint [H-35] [C-01]
Extreme Tsunami Warning	A Hawai'i map-and-brochure term directing evacuation of red and yellow zones; not a federal alert level [C-03] [F-06]
Information Statement	Lowest federal alert level: an earthquake or tsunami has occurred of interest to recipients [F-06]
Inundation	The horizontal flooding of normally dry land by tsunami water
Inundation distance	How far inland the water reached, measured from the shoreline; a field in the NCEI runup record [H-43]
Lamb wave	An atmospheric pressure wave; the 2022 Tonga Lamb wave travelled at about 710 mph and outran the water wave [H-27] [H-28]
Local-source tsunami	One generated close enough that waves arrive in minutes; a Hawai'i Island south-flank source reaches Hilo Bay in 4–5 minutes [F-49]
Meteotsunami	A tsunami-like wave driven by atmospheric pressure change rather than seafloor displacement [H-27]
N-wave	A wave form with a leading depression; amplified over Hawai'i's narrow insular shelves [H-59]
Orphan tsunami	A tsunami recorded at a distant coast with no locally felt earthquake; the 1586 Sanriku case is linked to a Kaua'i deposit [H-37]
Paleotsunami	A prehistoric tsunami known only from geological deposits, such as the Makauwahi sinkhole sediment on Kaua'i [H-34]
Proudman resonance	Amplification when an atmospheric pressure disturbance travels at the local shallow-water wave speed, as over deep trenches [H-27]
Refuge area	The staffed indoor facility opened for tsunami by Hawai'i, Maui and Kaua'i counties; Kaua'i opened nine in 2025 [C-58] [C-49]
Run-up	The maximum ground elevation reached by the water at the point of maximum inundation, above the reference sea level
Safe zone	Mapped destination ground outside the evacuation zones; a separate state GIS product covering seven islands [S-30] [S-29]
Single-egress community	A settlement served by one road out; named on O'ahu as Lanikai, East Honolulu and Windward O'ahu [C-17]
Tsunami Advisory	Federal alert level: potential for strong currents or waves dangerous to those in or very near the water [F-06]
Tsunami design zone	The ASCE 7 engineering zone at a 2,500-year return period; a building-code product, not an evacuation zone [S-37] [S-39]

TERM	DEFINITION
Tsunami earthquake	An earthquake producing a tsunami far larger than its magnitude implies, through slow shallow slip [H-13]
Tsunami Evacuation Zone	Hawai‘i’s red zone, evacuated on any Tsunami Warning and based on historical impacts [C-01] [F-46]
Tsunami travel time	Transit time from source to a coast; about 4.5 hours from Alaska, 14–15 from Chile, 30–60 minutes for local sources on O‘ahu [C-09]
Tsunami Warning	Federal alert level: a tsunami with potential to generate widespread inundation is imminent, expected or occurring [F-06]
Tsunami Watch	Federal alert level: a tsunami may later impact the watch area [F-06]
Vertical evacuation	Moving upward inside a structure instead of inland; Hawai‘i’s published rule is the fourth floor or higher of a building of ten or more stories [C-01] [S-32]
Wave period	Time between successive crests; 19–23 minutes at Hawai‘i gauges in 1964, 2–3 minutes for the 1975 local source [H-16] [H-17]

BIBLIOGRAPHIC SURVEY

Hawai'i Tsunami Source Register

Two hundred and five verified sources — federal, state, all four counties,
and the scientific record — in date order, with what each one alone holds.

THE COMPLETE REGISTER

205 verified sources · 1947–2026

Federal · State · Four counties · Scientific record

Compiled by Jerry Perone

25 August 2026

What is here, and what it is for

This is the bibliography behind the Hawai‘i Tsunami Operational Compendium, in full. Four parallel research passes surveyed the federal, state, county, and scientific-historical record. They returned 219 source entries; twelve documents had been found independently by two or three passes, leaving 205 unique sources spanning 1947 to February 2026.

Every entry states the one thing that source alone contains — the number, threshold, timing, or authority found nowhere else. That is the test each document had to pass to earn a place here, and it is why the register is useful as a research index rather than a reading list.

WHAT IT MEANS	
Identifier	F for federal, S for State of Hawai‘i, C for county, H for the scientific and historical record. A source found by more than one pass carries its alternate identifiers after the primary one.
Date	Publication or current-revision date. Entries marked “current” are living web resources with no stated date; the access date is 2026-08.
Unverified	Confirmed by citation but could not be fetched directly at compilation. Obtain before formal quotation.
Superseded	Replaced by a later version. Retained where the change itself is the point — a superseded plan often holds statistics the update dropped.

CAUTION

Nothing here substitutes for the official guidance of the Pacific Tsunami Warning Center, the Hawai‘i Emergency Management Agency, or your county emergency management agency. URLs were live at compilation; agency sites reorganise often.

Three governments, one wave

The single cleanest statement of the split appears on one NOAA page and nowhere else: the federal government issues the warning, the state sounds the first siren, and the county orders the evacuation and gives the all-clear. Almost every public misunderstanding in Hawai‘i traces to one of these handoffs.

FIGURE The authority chain. The federal government issues the warning, the state sounds the first siren, the county orders the evacuation and gives the all-clear.

THE LOAD-BEARING DETAIL

HI-EMA operates the sirens but cannot order an evacuation; the counties order evacuations but do not own a single siren. Compulsory evacuation exists nowhere in Hawai‘i law until a governor or mayor signs an emergency proclamation under HRS §127A-14 — and that proclamation expires by operation of law after sixty days.

The bottom tier is a Hawai‘i map product, not a federal alert category.

FIGURE The alert levels and what each asks of a person. The bottom tier is a Hawai‘i map product, not a federal alert category.

The mapped line is a stated minimum. A locally generated tsunami is not modelled in it at all.

FIGURE Red, yellow, green — and up. The mapped zone is a stated minimum, and it does not model a locally generated tsunami.

One spoke per source region · radius = travel time to Hawai'i

FIGURE Travel time to Hawai'i by source region. One spoke per source; radius is hours of warning. A local rupture sits at the centre — four to five minutes to Hilo Bay.

One siren system, three doctrines

Residents and visitors move freely among the islands. The instructions do not. Every difference below is sourced in the register.

	HONOLULU	HAWAI'I	MAUI	KAUA'I
Evacuation zone tiers	Red + yellow	Appears single-tier — unconfirmed	Red + yellow	Red + yellow
Zone data vintage	April 2025	March 2025, corrected Nov 2025	August 2013	April 2025
What a siren means	Tune in to radio or TV	One ring = one hour of travel time	Evacuate — flooding expected	One ring = one hour of travel time
Who sounds it	HI-EMA	HI-EMA	HI-EMA (not MEMA)	HI-EMA
What opens	16 outdoor assembly areas, unstaffed	10 gyms and armories	7 community centres and schools	9 staffed refuge areas
Evacuation addressed by	Zone colour	Zone colour	Named Genasys zone	Zone colour
Mass notification	HNL Alert (Everbridge)	Everbridge	Genasys	Everbridge (from May 2026)
Controlling constraint	4 inland routes for Waikīkī	Hilo Bay and single-egress valleys	Kahului corridor; Moloka'i and Lāna'i	Hanalei Bridge — no refuge beyond it
2025 after-action report	Published July 2026	Not evidenced	Not evidenced	Committed, not published

THE FINDING THAT GOVERNS EVERYTHING ELSE

Honolulu’s after-action report on the 29 July 2025 evacuation — the only one of the four counties published — found that **92 percent of the vehicle trips made during the evacuation were unnecessary**, that department staff ran the response on institutional knowledge rather than written protocol, and that the City Emergency Operations Plan **contained no tsunami-specific protocols at all**.

Every damaging tsunami, measured

Assembled from the primary field surveys, the ITIC historical-effects chart, and the NOAA global database. Travel times are to Hilo unless noted; runups are the maximum recorded anywhere in the state.

YEAR	SOURCE	MAGNITUDE	TRAVEL TIME	MAXIMUM RUNUP IN HAWAI'I	DEATHS	DAMAGE
1868	Local — Ka'ū, Hawai'i Is.	M 7.5–7.9	minutes	45 ft · Keauhou Landing	47	108 homes
1877	Iquique, Chile	≈M 8.5	14–15 h	12 m oscillations	5	37 dwellings
1923	Kamchatka	M 8.5	6–7 h	20 ft · Hilo	1	≈\$26 M (2023)
1946	Unimak I., Aleutians	Mw 8.6	4.9 h	54 ft · Waikolu Valley, Moloka'i	159	\$26 M ≈ \$370 M (2023)
1952	Kamchatka	Mw 9.0	6–7 h	6.1 m · Hawai'i Is.	0	\$0.8–1.0 M
1957	Andreanof Is.	Mw 8.3 – 8.6–8.8	4.5–5 h	16 m · Hā'ena, Kaua'i	0	≈\$5 M · 54 homes
1960	Valdivia, Chile	Mw 9.5	≈15 h	35 ft · Hilo waterfront	61	\$23.5 M · 282 injured
1964	Prince William Sound	Mw 9.2	5.3 h	4.8 m · Honolulu	0	\$68 K
1975	Local — Kalapana	M 7.2	minutes	47 ft · SE coast; 3.5 m subsidence	2	\$4.1 M
2010	Maule, Chile	Mw 8.8	14.5 h	1 m Hilo (2.5 m forecast)	0	Statewide over-evacuation
2011	Tōhoku, Japan	Mw 9.1	≈8 h	5 m · three islands	0	\$30–38 M
2022	Hunga Tonga volcano	VEI 5	Lamb wave, ~2 h early	≈3 ft · West Hawai'i	0	\$75 K · advisory came after the wave
2025	Kamchatka	Mw 8.8	6–7 h	5.7 ft · Kahului	0	Statewide evacuation
≈1500	Prehistoric — E. Aleutians	Mw > 9.0	4–5 h	8–9 m modelled at Makauwahi, Kaua'i	—	≥3× the 1946 event
Design	Yellow-zone envelope	Mw 8.6–9.6, 40 scenarios	4–5 h	30–35 m Hilo · >40 m Hanalei	—	2–10× the historical record

Two rows carry the design case for the yellow zone. The 1957 Andreanof event produced sixteen metres of runup at Hā'ena on Kaua'i from an earthquake whose assigned magnitude could not explain it — a discrepancy unresolved for sixty-seven years until 2024, when shallow slip of twelve to twenty-six metres was identified along six hundred kilometres of the eastern Aleutians, the segment aimed squarely at Hawai'i. And a marine deposit sits two metres down inside the Makauwahi sinkhole on Kaua'i, a hundred metres from the shore and behind seven-metre walls, dated to roughly five hundred years ago. Only a rupture greater than magnitude 9.0 reproduces it.

The last time the islands emptied

Reconstructed minute by minute from the state Department of Transportation’s legislative briefing, the county press releases, and the contemporaneous reporting. The margin between the last road being cleared and the first wave arriving was seventeen minutes.

TIME (HST)	EVENT	ACTOR
13:25	Tsunami Watch	PTWC, statewide
14:43	Tsunami Warning	PTWC upgrades
14:56	State employees released	HDOT
15:00	Kaua’i evacuation notices	KEMA
15:15	Kolekole Pass opened	US Army, ~400 vehicles
15:22	Maui evacuations issued	MEMA
15:25	Kaua’i sirens	HI-EMA
15:50	Hanalei Bridge one-way	westbound halted
16:15	9 Kaua’i refuges open	≈1,800 people
17:10	Statewide siren	first of three
18:10	Statewide siren · 11 bridges close	second sounding
18:40	Statewide siren	third and final
19:00	All evacuation-zone roads clear	HDOT confirms
19:17	First wave	17-minute margin

Observed amplitudes: Kahului 5.7 ft — the highest in the state — Hilo 4.9 ft, Hale’iwa 4.0 ft, Hanalei 3.0 ft. Deep-ocean buoy 21416 recorded 0.85 m, the second-largest DART amplitude ever measured, exceeded only by Tōhoku in 2011.

205 sources in date order

Each entry states what that source alone contains. Grouped into five eras; within each era, oldest first.

The founding record

1940–1979 Field surveys of the events that built the warning system

H-01 · 1947-01 · The Tsunami of April 1, 1946, in the Hawaiian Islands

Science & History · Gordon A. Macdonald, Francis P. Shepard, Doak C. Cox — Pacific Science (Univ. of Hawai'i Press) · survey, 17
<https://scholarspace.manoa.hawaii.edu/items/7a685b2a-d932-444d-8413-47efe991ab29>

The foundational post-event field survey of the event that created the U.S. warning system. Reports "over 150 deaths" (primarily drowning), at least 161 injured, and ~\$25,000,000 in 1946-dollar property damage. Its central scientific finding is that wave heights and destructive intensity varied sharply between adjacent coastal locations in patterns that contradicted then-current tsunami literature — the origin of the modern understanding that local bathymetry and shoreline configuration control runup. The authors flag a fuller quantitative analysis in preparation, making this the primary contemporaneous record.

H-09 · 1954 · The tsunami of November 4, 1952, on the Island of Hawaii

Science & History · Bulletin of the Seismological Society of America (author attribution unconfirmed — see GAPS) · survey, 12
<https://pubs.geoscienceworld.org/ssa/bssa/article-abstract/44/3/463/115713/The-tsunami-of-November-4-1952-on-the-Island-of>

The peer-reviewed Big Island survey of the first major test of the warning system created after 1946 — the event where the system worked and nobody died. Complements the runup record (max 12 ft at Coconut Island, ~11.5 ft in Hilo, 11 ft at Reed's Bay) against \$800,000–\$1,000,000 in 1952-dollar damage with zero fatalities.

H-11 · 1959-01 · The tsunami of March 9, 1957, on the Island of Hawaii

Science & History · G. D. Fraser, J. P. Eaton, C. K. Wentworth — Bulletin of the Seismological Society of America · survey, 29
<https://pubs.geoscienceworld.org/ssa/bssa/article/49/1/79/115893/The-tsunami-of-March-9-1957-on-the-Island-of>

The primary field survey for the 1957 event on Hawai'i Island, the classic reference for Hilo Bay resonance and the anomalous distribution of 1957 runup. Essential because 1957's Hawai'i runups (16 m on Kaua'i near Hā'ena) were far larger than the seismic magnitude then assigned would predict — the discrepancy that stood unresolved for 65 years until Yamazaki et al. (H-13).

H-07 · 1961-04 · The tsunami of May 23, 1960, on the Island of Hawaii

Science & History · J. P. Eaton, D. H. Richter, W. U. Ault — Bulletin of the Seismological Society of America · survey, 23
<https://pubs.geoscienceworld.org/ssa/bssa/article-abstract/51/2/135/116019/The-tsunami-of-May-23-1960-on-the-Island-of-Hawaii>

The USGS/HVO Big-Island-specific companion to Cox & Mink, written by observers on the ground. Contains the detailed Hilo Bay wave-by-wave reconstruction and the bore description (the third wave being the destructive one) that underpins every later account of the Hilo bayfront destruction and the subsequent decision not to rebuild in the inundated zone.

H-06 · 1963-12 · The Tsunami of 23 May 1960 in the Hawaiian Islands

Science & History · Doak C. Cox and John F. Mink — Bulletin of the Seismological Society of America; Hawaii Institute of Geophysics Contribution No. 20 · catalog, 19
<https://tsunami-dl.jp/document/069>

The definitive statewide runup catalog for 1960 and the anchor document of the warning-failure record. Tsunami detected in Hilo Bay at 0007 HST and on the Honolulu tide gauge at 0033 HST; ocean-crossing velocity 440–445 mph. Statewide runup 2–17 ft, with a 35 ft maximum near the Hilo waterfront*; island averages ~9 ft (Hawai'i), ~10 ft (Maui), ~7 ft (O'ahu), ~5 ft (Kaua'i). 61 deaths, all in Hilo; 282 injured requiring medical attention — despite an official warning issued more than five hours before arrival. That gap between warning and casualty is the single most important fact in Hawai'i evacuation policy.

H-49 · 1968 · ITIC Tsunami Newsletter (archive, 1960s–2014)

Science & History · International Tsunami Information Center, Honolulu · public education, hundreds (multi-decade run)

https://legacy.itic.ioc-unesco.org/legacy.itic.ioc-unesco.org/index3fdc.html?option=com_content&view=category&layout=blog&id=1081&Itemid=1081

The continuous institutional record of the Pacific warning system from Honolulu, organized by decade (1960–69, 1970–79, 1980–89, 1990–99, 2000–09, 2010–14). This is where the operational history of the warning system — including the 1986 and 1994 Hawai'i warnings, and the false-alarm debates — is documented contemporaneously rather than retrospectively.

H-17 · 1975-12 · The Tsunami of November 29, 1975 in Hawaii (NOAA-JTRE-152 / HIG-75-21)

Science & History · Harold G. Loomis — Hawaii Institute of Geophysics, Univ. of Hawai'i; Joint Tsunami Research Effort, NOAA/PMEL · report, 29

<https://www.pmel.noaa.gov/pubs/PDF/loom150/loom150.pdf>

The definitive contemporaneous report on Hawai'i's most important LOCAL-source tsunami — the one that gives minutes, not hours.* M7.2 at 19°20'N, 155°01'45"W, 2.5 mi SW of Kalapana, onset 0448 HST. Maximum runup 20 ft at Kamoamoa Campground. Documents the compound mechanism: initial water rise of 3 ft at Kalapana and 6+ ft at Halape attributable partly to *co-seismic ground subsidence, not wave arrival. Wave periods 2–3 min crest-to-crest, with 10–15 second oscillations reported at Halape; five or six discernible waves, the second largest. Two deaths among 36 campers at Halape. Damage ~\$3.75 million total, ~\$1.5 million from the tsunami alone; ~12 dwellings and ~12 boats destroyed or severely damaged.

H-18 · 1976 · Earthquakes and related catastrophic events, Island of Hawaii, November 29, 1975: A preliminary report (USGS Circular 740)

Science & History · R. I. Tilling, R. Y. Koyanagi, P. W. Lipman, J. P. Lockwood, J. G. Moore, D. A. Swanson — U.S. Geological Survey · report, 33

<https://pubs.usgs.gov/publication/cir740>

The USGS geologic counterpart to Loomis, and the source of the higher runup figure now standard in the literature: 12.2–14.6 m above sea level on the southeastern coast. Documents up to 3.5 m of subsidence of Kilauea's south flank (coconut palms left standing in seawater, near-shore islands submerged), a magnitude-5.7 foreshock, hundreds of aftershocks, and a summit eruption ~45 minutes after the main shock. Total damage \$4.1 million per Hawai'i Civil Defense. The subsidence-plus-tsunami coupling documented here is what makes local-source events qualitatively different from distant ones.

Consolidation

1980–2009 Statute, landslide science, and the first behavioural studies

H-38 · 1984-12 · Deposit from a Giant Wave on the Island of Lanai, Hawaii

Science & History · James G. Moore and George W. Moore — Science · paper, 4

<https://doi.org/10.1126/science.226.4680.1312>

The origin of the Hawaiian mega-tsunami hypothesis. The limestone-bearing Hulopoe Gravel on Lāna'i's coastal slopes reaches elevations of up to 326 m*. Dated submerged corals and tide measurements show the southeastern Hawaiian Islands are subsiding rapidly, placing former high sea stands *below present sea level — which eliminates the competing "multiple ancient sea levels" explanation. The authors conclude the Hulopoe Gravel and similar deposits on nearby islands "were deposited during the Pleistocene by a giant wave generated by a submarine landslide on a sea scarp south of Lanai."

H-39 · 1989 · **Prodigious submarine landslides on the Hawaiian Ridge**

Science & History · J. G. Moore, D. A. Clague, R. T. Holcomb, P. W. Lipman, W. R. Normark, M. E. Torresan — Journal of Geophysical Research: Solid Earth · paper, 20

<https://doi.org/10.1029/JB094iB12p17465>

The GLORIA-sonar mapping paper that established the scale of the landslide tsunami source. Documents submarine mass wasting over approximately 100,000 km² of the Hawaiian Ridge, with individual debris avalanches exceeding 200 km in length and 5,000 km³ in volume — among the largest landslides known on Earth. Distinguishes two behavioral classes: slow slumps up to 110 km wide and ~10 km thick, versus fast debris avalanches 230 km long and 0.05–2 km thick. The fast avalanches are the tsunamigenic class.

C-14 · 1993-08 · **Revised Ordinances of Honolulu, Article 25 — Department of Emergency Management (ROH §2-25.1 et seq.)**

County · City and County of Honolulu / American Legal Publishing (Honolulu) · ordinance, web page

<https://codelibrary.amlegal.com/codes/honolulu/latest/honolulu/0-0-0-2014>

The ordinance-level counterpart to the charter provision, codified at ROH §2-25.1 "Director of emergency management," carrying an editor's note dating the article's effectiveness to 13 August 1993 pursuant to Civil No. 88-1285-04. This is the correct citation anchor for O'ahu civil-defense ordinance authority — note it sits in ROH Chapter 2 (Administration), not Chapter 6 (Funds, Fees, and Loan Programs), correcting a common mis-citation.

H-40 · 1994 · **Giant Hawaiian Landslides**

Science & History · James G. Moore, William R. Normark, Robin T. Holcomb — Annual Review of Earth and Planetary Sciences · paper, 26

<https://doi.org/10.1146/annurev.ea.22.050194.001003>

The synthesis inventory: at least 68 major landslides more than 20 km long along 2,200 km of the Hawaiian Ridge from Midway to Hawai'i Island — an average of one every 32 km. Largest exceed 200 km length and several thousand km³ volume, with a maximum documented debris-avalanche length of 230 km. Describes Nu'uuanu as a debris avalanche northeast of O'ahu, ~3.6 Ma, with distal hummocks carrying ~9 m of sediment, and names Wailau (Moloka'i). States these avalanches "are believed to have produced major tsunamis" but supplies no runup estimates — the quantitative gap that Moore & Moore (H-38) fills from the deposit side.

H-08 · 1999 · **Surviving a Tsunami — Lessons from Chile, Hawaii, and Japan (USGS Circular 1187, v1.1)**

Science & History · Brian F. Atwater, Marco Cisternas V., Joanne Bourgeois, Walter C. Dudley, James W. Hendley II, Peter H. Stauffer — U.S. Geological Survey · report, 18

<https://pubs.usgs.gov/circ/c1187/>

The clearest published narrative of the 1960 warning failure with the timing spelled out: warning issued 6:47 p.m. Hawaiian time, waves arriving after midnight — ~15 hours transit from Chile. Gives the Hilo wave sequence explicitly: first wave 4 ft, second wave 9 ft above normal, largest wave ~20 ft. 61 killed and 282 badly hurt in Hilo. Also fixes the 1946 Hilo-only death toll at 98 and situates Hawai'i's 61 deaths against Chile's >2,000 and Japan's 122. Written as survivor-behavior instruction, so it is the best single source for why people died after a warning.

H-41 · 2002 · **Mapping the Nuuanu and Wailau Landslides in Hawaii**

Science & History · James G. Moore, David A. Clague — in *Hawaiian Volcanoes: Deep Underwater Perspectives*, AGU Geophysical Monograph 128, pp. 223–244 · paper, 22

<https://doi.org/10.1029/GM128p0223>

The only dedicated mapping treatment of the two specific slides named in the Hawai'i giant-landslide tsunami hazard — the Nu'uuanu slide off northeast O'ahu and the Wailau slide off north Moloka'i, including the transported blocks (such as Tuscaloosa Seamount) that demonstrate the violence of emplacement. Required if the compendium needs slide geometry rather than the ridge-scale statistics of H-39/H-40.

H-02 · 2002-07 · **A Field Survey of the 1946 Aleutian Tsunami in the Far Field**

Science & History · E. A. Okal, C. E. Synolakis, G. J. Fryer, P. Heinrich, J. C. Borrero, C. Rusc, D. Arcas, G. Guille, D. Rousseau — Seismological Research Letters · survey, 14

<https://pubs.geoscienceworld.org/ssa/srl/article-abstract/73/4/490/142766/A-Field-Survey-of-the-1946-Aleutian-Tsunami-in-the>

The only systematic far-field re-survey of 1946. Confirms Hawai'i maximum runup of 16 m, then adds 54 new measurements across six inhabited Marquesas islands: overland runup averaging 6.6 m (σ 2.7 m), riverbed runup averaging 10.0 m (σ 4.8 m), maximum 14.6 m at Tahauku Bay, Hiva Oa. Easter Island yielded 7.1 and 8.6 m; Robinson Crusoe Island only 2.7 m — substantially lower than previously published, correcting the historical catalog. Establishes that 1946 was anomalously destructive in the far field relative to its seismic moment.

H-03 · 2003-06 · **Near-Field Survey of the 1946 Aleutian Tsunami on Unimak and Sanak Islands**

Science & History · Emile A. Okal, George Plafker, Costas E. Synolakis, José C. Borrero — Bulletin of the Seismological Society of America · survey, 16 (preprint)

<https://pubs.geoscienceworld.org/ssa/bssa/article/93/3/1226/147031/Near-Field-Survey-of-the-1946-Aleutian-Tsunami-on>

Measured maximum runup of 42 m at Scotch Cap lighthouse, Unimak Island — the destroyed reinforced-concrete lighthouse whose base sat ~90 ft above sea level, killing all five crew. Runup of 30–40 m along the SW coast between Scotch Cap and Cape Lutke, falling to 15–20 m in Unimak Bight; 15–24 m on Long Island and 7–15 m on southeastern Sanak. Concludes on aspect-ratio grounds (matching the 1998 Papua New Guinea landslide event) that a slow seismic rupture triggered a ~200 km³ submarine landslide at Davidson Bank, and that the landslide, not the earthquake, produced the extreme near-field amplitudes.

C-25 · 2005-02 · **General Plan for the County of Hawai'i — Chapter 5: Flooding and Other Natural Hazards**

County · County of Hawai'i Planning Department (Hawai'i) · plan, 17 (pp. 5-1 to 5-17) within a 400+ page plan

https://hidot.hawaii.gov/harbors/files/2014/04/Plans_CtyHawaii-General.pdf

The county's binding land-use policy instrument for tsunami inundation. Chapter 5 is structured as Introduction/Analysis, Goals, Policies, Standards, and then district-by-district guidance across all nine districts — meaning tsunami land-use standards are stated separately for South Hilo (Hilo Bay) than for Puna, Ka'ū, Kona, Hāmākua, etc. This district-specific structure is the policy vehicle through which the post-1946/1960 Hilo bayfront setback and open-space pattern is perpetuated in current law.

F-26 · 2006-06 · **U.S. Tsunami Preparedness: Federal and State Partners Collaborate to Help Communities Reduce Potential Impacts, but Significant Challenges Remain (GAO-06-519)**

Federal · U.S. Government Accountability Office · report, ~70

<https://www.gao.gov/products/gao-06-519>

The post-2004-Indian-Ocean baseline audit. It records the \$17.24 million 2005 supplemental appropriation that launched the modern DART expansion, and its recommendations to standardize loss-estimation software, reduce false alarms, conduct system tests, and evaluate the TsunamiReady program are the origin of several present-day NTHMP requirements. Useful as the "before" state against which GAO-10-490 and GAO-23-105961 measure progress.

F-27 · 2007-01 · **33 U.S.C. Chapter 45 — Tsunami Warning and Education**

Federal · U.S. Congress (codification of P.L. 109-479 Title VIII as amended) · statute, web page (~25 printed)

<https://uscode.house.gov/view.xhtml?path=/prelim@title33/chapter45&edition=prelim>

The statutory foundation, sections 3201–3208. It legally requires NOAA to maintain the detection buoy array at not less than 80 percent operational capacity, to operate two primary warning centers specifically in Alaska and Hawai'i with fail-safe backup capability, to develop uniform operational procedures across centers, and to provide forecasting incorporating tsunami inundation models and maps. It also sets the funding split: minimum 27 percent to mitigation, minimum 8 percent to research, with authorizations of \$25–29 million annually for FY2008–2012 and \$25.8 million annually for FY2016–2021.

H-57 · 2007 · Tsunami Warnings: Understanding in Hawai'i

Science & History · Chris E. Gregg, Bruce F. Houghton, Douglas Paton, David M. Johnston, Donald A. Swanson, Brian S. Yanagi — Natural Hazards · paper, 17

<https://doi.org/10.1007/s11069-006-0005-y>

The foundational Hawai'i evacuation-behavior study, and its central number is devastating: only 13% of surveyed residents understood what the sirens meant — despite very high awareness that the sirens are tested monthly. Hilo residents showed only moderate awareness of natural tsunami warning signs; the majority expected to receive an official alert rather than to act on environmental cues; and length of residence in Hawai'i showed no correlation with understanding**. The authors conclude that "a major change is needed in tsunami education." This is the empirical basis for the whole "don't wait for a warning" messaging shift.

F-37 · 2008-03 · Deep-ocean Assessment and Reporting of Tsunamis (DART®) Description

Federal · NOAA National Data Buoy Center · dataset, web page

<https://www.ndbc.noaa.gov/dart/dart.shtml>

The operational specification of the buoy network Hawai'i depends on. It documents the growth from 6 buoys (2001) to a full network of 39 stations in March 2008; the two operating modes — standard mode reporting four spot values of estimated sea-surface height at 15-minute intervals, and event mode triggered by an internal detection algorithm sending 15-second values for the first few minutes then 1-minute averages, reverting after four hours without further detection; DART I's hourly one-way GOES transmission versus DART II's two-way Iridium link permitting remote troubleshooting and high-resolution data retrieval.

F-33 · 2008-08 · U.S. States and Territories National Tsunami Hazard Assessment: Historical Record and Sources for Waves

Federal · NOAA NGDC (Dunbar) and U.S. Geological Survey (Weaver) · report, ~66

<https://nehrpsearch.nist.gov/static/files/USGS/PB2009104996.pdf>

Assigns Hawai'i the highest hazard classification, "Very High," and supplies the recurrence statement found nowhere else: "A tsunami with a runup greater than 3.0 m, irrespective of source distance, hits Hawaii on average about once every ten years." Its Hawai'i tallies — 114 recorded tsunami events, 18 with runup exceeding 3.0 m, 326 deaths, \$59 million damage, 1,592 runup observations, with the 1946 Hilo event alone producing over 400 runup records — are the standard federal citation for Hawai'i tsunami frequency.

F-13 · 2009-01 · Operational Users Guide for the Pacific Tsunami Warning and Mitigation System (PTWS), IOC Technical Series No. 87 **SUPERSEDED**

Federal · IOC-UNESCO / operationalized by NOAA PTWC · product guide, 141

https://www.unisdr.org/files/9505_180097e.pdf

The pre-2014 operational rulebook PTWC ran under, and still the only document giving PTWC's historical magnitude-triggered bulletin hierarchy in numbers: Information Bulletins for M6.5–7.5; Regional Fixed Warnings for M>7.5 within 1000 km; Regional Expanding Warnings for M>7.8; Pacific-Wide Warning upon tsunami confirmation. It also states PTWC's 10–20 minute response target after earthquake occurrence and records the April 2006 move to two watchstanders always on duty. Necessary baseline for describing what changed in 2014.

F-30 · 2009-06 · Vertical Evacuation from Tsunamis: A Guide for Community Officials (FEMA P-646A)

UNVERIFIED

Federal · FEMA / Applied Technology Council · guideline, ~40

<https://hdl.loc.gov/loc.gdc/gdcebookspublic.2023691874>

The non-engineering companion to P-646, written for mayors, county councils and emergency managers rather than structural engineers. It covers the siting, ownership, liability, funding and community-acceptance decisions that precede design — the questions a Hawai'i county would face before commissioning a refuge structure. Distinct from P-646 in that it contains no design equations at all.

S-35 · 2009-10 · **Emergency Procedures Guide (RS 10-0431, revision of 99-1167)**

State · Hawai'i State Dept. of Education — Office of School Facilities & Support Services, Safety, Security & Emergency Preparedness Branch · procedure, ~60

<https://www.hawaiipublicschools.org/DOE%20Forms/Emergency%20Procedures%20Guide.pdf>

The standing DOE school procedure. Establishes that schools inside tsunami inundation zones evacuate immediately to higher ground on the school's own plan and by the school administrator's initiation, while schools outside zones "shall remain open unless directed otherwise by authorized DOE personnel or State Civil Defense" — and it still names State Civil Defense, an entity abolished in 2014, making it the clearest surviving example of an unrevised pre-HI-EMA state authority reference. Requires student attendance at the evacuation site and bars return until the administrator (not the county or state) gives the all clear.

The remapping

2010–2016 Tōhoku, the paleotsunami discovery, and the yellow zone

F-25 · 2010-04 · **U.S. Tsunami Preparedness: NOAA Has Expanded Its Tsunami Programs, but Improved Planning Could Enhance Effectiveness (GAO-10-490)**

Federal · U.S. Government Accountability Office · report, ~60

<https://www.gao.gov/assets/a303680.html>

The only source with warning-latency performance figures over time: average time to issue a warning for distant tsunamis fell from 24 minutes in 2005 to 15.7 minutes in 2009, with 100 percent detection since 2005; PTWC issued its initial bulletin within 12 minutes for the February 2010 Chile event. It also states PTWC's reach as Hawai'i, U.S. Pacific territories and over 90 countries, records the 39-buoy DART array, and notes DART maintenance consumed roughly 28 percent of the FY2009 Tsunami Program budget.

C-15 · 2010 · **Evacuating Waikīkī**

County · Honolulu Magazine (Honolulu) · report, web page

<https://www.honolulumagazine.com/evacuating-waikiki/>

Preserves the earlier O'ahu vertical-evacuation standard — O'ahu Civil Defense then recommended climbing "three stories or higher, in a steel-reinforced building at least six stories tall," against today's fourth-floor-of-ten-stories rule. This is the only source documenting that doctrinal shift. It also records the legal position, from Civil Defense spokesperson John Cummings, that privately owned high-rises "are under no legal obligation to provide shelter to the general public" — the key constraint on Waikīkī vertical evacuation. Documents practical failures encountered by someone attempting vertical evacuation: narrow unmarked stairways, locked doors, unhelpful staff. Notes 1994 false-alarm gridlock and up to 100,000 people in the Waikīkī low-lying area.

H-22 · 2010 · **NOAA Center for Tsunami Research — February 27, 2010 Chile Tsunami Event**

Science & History · NOAA/PMEL Center for Tsunami Research · dataset, 4

<https://ncctr.pmel.noaa.gov/chile20100227/>

The MOST-model propagation and DART-inversion archive for 2010, with the model-skill statement relevant to Hawai'i: the model produced a 9-minute early arrival for Hawai'i and the U.S. West Coast, a 0.8–1% timing error accumulated over propagation. First waves reached Valparaíso ~34 minutes after the earthquake. Holds the sea-level gauge comparison plots for U.S. coastlines.

S-26 · 2010 · **Tsunami Evacuation Zones for Oahu (tsunevac_oahu) — GIS metadata** SUPERSEDED

State · Hawai'i Statewide GIS Program / Honolulu Land Information System (HoLIS) · dataset, ~4

https://files.hawaii.gov/dbedt/op/gis/data/tsunevac_oahu.pdf

The pre-2014 O'ahu evacuation-zone dataset — the maps the 2018 SHMP says the 2011 Tōhoku event proved inadequate. Preserves the original single-attribute schema (ZONE = 1/0 binary, no extreme-zone class at all), the HoLIS source lineage, and

the reprojection from State Plane Zone 3 to UTM Zone 4 NAD 83. Its structure is the direct evidence that the yellow/extreme zone did not exist before the 2014 remapping.

H-21 · 2011 · Appendix J — Response to the Chilean-Earthquake Generated Tsunami: The Hawaii Case Study (in *Tsunami Warning and Preparedness: An Assessment of the U.S. Tsunami Program and the Nation's Preparedness Efforts*)

Science & History · National Research Council / National Academies Press · report, 12

<https://nap.nationalacademies.org/read/12628/chapter/19>

The authoritative forecast-vs-observed record for the 2010 over-evacuation lesson. M8.8 Chile at 8:34 p.m. HST Feb 26; first PTWC warning 15 minutes later; sirens ~6:00 a.m. Feb 27; first waves ~14.5 hours after the earthquake; warning lifted by 2:00 p.m. the following day. PTWC forecast Hilo 2.5 m crest-to-trough, Kahului 2.2 m, Honolulu 0.5 m; observed amplitudes were Hilo ~1 m, Kahului 0.98 m, Nāwiliwili 0.28 m** — roughly a factor-of-two over-forecast at the key sites. Also documents specific official misstatements about sheltered coastlines that contradicted tsunami physics, and unclear shelter protocols.

H-36 · 2012-01 · Re-examination of the Potential for Great Earthquakes along the Aleutian Island Arc with Implications for Tsunamis in Hawaii

Science & History · Rhett Butler — Seismological Research Letters · paper, 10

<https://pubs.geoscienceworld.org/ssa/srl/article-abstract/83/1/29/143906/>

The post-Tōhoku seismological argument that opened the extreme-zone program: re-examines whether the Aleutian arc can host a Mw 9+ rupture aimed at Hawai'i, motivated by the observation that Tōhoku exceeded every prior assessment for that margin. This is the earliest citable step in the chain that runs Butler 2012 → Butler et al. 2014 (Kaua'i deposit) → Butler et al. 2017 (inundation modeling) → the adopted yellow zones.

C-37 · 2012 · Maui County General Plan 2030, Maui Island Plan — Chapter 3: Natural Hazards UNVERIFIED

County · County of Maui Department of Planning (Maui) · plan, ~30

<https://www.mauicounty.gov/DocumentCenter/View/84678/Chapter-3>

The binding Maui Island land-use policy chapter addressing tsunami among natural hazards — the instrument through which Kahului and Lahaina shoreline development standards are set. Distinct from the hazard mitigation plan in that its policies are enforceable through zoning and permitting rather than advisory.

H-24 · 2012 · Tohoku-Oki Earthquake Tsunami Runup and Inundation Data for Sites Around the Island of Hawai'i (USGS Open-File Report 2012-1229)

Science & History · F. Trusdell, A. Chadderton, G. Hinchliffe, A. Hara, B. Patenge, T. Weber — U.S. Geological Survey / Hawaiian Volcano Observatory · survey, 36 + data spreadsheet

<https://pubs.usgs.gov/publication/ofr20121229>

The official field survey of measured runup and inundation for Hawai'i Island after 2011**, with a machine-readable Table 1 of site-by-site measurements — the ground-truth dataset behind every 2011 Hawai'i inundation figure. Documents that East Hawai'i coastlines were impacted as well as the heavily-damaged Kona side, correcting the popular impression that 2011 was a west-side-only event.

S-34 · 2013-03 · Tsunami Emergency Plan (DOBOR)

State · Dept. of Land and Natural Resources, Division of Boating and Ocean Recreation (DLNR/DOBOR) · procedure, ~8

<https://files.hawaii.gov/dlnr/dobor/contacts/Plan-TSUNAMI.pdf>

The only state small-boat-harbor tsunami procedure, and the source of Hawai'i's harbor timing standard. Level One Alert begins "a minimum of three hours prior to the arrival of the first wave"; roadblocks are established "one hour before the expected arrival of the first wave"; all harbor personnel are released to evacuate after utilities are shut off and vital non-digitized records (including vessel registrations) are removed. Sets the vessel threshold at relocating to waters 300+ feet in depth as soon as a Tsunami Warning is declared, and distinguishes Advisory conduct (individual judgment; strong currents risk) from Warning conduct. Requires harbor-specific ALL CLEAR before any vessel returns to port. Note: the state boating depth rule (300 ft) differs

from HI-EMA's public guidance of 100 fathoms / 100 meters (S-32, S-33) — a genuine inconsistency worth flagging in the compendium.

H-23 · 2013 · **Surges around the Hawaiian Islands from the 2011 Tohoku tsunami**

Science & History · Kwok Fai Cheung, Yefei Bai, Yoshiki Yamazaki — Journal of Geophysical Research: Oceans · paper, 17
<https://doi.org/10.1002/jgrc.20413>

The definitive modeling study of what the 2011 tsunami actually did around Hawai'i. ** Uses NEOWAVE with the authors' finite-fault Tohoku source to reproduce observed surges island-by-island, and explains the multi-day persistence of dangerous currents through trapped standing-wave/shelf-resonance modes around the island chain — the mechanism behind the Kona destruction and the harbor damage that occurred hours after the first wave. This is the paper that establishes why Hawai'i harbors stay hazardous long after the "first wave."

C-33 · 2013-08 · **Maui County tsunami evacuation map sheet series (e.g., "Maui Eleven — Kahakuloa Bay")** **UNVERIFIED**

County · Maui County / Maui Emergency Management Agency (Maui) · map, 1 per sheet (numbered series)
<https://www.mauicounty.gov/DocumentCenter/View/85127/Maui-Eleven-Kahakuloa-Bay>

Confirms Maui County maintains its own numbered PDF evacuation sheet series in DocumentCenter, each printing the three-band legend (Safe Zone / Tsunami Evacuation Zone / Extreme Tsunami Evacuation Zone). Notable county difference: HI-EMA and NWS/ITIC both point the public for Maui County to NOAA's national viewer (tsunami.coast.noaa.gov) rather than to these county sheets, so the county's own map series is effectively unadvertised.

F-34 · 2013-09 · **Alaska Earthquake Source for the SAFRR Tsunami Scenario (USGS Open-File Report 2013-1170, Chapter B / CGS Special Report 229)**

Federal · U.S. Geological Survey (Kirby, Scholl, von Huene, Wells) · report, 40
<https://pubs.usgs.gov/of/2013/1170/b/index.html>

The federal source-characterization study for the Alaska-Aleutian megathrust segment that dominates Hawai'i's far-field hazard. It defines an Mw 9.1 rupture of the Semidi subduction sector between Kodiak Island and the Shumagin Islands with 18.6 m average slip, and it justifies the slip distribution by analogy to the 2011 Tohoku rupture, arguing the Semidi sector's geological and geophysical features are "remarkably similar" to northeastern Japan. This is the scientific rationale that underwrites the extreme-scenario Aleutian sources used in Hawai'i modeling.

C-18 · 2014 · **New extreme tsunami evacuation zone maps indicate far greater impact**

County · Hawaii News Now (Honolulu) · report, web page
<https://www.hawaiinewsnow.com/story/27411586/new-extreme-tsunami-evacuation-zone-maps-indicate-far-greater-impact/>

The origin record for O'ahu's extreme zone. States the modeled scenario as an M9.0+ Aleutian event producing a ~30-foot surge, and that the new XTEZ extends roughly 2–3 times deeper inland than the 2010 maps — in Waikiki reaching the H-1 where the prior line ended above the Ala Wai. Carries then-DEM Director Melvin Kaku's characterization ("high impact because of the depth ... but very low frequency") and PTWC's Dr. Gerard Fryer's quantified probability: "In any person's lifetime there's like a 5% chance this will happen." That 5%-per-lifetime figure appears nowhere else in county materials.

F-12 · 2014 · **NOAA/NWS Pacific Tsunami Warning Center User's Guide: PTWC Tsunami Warning Center Products for Guam and CNMI**

Federal · NOAA / NWS Pacific Tsunami Warning Center · product guide, ~40 (estimate; direct fetch blocked by robots.txt, listed on tsunami.gov product-guides index)
<https://www.tsunami.gov/operations/GuamCNMIUserGuide.pdf>

One of only four PTWC domestic user's guides published; together with the American Samoa guide it shows how PTWC tailors the same product suite for each Pacific jurisdiction it serves directly. Its existence alongside "Canada/US except Hawaii" on the

tsunami.gov product-guides index is the affirmative evidence that Hawai'i alone among PTWC-served U.S. jurisdictions lacks a published product user's guide.

H-04 · 2014 · **The destructive 1946 Unimak near-field tsunami: New evidence for a submarine slide source from reprocessed marine geophysical data**

Science & History · Roland von Huene et al. — Geophysical Research Letters · paper, 8

<https://agupubs.onlinelibrary.wiley.com/doi/full/10.1002/2014GL061759>

Reprocesses legacy marine geophysical lines across the Aleutian margin to image the slide mass invoked by Okal et al., providing the independent geophysical test of the landslide-source hypothesis for 1946. Matters for Hawai'i because a landslide-amplified near-field source implies the far-field Hawai'i runup was generated by a different (seismic) component than the near-field extreme — bearing directly on how the Aleutian source is parameterized in Hawai'i inundation modeling.

S-24 · 2014 · **HRS Chapter 128 — Civil Defense and Emergency Act (Repealed)** **SUPERSEDED**

State · Hawai'i State Legislature · statute, web page

<https://law.justia.com/codes/hawaii/title-10/chapter-128/>

Confirms the legal discontinuity: Chapter 128, the Civil Defense and Emergency Act under which "State Civil Defense" operated, was repealed by Act 111 of 2014 §24 and replaced by Chapter 127A. Any pre-2014 State Civil Defense publication citing chapter 128 authority is no longer legally operative — the single most important supersession fact for the historical layer of this compendium. The same Act renamed State Civil Defense to HI-EMA.

F-14 · 2014-08 · **Users Guide for the Pacific Tsunami Warning Center Enhanced Products for the Pacific Tsunami Warning System, IOC Technical Series 105 (Rev. 2)** **UNVERIFIED**

Federal · IOC-UNESCO / NOAA PTWC · product guide, ~90 (listed at 4.4 MB on the ITIC index; direct fetch returned 404 at time of check)

https://legacy.itic.ioc-unesco.org/images/stories/about_warnings/what_are_they/ts105-Rev2_eo_220368E.pdf

The definitive description of the post-2014 PTWC "enhanced products," including the wave-height threat forecast bands PTWC now transmits to national warning centers in lieu of issuing warnings directly, and the message templates for threat messages and information statements. It is the reference for understanding why PTWC's international output differs in form from what Hawai'i receives domestically.

F-08 · 2014-08 · **Service Change Notice 14-43 (Corrected), New Domestic Tsunami Products for Guam and the Commonwealth of the Northern Mariana Islands**

Federal · NOAA / NWS · rule, 1

https://www.weather.gov/media/notification/pdfs/scn14-43tsunami_cca.pdf

Documents the PTWC domestic-product architecture that Hawai'i's products mirror: the three-family structure of Tsunami Information Statements (TIB*), Tsunami Watch/Warning/Advisory messages (TSU*), and Tsunami Seismic Information Statements (EQI*), each with its own WMO header and AWIPS identifier. Useful as the only SCN that spells out the naming convention Hawai'i's TIBHWX/TSUHWX products follow.

F-07 · 2014-08 · **Service Change Notice 14-45, Changes to the Tsunami Threat Message**

Federal · NOAA / NWS (NOUS41 KWBC, PNSWSH) · rule, 1

https://www.weather.gov/media/notification/pdfs/scn14-45tsunami_ptwc_ww.pdf

The primary source for the October 1, 2014 product break. It records that PTWC eliminated the alerting terms "watch" and "warning" from its international WEPA40 PHEB Pacific product and moved to issuing Watch/Warning/Advisory only under separate headers for U.S. domestic locations — the change that created the present-day separation between Hawai'i domestic products and PTWC's international threat forecasts. It names the requesting body (PTWS member states) and the exact effective date/time.

H-34 · 2014-10 · **Paleotsunami evidence on Kaua'i and numerical modeling of a great Aleutian tsunami**

Science & History · Rhett Butler, David Burney, David Walsh — Geophysical Research Letters · paper, 8

<https://doi.org/10.1002/2014GL061232>

The empirical discovery that reset Hawai'i's evacuation policy and produced the yellow/extreme zone. Marine sediment — coral fragments, mollusc shells, beach sand — found ~2 m (6.5 ft) below the surface inside the Makauwahi sinkhole on Kaua'i, 100 m (328 ft) from shore and behind 7 m (23 ft) walls. Radiocarbon dating places the event 350–575 years before publication, i.e. roughly 500 years ago. Modeling across Mw 9.0–9.6 Aleutian–Alaska scenarios shows only a magnitude greater than 9.0 reproduces the observed inundation, producing water levels of 8–9 m (26–30 ft) — versus the 1946 event's ~2.5 m at that site, i.e. at least three times the size of 1946**. Recurrence estimated at roughly once per thousand years (~0.1% annual probability). Corroborating deposits of the same age at Sedanka Island, Alaska and on the western Canadian and U.S. coasts.

C-03 · 2015-04 · **Map 1 – Waikīkī, Tsunami Evacuation Map**

County · City and County of Honolulu DEM (Honolulu) · map, 1 (large-format sheet)

<https://www.honolulu.gov/dem/wp-content/uploads/sites/64/2025/09/Waikiki-map-1-waikiki.pdf>

This sheet carries the actual printed official vertical-evacuation legend text for Waikīkī — the authoritative wording the user asked for: "Structural steel or reinforced concrete buildings of ten or more stories provide increased protection on or above the fourth floor; if you are caught near the shoreline consider using vertical evacuation." It also prints the two-tier decision rule: "For most Tsunami Warnings, evacuate out of the red zone; in the unlikely case of an 'Extreme Tsunami Warning', evacuate out of the red and yellow zones." Shows the XTEZ reaching the H-1 corridor inland of Waikīkī, with named anchor facilities (Kapi'olani Medical Center, Waikīkī and Kūhiō Elementary, Honolulu Zoo, Ala Wai Golf Course).

F-22 · 2015 · **Final Approved TsunamiReady® Guidelines (2015)**

Federal · NOAA / National Weather Service · guideline, 9

<https://www.weather.gov/media/tsunamiready/resources/2015TRguidelines.pdf>

The checklist a Hawai'i county must actually satisfy, organized as MIT-1 through MIT-3, PREP-1 through PREP-4, RESP-1 through RESP-7. Specific thresholds found only here: communities with a year-round population of 15,000 or more must operate their own EOC (RESP-3); at least three different methods of receiving official alerts (RESP-4) and at least three different methods of disseminating them to the public (RESP-5); designated and mapped tsunami hazard zones (MIT-1); signage for danger areas, evacuation routes and assembly areas as locally determined (MIT-3); and a three-year follow-up exercise/education period after recognition.

S-11 · 2015 · **2015 Hawaii Catastrophic Hurricane Plan / FEMA Region IX Hawaii Catastrophic Hurricane Annex, Version 1.0**

State · HI-EMA and FEMA Region IX · plan, ~100+

https://dod.hawaii.gov/hiema/files/2016/03/2015Hawaii_Cat_Plan.pdf

Hawai'i's only published catastrophic-scale plan; contains no tsunami analysis, which is itself the finding — there is no state catastrophic tsunami plan. Its transferable planning numbers are the mass-care and logistics baselines: 425,867 pre-impact and 141,957 post-impact shelter population, up to 710,000 people affected, 12.7 million tons of debris, ~508,000 25-ton truckloads, 30 days without power at 50% generation loss, 7 days without water/sewer, 3–5 days to restore airports (military transport only).

F-50 · 2015-11 · **The U.S. Tsunami Program: A Brief Overview (CRS Report R41686)** **UNVERIFIED**

Federal · Congressional Research Service · report, ~20

https://www.congress.gov/crs_external_products/R/PDF/R41686/R41686.13.pdf

The congressional-analyst synthesis of program structure, appropriations history and reauthorization debate across NOAA, FEMA and USGS lines — the only source that assembles the tsunami program's budget trajectory alongside its statutory history in one place, and the framing document Congress used when writing the 2017 reauthorization. Fetch was blocked by robots.txt; the URL was returned by search and matches CRS's standard external-product path pattern.

C-38 · 2016-01 · **Kaua'i Island and Ni'ihau Tsunami Evacuation Maps (with disclaimer) — extreme tsunami evacuation zone map book**

County · County of Kaua'i / Kaua'i Emergency Management Agency (Kaua'i) · map, 22 map sheets plus overview

https://www.kauai.gov/files/assets/public/v/1/emergency-management/documents/finalwithdisclaimer_kauaicountyextremetsunami_2016_compressed.pdf

Kaua'i's complete two-tier evacuation map book in a single downloadable PDF — the only county of the four that publishes its entire extreme-zone map book as one consolidated file. 22 sheets cover Kaua'i and Ni'ihau from Līhu'e/Nāwiliwili through Waimea, Port Allen, Po'ipū, and the Nā Pali Coast. Prints the operative decision rule ("in the unlikely case of an 'Extreme Tsunami Warning' ... evacuate out of the red and yellow zones") and a disclaimer that the data "is not intended to replace site survey" and does not account for locally generated tsunami effects. Ni'ihau zone data is separately sourced from NOAA (October 2016).

H-51 · 2016-06 · **Tsunami! (Second Edition)**

Science & History · Walter C. Dudley and Min Lee — University of Hawai'i Press (Latitude 20) · book, 380

<https://uhpress.hawaii.edu/title/tsunami-second-edition/>

The standard authoritative popular-scientific history of Hawai'i tsunamis**, by the UH Hilo oceanographer who co-founded the Pacific Tsunami Museum. Opens on the 1946 Hilo tsunami (159 lives) and the 1960 Chilean tsunami (61 in the same town), then interleaves eyewitness narrative with tsunami mechanics and the operation of the warning system. The second edition adds many new eyewitness accounts plus expanded coverage of the Mediterranean, Japan, Chile, Indonesia, Fiji, Alaska, California, Newfoundland, the Caribbean, and the 1998 Papua New Guinea disaster. Dudley is also a co-author of USGS Circular 1187 (H-08).

F-31 · **S-37** · 2016 · **ASCE/SEI 7 Chapter 6, Tsunami Loads and Effects, and the Probabilistic Tsunami Design Zone Maps for the State of Hawai'i**

Federal · American Society of Civil Engineers (standard) / Hawai'i Office of Planning and Sustainable Development Coastal Zone Management Program (Hawai'i maps), referenced into federal codes · standard, web page (standard chapter ~40 printed pages)

<https://planning.hawaii.gov/czm/probabilistic-tsunami-design-zone-maps-for-hawaii/>

ASCE 7-16 Chapter 6 was the first national consensus standard for tsunami-resistant design and is the code basis referenced by FEMA P-646 and by the NTHMP modeling guidelines (source of the $n = 0.025$ friction value). The Hawai'i-specific element is the state-commissioned high-resolution Probabilistic Tsunami Design Zone maps built on a 2,500-year return period, covering O'ahu, Maui and Kaua'i, and determining which Risk Category III and IV structures — schools, hospitals, emergency facilities, high-occupancy buildings — require tsunami design. The ASCE 7 Tsunami Hazard Tool at asce7tsunami.online is the companion lookup.

F-32 · 2016-06 · **Community Exposure to Tsunami Hazards in Hawai'i (Scientific Investigations Report 2016-5053)**

Federal · U.S. Geological Survey (Jones, J.L., Jamieson, M.R., Wood, N.J.) · report, 32

<https://pubs.usgs.gov/publication/sir20165053>

The only federal quantification of who and what sits inside Hawai'i's extreme tsunami inundation zone. Using 2010 Census data it counts approximately 248,749 residents and 91,528 households (18 and 20 percent of state totals), 18,693 businesses (37 percent of state totals) and 245,827 employees (42 percent of the state labor force). It analyzes 91 coastal communities across the four counties, and its inundation zone is the composite of two great Aleutian Mw 9.3 and Mw 9.6 scenarios — the federal documentation of the source assumption behind Hawai'i's Extreme Tsunami Evacuation Zones.

F-09 · 2016-10 · **Service Change Notice 16-45, Combination of NTWC and PTWC Products on a Single Website**

Federal · NOAA / NWS · rule, 1

https://www.weather.gov/media/notification/pdfs/scn16-45twc_websites.pdf

Records the consolidation of the two warning centers onto a single tsunami.gov, with NTWC's site assuming the tsunami.gov URL and a six-month parallel-operations period during which the legacy PTWC site remained live. This is the source that dates

and explains why older Hawai'i emergency-management references to ptwc.weather.gov URLs no longer resolve to authoritative product pages.

H-35 · 2016-11 · **Extreme tsunami inundation in Hawai'i from Aleutian-Alaska subduction zone earthquakes**

Science & History · Rhett Butler, David Walsh, Kevin Richards — Natural Hazards · paper, 29

<https://doi.org/10.1007/s11069-016-2650-0>

THIS IS THE MODELING BASIS FOR THE HAWAI'I EXTREME ("YELLOW") TSUNAMI EVACUATION ZONE — the single most important entry for that purpose. Runs 40 distinct scenarios from Mw 8.6 to 9.6 through two independent codes, NOAA's operational SIFT/SIM and the University of Hawai'i research code NEOWAVE. Named scenarios include Mw 9.25ab (50 m shallow slip, 20 m deeper slip), Mw 9.43 (1,000 km fault) and Mw 9.6 (1,400 km fault). Forecast maximum runups exceed the historical record by factors of 2–10: 30–35 m at Hilo, comparably extreme values at Kahului and Hale'iwa, and over 40 m on the steep cliffs at Hanalei, Kaua'i*. Its governing conclusion for zone design: "maximal tsunami inundations everywhere in the Hawaiian Islands cannot be generated by a single large earthquake" — the extreme zone is therefore an *envelope of multiple scenarios, not a single event footprint.

Codification

2017–2022 Reauthorization, building code, hazard plans, Hunga Tonga

F-28 · 2017-04 · **Public Law 115-25, Weather Research and Forecasting Innovation Act of 2017, Title V — Tsunami Warning, Education, and Research Act of 2017**

Federal · U.S. Congress · statute, 30 (131 Stat. 91–120)

<https://www.congress.gov/115/plaws/publ25/PLAW-115publ25.pdf>

The current reauthorization text. It adds "research" to the program's statutory mission, names the National Tsunami Warning Center (Alaska) and Pacific Tsunami Warning Center (Hawaii) explicitly in statute, restates the 80 percent DART operational-capacity floor, and requires standardized warning products and uniform software across centers. It also directs that forecast models incorporate ocean observing systems, seismic networks and satellite detection, and creates the Tsunami Science and Technology Advisory Panel. This is the law NTHMP cites as identifying NOAA as lead agency.

S-04 · 2017-05 · **State of Hawaii Emergency Operations Plan (May 2017)** SUPERSEDED

State · HI-EMA · plan, ~180

https://dod.hawaii.gov/hiema/files/2017/08/HI-EOP.FINAL_.Version-May-2017.pdf

Historical baseline showing the 16-SESF structure and listing "Tsunami watch, warning or advisory" as a named triggering event for state notification. Only value now is documenting the pre-2021 architecture for change tracking.

H-37 · 2017 · **The orphan Sanriku tsunami of 1586: new evidence from coral dating on Kaua'i**

Science & History · Rhett Butler, David Burney, Ken Rubin, David Walsh — Natural Hazards · paper, 20

<https://doi.org/10.1007/s11069-017-2902-7>

Refines the dating of the Makauwahi paleotsunami using U-series/radiocarbon coral dating and links the Kaua'i deposit to the "orphan" Sanriku tsunami recorded in Japan in 1586 — i.e. proposes a specific dated Aleutian event rather than an undated window. Tightening that date is what converts the extreme-zone scenario from a hypothetical envelope into an event with an assignable recurrence position.

H-47 · 2017 · **Tsunami Essentials: Knowledge needed to save Your life and the lives of others**

Science & History · Daniel A. Walker; issued via UNESCO/IOC-NOAA International Tsunami Information Center · public education, 6

https://www.weather.gov/media/itic-car/hawaii_information/TsunamiEssentialsbrochure.pdf

The best compact source pairing runup with travel time by source region — exactly the table a compendium needs. Fourteen Pacific-wide events: Chile source — 1960 highest, 35 ft in Hilo, 17 ft at Honu'apo, 61 deaths all in Hilo, travel time 14–15 hours.

Japan source — 2011, 17 ft on Kaua'i and O'ahu north shores, 17 ft at Kealahou, travel time ~8 hours. Kamchatka source — 1923, 20 ft in Hilo, 12 ft at Hale'iwa, travel time 6–7 hours. Aleutian/Alaska source — 1946 most devastating, 54 ft at Waikolu Valley (Moloka'i), 45 ft at Hā'ena (Kaua'i), 27 ft in Hilo, 159 deaths, travel time 5–6 hours. Fourteen confirmed or suspected local tsunamis, including 1868 with a 46 ft runup near Halape and 47 deaths**, and 1975 with 2.

F-36 · 2017-07 · Advanced National Seismic System — Current Status, Development Opportunities, and Priorities for 2017–2027 (USGS Circular 1429, v1.1)

Federal · U.S. Geological Survey · plan, 32

<https://pubs.usgs.gov/circ/1429/circ1429.pdf>

Documents the seismic backbone that feeds tsunami warning decisions, stating that NOAA tsunami monitoring depends on the Global Seismographic Network partnership among USGS, NSF and IRIS. It lists Hawai'i as one of seven ANSS regions and identifies USGS Hawaiian Volcano Observatory as the participating regional network — the institutional link between local Hawai'i seismic detection and PTWC's earthquake parameters. Note: ShakeAlert is scoped to California, Oregon and Washington only and does not cover Hawai'i.

H-20 · 2018-04 · Volcano Watch — Disaster strikes Ka'ū in 1868: The rest of the story

Science & History · USGS Hawaiian Volcano Observatory · report, 2

<https://www.usgs.gov/observatories/hvo/news/volcano-watch-disaster-strikes-kau-1868-rest-story>

The HVO account of the largest historical Hawaiian earthquake: the M7.9 (or M7.5, per the ITIC table) Ka'ū event of April 2, 1868, in which "the subsequent tsunami and mud flow took the lives of 77 Hawaiians." Records the March 28, 1868 foreshock that toppled four or five stone churches and destroyed Captain Brown's stone house at Kahuku, over 100 cattle lost in the eruption, and relief provided by Kamehameha V to ~800 people. Eyewitness-driven rather than instrumental — the human record for the long tail of the catalog.

F-35 · 2018 · Pedestrian evacuation modeling to reduce vehicle use for distant tsunami evacuations in Hawai'i

Federal · U.S. Geological Survey (Wood, N.J., Jones, J., Peters, J., Richards, K.), International Journal of Disaster Risk Reduction v.28 · report, 13 (pp. 271–283)

<https://pubs.usgs.gov/publication/70196715>

The only federal analysis of whether Hawai'i residents can physically walk out in time. It finds 98–76 percent of residents in the standard evacuation zone can walk clear in under 15 minutes at reasonable speeds, but 76 percent of hotel visitors in the extreme zone would need more than 15 minutes. Adopting the extreme zone roughly triples affected residents, employees and facilities and adds a 26 percent increase in hotel visitors encouraged to evacuate. It locates bottlenecks on O'ahu's North Shore for the standard zone and all around the O'ahu coastline for the extreme zone.

H-59 · 2018 · Amplification of drawdown and runup over Hawaii's insular shelves by tsunami N-waves from mega Aleutian earthquakes

Science & History · Yefei Bai, Yoshiki Yamazaki, Kwok Fai Cheung — Ocean Modelling · paper, 14

<https://doi.org/10.1016/j.ocemod.2018.02.005>

The mechanism paper explaining why Hawai'i's extreme-scenario runups are so large relative to open-ocean wave height: N-waves from mega-Aleutian sources undergo drawdown-and-runup amplification over Hawai'i's narrow insular shelves. This is the hydrodynamic justification for the 30–40 m extreme-zone figures in Butler et al. 2017 and the reason Hawai'i cannot be assessed with continental-shelf assumptions.

S-13 · 2018 · State of Hawai'i 2018 Hazard Mitigation Plan — Section 4.13 Tsunamis SUPERSEDED

State · HI-EMA · report, 28 (pp. 4-271 to 4-298)

<https://dod.hawaii.gov/hiema/files/2018/06/Draft-Section-4.13-Tsunamis.pdf>

Holds the long-run statistical baseline that the 2023 update dropped: since 1812 there have been more than 160 tsunamis in the state (135 confirmed, 26 unconfirmed) with over 2,000 runup observations; nine confirmed events caused 294 deaths and over

\$600 million in damage. Gives the recurrence rule of thumb — "the State should expect a potentially damaging tsunami, one requiring coastal evacuation, approximately once every six years." Hazard-area geometry: 143.0 sq mi statewide (2.2%), Honolulu 61.0 sq mi (10.2% of county), Kaua'i 32.8 sq mi (5.3%). Population in GAT inundation 236,357 (17.4%), casualties ranging 0 to 190,851 depending on preparedness, >\$12.8 billion building loss. Also documents that the 2011 Tohoku event proved the 2010 evacuation maps had underestimated flooding — the origin of the 2014 remapping.

S-38 · 2018-12 · High-Resolution Probabilistic Tsunami Design Zone Maps for O'ahu — Kick-off Meeting

State · OPSD CZM Program / University of Hawai'i · report, 20

<https://files.hawaii.gov/dbedt/op/czm/tsunami/oahumappingkickoffmeeting20181207.pdf>

The only published technical specification for Hawai'i's tsunami modeling program. Names NEOWAVE, developed with Kwok Fai Cheung (UH Ocean and Resources Engineering) — the same modeling lineage behind the extreme evacuation zones. Specifies a 10 m horizontal grid for the high-resolution product and the ASCE 7-16 calibration constraint that no site-specific point may fall below 80% of the ASCE Tsunami Geodatabase offshore wave heights. Also documents the DEM verification and source-scenario development workflow.

H-48 · 2019 · Tsunami Glossary (IOC Technical Series 85, Rev. 3, 2019 edition)

Science & History · UNESCO Intergovernmental Oceanographic Commission / International Tsunami Information Center · public education, 48

https://legacy.itic.ioc-unesco.org/legacy.itic.ioc-unesco.org/index4284.html?option=com_content&view=article&id=1328&Itemid=1142&lang=en

The internationally-agreed definitional authority for every technical term a Hawai'i compendium will use — runup, inundation, amplitude, tsunami magnitude vs intensity, advisory vs watch vs warning — plus the intergovernmental coordination-group structure. Available in English, Spanish, French, Arabic, Chinese and Bahasa Indonesia; prior editions 2008, 2013, 2016. Since 2016 updates are approved through the IOC Task Team on Watch Operations and Disaster Management and Preparedness.

S-22 · C-57 · 2019 · HRS § 127A-14 — State of emergency

State · Hawai'i State Legislature · statute, web page

<https://law.justia.com/codes/hawaii/title-10/chapter-127a/section-127a-14>

Sets the declaration mechanics: the Governor proclaims a state of emergency statewide, a mayor a local state of emergency in their county, upon finding an emergency exists or is imminent; the declaring official "shall be the sole judge of the existence of the danger, threat, or circumstances"; and every proclamation automatically terminates 60 days after issuance unless ended sooner by separate proclamation. The 60-day sunset is the specific number found only here.

F-29 · 2019-08 · Guidelines for Design of Structures for Vertical Evacuation from Tsunamis, Third Edition (FEMA P-646)

Federal · FEMA / Applied Technology Council (ATC-64 project), with NOAA · guideline, ~200

https://www.weather.gov/media/itic-car/vertical_evac/FEMAP646_ThirdEdition_508.pdf

The central federal engineering document for Hawai'i vertical evacuation, since much of urban Honolulu has no reachable high ground. It requires refuge structures be assigned Tsunami Risk Category IV, mandates that refuge-area elevation carry conservative margin above design tsunami elevation because "overtopping of the refuge area will result in unacceptable loss of life," and provides Table 5-2, Maximum Spacing of Vertical Evacuation Structures Based on Ambulatory Speed and Warning Time. The third edition revised the debris-impact expression to remove over-conservatism present in the second. Section 2.1.1 uses Hawai'i as the case study — 159 deaths in Hilo from the 1946 Aleutian tsunami, 61 deaths from the 1960 Chilean tsunami, \$40 million damage from 2011 Tohoku, and 1975 local Hawaiian tsunami run-up exceeding 6 meters (20 feet); Figure 4-6 is the Waikiki Beach evacuation map.

S-23 · 2019-08 · Overview of Hawai'i Revised Statutes Chapter 127A

State · HI-EMA · guideline, 1

<https://dod.hawaii.gov/hiema/files/2019/08/Reference.Overview-of-127A.pdf>

HI-EMA's own one-page plain-language crosswalk of which powers belong to mayors versus the Governor. It is the only official state document that explicitly lists "operate the Statewide Outdoor Siren Warning System" as a chapter 127A power, and that presents "direct non-compulsory evacuations" as a shared mayor/governor power while reserving federal disaster requests, law suspension, direct operational control and suspension of state holidays to the Governor alone.

F-47 · 2019-10 · **National Response Framework, Fourth Edition**

Federal · FEMA / U.S. Department of Homeland Security · plan, ~60

https://www.jcs.mil/Portals/36/Documents/Doctrine/Interorganizational_Documents/nrf_4th_2019.pdf

The federal response doctrine that would govern post-impact operations in Hawai'i. Its fourth edition introduced ESF #14, Cross-Sector Business and Infrastructure, bringing the total to 15 ESFs. Significantly for this compendium, the NRF contains no tsunami-specific provision — it addresses "major hurricanes or earthquakes" and natural disasters generically — which means tsunami-specific federal response detail lives in state and regional annexes rather than in national doctrine. That absence is itself the finding.

S-15 · 2019-11 · **Hawai'i Emergency Management Agency Five Year Strategic Plan 2020-2025**

State · HI-EMA · plan, 31 plus appendices

<https://dod.hawaii.gov/hiema/files/2022/04/2020-HI-EMA-Strategic-Plan.pdf>

The only document stating the siren program's own performance targets. Objective 3.07 (All Hazards Outdoor Siren Capability) sets a maintenance standard of servicing one-third of the siren inventory annually for preventive maintenance, and tracks legacy sirens upgraded, new sirens installed and sirens repaired to restore coverage, against a stated base of over 400 sirens. Objective 3.08 commits to a 24/7 State Warning Point with staffing and training as the measured deliverable.

F-19 · 2019-11 · **NTHMP Warning Coordination Subcommittee Terms of Reference**

Federal · NTHMP Warning Coordination Subcommittee · procedure, 2-3

https://www.weather.gov/media/nthmp/WCS/WCTermsOfReference_2019.pdf

The only document describing the formal channel by which Hawai'i emergency managers can change PTWC products. It establishes that WCS consensus recommendations "represent the collective will" of NTHMP partners; that major changes are routed through the NTHMP Coordinating Committee to NWS via the formal service-change process while minor changes are implemented directly by the warning centers; and that co-chairs are the two Tsunami Warning Center directors plus one state/territory emergency manager. Outside experts may participate but cannot vote.

C-23 · 2020-05 · **County of Hawai'i Multi-Hazard Mitigation Plan (2020 Public Review Draft)** **UNVERIFIED; SUPERSEDED**

County · County of Hawai'i / Hawai'i County Civil Defense Agency (Hawai'i) · plan, several hundred (>30 MB PDF)

https://records.hawaiicounty.gov/Weblink/1/edoc/104769/2020-05-18_HawaiiCountyHMP_PublicReviewDraft.pdf

The predecessor plan of record for Hawai'i Island tsunami risk, containing the county's own tsunami hazard profile, Hilo Bay inundation history, and exposure/loss estimates. Now superseded in substance by the 2025 update but still the last version with a confirmed public URL.

C-31 · 2020 · **2020 Maui County Hazard Mitigation Plan (Final) — and Parts 1 and 2** **SUPERSEDED**

County · Maui Emergency Management Agency (Maui) · plan, several hundred (48 MB; split versions at DocumentCenter/View/135090 and /135089)

<https://www.mauicounty.gov/DocumentCenter/View/125977/2020-Maui-County-Hazard-Mitigation-Plan-Final>

The plan in force during the 2023 Lahaina fire and the 2025 tsunami, so it is the baseline against which the 2025 update's changes must be read. A separate "2020 MCHMP Amendments" document exists at DocumentCenter/View/152889, recording interim changes made between the two plan cycles — the only place those amendments are captured.

C-47 · 2020-07 · **Kaua'i Emergency Management Agency Fiscal Year 2021 Annual Report**

County · County of Kaua'i, Office of the Mayor (Kaua'i) · report, 7 (pp. II-1 to II-7)

https://www.kauai.gov/files/assets/public/v/1/office-of-the-mayor/documents/annual-reports/fy21/2_kema_ar-fy21.pdf

Documents KEMA's capacity trajectory in hard numbers: 6 positions in FY2020 (2 grant-funded) — 18 in FY2021 (14 grant-funded) — 26 projected FY2022 (22 grant-funded), on a FY2021 program expenditure of ~\$2.23M (\$996,886 salaries; \$1.22M operations). Records specific tsunami activations in the period — an advisory in October 2020, a watch activation in March 2021 — and the "Tsunamis Live!" public training events of April–May 2021. The heavy grant-funding dependency (22 of 26 positions) is a structural fragility not visible in any other county document.

F-16 · 2021-01 · **Tsunami Modeling and Mapping: Guidelines and Best Practices, Part I: Tsunami Inundation Modeling**

Federal · NTHMP Mapping and Modeling Subcommittee · guideline, 4

<https://www.weather.gov/media/nthmp/MMS/1inundationmodelingguidelines.pdf>

Carries the actual numeric modeling standards Hawai'i's inundation products must meet: nearshore grids fine enough that a significant coastal feature spans more than 3 cells; DEM cell sizes under 3 arc-seconds (~90 m, "Type 1"); a bottom friction coefficient with $n = 0.025$ cited as the ASCE 7 reference value; the NOAA Forecast Source Database as the default distant-source resource; and mandatory conformance to NTHMP MMS benchmark standards before a code may be used for federally funded mapping.

F-17 · 2021-01 · **Tsunami Modeling and Mapping: Guidelines and Best Practices, Part II: Tsunami Inundation Maps**

Federal · NTHMP Mapping and Modeling Subcommittee · guideline, 4

<https://www.weather.gov/media/nthmp/MMS/2inundationmapguidelines.pdf>

Defines the three map types by data resolution (Type 1 >90 m; Type 2 ~10 m; Type 3 site-specific), requires that maximum-inundation maps envelope all modeled scenarios plus documented historical events, and directs mappers to extend the inland boundary beyond the modeled extent to absorb the 10–20 percent model discrepancy observed in narrow areas. It sets the re-evaluation triggers: after any actual tsunami, on discovery of a significant new source, every 5–10 years, or on technological advance — the clause that drives periodic Hawai'i evacuation-zone updates.

F-18 · 2021-01 · **Tsunami Modeling and Mapping: Guidelines and Best Practices, Part III: Tsunami Inundation Determination for Non-Modeled Regions**

Federal · NTHMP Mapping and Modeling Subcommittee · guideline, 3

<https://www.weather.gov/media/nthmp/MMS/3nonmodeledregionguidelines.pdf>

The fallback rule set for coastline without a numerical model — relevant to Hawai'i's remote and unmodeled shorelines. It gives the default screening rule that coastal areas, bays, inlets and river reaches below 10 meters (~33 feet) elevation are at risk, and endorses Green's Law approximation for projecting offshore amplitude onshore plus interpolation from neighboring modeled areas, with a safety margin applied to maximum recorded historical runup.

S-43 · 2021-03 · **2011 Hawaii Tsunami 10 Year Anniversary**

State · HI-EMA · report, 1

<https://dod.hawaii.gov/hiema/files/2021/03/2011-Hawaii-Tsunami-10-Year-Anniversary.pdf>

The state's own accounting of what the 2011 Tohoku tsunami changed in Hawai'i. Damage across Honolulu, Maui and Hawai'i counties ~\$7.5 million (~\$8.725 million in 2021 dollars); Presidential Major Disaster declaration April 8, 2011; \$6.4 million in federal repair assistance; over 200 waves recorded. Lists the resulting state improvements including tsunami evacuation zone maps described as the first in the U.S., and gives a siren inventory snapshot of 410 outdoor warning sirens with 76 new state-of-the-art units planned — the datum that brackets the later 418 count in S-18.

S-39 · 2021-04 · **State Building Code — 2018 IBC Amendments, Errata and Addenda (Section 1615 Tsunami Loads)**

State · Hawai'i State Building Code Council / Dept. of Accounting and General Services · standard, 70

https://ags.hawaii.gov/wp-content/uploads/2021/05/2018SBCErrataandAddenda_20210518.pdf

Hawai'i's binding tsunami construction law. Amended IBC Section 1615 requires Risk Category III and IV buildings, and Risk Category II buildings meeting all three tests, to be designed to ASCE 7-16 Chapter 6 when located in a Tsunami Design Zone. The Risk Category II triggers are precise and found only here: occupancy A, B, E, I, M, R-1, R-2 or higher-education laboratories; tsunami inundation depth exceeding 3 feet within the building footprint; and highest occupiable floor exceeding 75 feet. Zones are those defined in the ASCE 7 Tsunami Design Geodatabase version 2016-1.0, and the requirement applies only to new buildings and additions — the legal reason most existing Waikiki towers are not tsunami-designed.

F-10 · 2021-07 · **Service Change Notice 21-69, Change to Pacific Tsunami Warning Center City Location in the Mass News Disseminator (MND) Header Block**

Federal · NOAA / NWS · rule, 1

https://www.weather.gov/media/notification/pdf2/scn21-69change_ptwc_mnd_header.pdf

The only document that dates and explains the header change from "NWS PACIFIC TSUNAMI WARNING CENTER EWA BEACH HI" to "NWS PACIFIC TSUNAMI WARNING CENTER HONOLULU HI," with the explicit note that tsunami services were not otherwise affected. Essential for anyone parsing archived Hawai'i tsunami message text, since the string differs before and after September 2021.

S-01 · 2021-08 · **State of Hawai'i Emergency Operations Plan — Tsunami Incident Annex (Part 1, signed)**

State · Hawai'i Emergency Management Agency (HI-EMA), Dept. of Defense · plan, ~80

<https://dod.hawaii.gov/hiema/files/2021/09/FINAL-Tsunami-Incident-Annex-8.19.2021-part-1-signed.pdf>

The single authoritative state tsunami playbook. Contains the four-level alert decision matrix with actual magnitude/runup thresholds: Information Statement (local M4.0–6.8 / distant M6.5–7.8), Watch (distant M≥7.9, ETA 3–6 hrs), Advisory (M≥6.9 with runup 0.3–1.0 m), Warning (M≥6.9 with runup ≥1.0 m = full evacuation). Specifies the distant-tsunami siren cadence found nowhere else: first siren sounded simultaneously statewide at least 3 hours before first wave, then hourly, with a final sounding 30 minutes prior. States that for a local earthquake >M7.5 the State Warning Point sounds sirens in all counties immediately without county concurrence. Defines the extreme/yellow zone benchmark as an Eastern Aleutian M9.0+ event and gives the exposure figure of >17% of state population and 55% of total households inside the extreme inundation zone. Enclosures include the Tsunami Action Summary Sheet, Meeting Sequence Chart, State Warning Point Alert Messages, Public Information Templates, Distant Tsunami Checklist, and the New Urgent Local Tsunami Warning Procedures Memorandum.

S-07 · 2021-11 · **HI-EOP State Emergency Support Function #5 — Planning and Information Annex**

State · HI-EMA · plan, ~6 plus attachments

<https://dod.hawaii.gov/hiema/files/2022/01/HI-EOP-SESF-5-Annex-Nov2021-part-1-signed.pdf>

The only annex that formally seats the Pacific Tsunami Warning Center and the Hawaiian Volcano Observatory as SESF support agencies alongside NWS. Defines the four SEOC Planning Section units — Situational Awareness (with county desks and GIS support), Documentation, Technical Specialists/Hazard Advisors, and Planning — and the county-desk model of direct SEOC-to-county-EOC liaison that governs tsunami situational reporting.

S-10 · 2021-12 · **HI-EOP State Emergency Support Function #13 — Public Safety and Security Annex**

State · HI-EMA / State Law Enforcement Coalition · plan, ~30

<https://dod.hawaii.gov/hiema/files/2022/01/ESF-13-Annex-part-1-signed.pdf>

The enforcement half of evacuation authority: SESF #13 promotes compliance with gubernatorial emergency proclamations and handles traffic control and evacuated-area security. Establishes the State Law Enforcement Coalition (SLEC) and assigns lead agencies by venue — Harbor Police for maritime incidents, DLNR for state parks and 'Iolani Palace. Sets the National Guard rule

that SESF #20 forces are "accompanied by sworn law enforcement officers, not solely in place of" them, i.e., the Guard cannot itself enforce an evacuation order.

F-02 · 2022-01 · **NWS Instruction 10-701, Tsunami Warning Center Operations**

Federal · NOAA / National Weather Service, Analyze Forecast and Support Office · procedure, 23 (plus Appendix A)

https://www.weather.gov/media/directives/010_pdfs/pd01007001curr.pdf

The single most important operational document for Hawai'i. It carries the actual numeric alert thresholds: Tsunami Warning when forecast/observed wave height exceeds 1 meter or widespread inundation is possible or impact is unknown; Tsunami Advisory when maximum forecast height is 0.3–1.0 m (or observed 0.5–1 m); cancellation when expected/observed height falls below 0.3 m with a diminishing trend. It also fixes update cadence — next message in 30–60 minutes when the source is inside the center's Domestic Service Area, 60 minutes when outside, stretchable to 120 minutes after the third message in prolonged events — and specifies VTEC/UGC segmentation of domestic products. No other federal document states these numbers as binding operational criteria.

H-29 · 2022-01 · **"It could have been worse": Tsunami triggered by volcanic eruption in Tonga causes minor damage in West Hawaii**

Science & History · West Hawaii Today · report, 3

<https://www.westhawaii.com/2022/01/15/hawaii-news/it-could-have-been-worse-tsunami-triggered-by-volcanic-eruption-in-tonga-causes-minor-damage-in-west-hawaii/>

The only detailed on-the-ground damage record for Hawai'i from 2022, and a documented warning failure. ~3-foot surge in West Hawai'i; first waves ~2 a.m. Saturday, from an eruption ~6 p.m. Hawai'i time Friday. Hawai'i County Civil Defense sent its advisory at 2:03 a.m. — after the waves had already arrived — and no sirens sounded in West Hawai'i. ** Damage itemized: a 288-gallon propane tank thrown 30 feet into the Sea Quest retail space (tens of thousands of dollars); debris and a destroyed picnic table at Kahalu'u Beach Park; flooding at King Kamehameha's Kona Beach Hotel and Kai Eats and Drinks; canoes pushed into the rockwall at Kamakahonu Bay.

H-26 · 2022-02 · **15 January 2022, Hunga-Tonga Hunga-Ha'apai Volcanic Eruption and Tsunami (TsuInfo Alert v.24 no.1)**

Science & History · International Tsunami Information Center, published in TsuInfo Alert (Washington DNR / Geological Survey) · report, 21

https://dnr.wa.gov/sites/default/files/2025-03/ger_tsuinfo_2022_v24_no1.pdf

The ITIC's own institutional assessment of the mechanism that broke the warning system's assumptions. Identifies the multiple generating processes — submarine explosion, caldera collapse, pyroclastic flows, and "acoustic pressure waves that generate coupled air-sea waves" travelling faster than water waves. PTWC reported waves up to 2 m amplitude. States plainly: "This is the first time that the PTWS has had to respond to a destructive volcanic event of these characteristics as the PTWS has primarily focused on earthquake-generated tsunamis," and notes damaging waves in Hawai'i alongside New Zealand, Rarotonga and the U.S. West Coast.

S-06 · 2022-02 · **HI-EOP State Emergency Support Function #2 — Communications Annex**

State · HI-EMA / Office of Enterprise Technology Services (ETS) · plan, ~25

<https://dod.hawaii.gov/hiema/files/2022/04/22-0412-State-Emergency-Support-Function-SESF-2-Communications-Annex.pdf>

Names ETS (not HI-EMA) as coordinating agency for communications restoration and identifies Hawai'i's single-provider fragility for local telephone and cable, plus dependence on AT&T FirstNet, Hawaiian Telcom, the DoD Statewide Interoperability Coordinator, the PUC and RACES volunteers. Confirms by omission that EAS/WEA/siren activation procedures live in the Tsunami Annex and State Warning Point SOPs, not here.

S-03 · 2022-04 · **State of Hawai'i Emergency Operations Plan — Basic Plan (April 2022)** **SUPERSEDED**

State · HI-EMA · plan, ~200

<https://dod.hawaii.gov/hiema/files/2022/07/22-0228-State-of-Hawaii-Emergency-Operations-Plan-Basic-Plan.pdf>

The version in force during the 2022 Tonga and 2025 Kamchatka events; useful only as the baseline the 2026 plan changed. Contains the "all incidents begin and end locally, and county authorities maintain operational control" formulation and the Adjutant General-as-Director-of-Emergency-Management construction.

S-42 · 2022-04 · **Hawai'i Emergency Management Agency Expands Outreach With Translated Tsunami PSA (Release No. 2022-020)**

State · HI-EMA · report, 2

https://www.weather.gov/media/itic-car/hawaii_tsunami_awareness_month/TAM_2022/HI-EMA_NewsRelease_PSA_14apr22.pdf

Establishes the state's language-access planning factor for tsunami warning: one in nine persons in Hawai'i has Limited English Proficiency. Documents the addition of Japanese and Tagalog captioning to the animated tsunami PSA as the state's response. This figure drives the multilingual requirement behind the 13+ language visitor resources in S-46.

F-03 · 2022-06 · **NWS Instruction 10-702, International Tsunami Information Center**

Federal · NOAA / National Weather Service · procedure, 5

https://www.weather.gov/media/directives/010_pdfs/pd01007002curr.pdf

Defines ITIC (co-located with PTWC in Honolulu) as the entity that runs tsunami training and TsunamiReady recognition support across the U.S. Pacific and Caribbean, monitors international warning activity under IOC coordination, and archives event data with the World Data System. This is the only directive that assigns Hawai'i-based ITIC its dual domestic-support and international-liaison mandate, which explains why Hawai'i public-education products are hosted on ITIC pages rather than WFO pages.

F-05 · 2022-06 · **NWS Instruction 10-704, The TsunamiReady® Recognition Program**

Federal · NOAA / National Weather Service · procedure, 24 (including appendices)

https://www.weather.gov/media/directives/010_pdfs/pd01007004curr.pdf

The governing instruction for TsunamiReady, distinct from the guidelines themselves. It sets the four-year recognition cycle, defines the roles of WFOs, Tsunami Warning Centers, and Regional TsunamiReady Program Managers in the application chain, establishes the fundamental vs. "Tier Two" recognition structure, and ties recognition to National Flood Insurance Program Community Rating System credits. It also creates the TsunamiReady Hero Award (life-saving actions) and Champion Award. Over 200 recognized jurisdictions are administered under it.

H-27 · 2022 · **In depth: Surprising tsunamis caused by explosive eruption in Tonga**

Science & History · U.S. Geological Survey, Pacific Coastal and Marine Science Center · report, 4

<https://www.usgs.gov/centers/pcmsc/news/depth-surprising-tsunamis-caused-explosive-eruption-tonga>

The clearest quantitative explanation of the meteotsunami mechanism. Lamb waves radiated at about 710 mph, circling the globe 3.5 times. Gives the conversion rule of thumb: "One millibar of pressure change will generate about 1 centimeter of up or down change in the ocean's surface." Explains Proudman resonance** over trenches deeper than ~6 miles as the amplifier, and documents waves arriving in Japan more than 2 hours ahead of the classical tsunami travel time. Observed far-field heights: 20 cm at Port San Luis CA, 10 cm at Mayagüez PR, up to 1.5 ft in the Mediterranean, 65 ft on Tongan islands.

H-28 · 2022 · **Global fast-traveling tsunamis driven by atmospheric Lamb waves on the 2022 Tonga eruption**

Science & History · T. Kubota, T. Saito, K. Nishida — Science · paper, 6

<https://doi.org/10.1126/science.abo4364>

The peer-reviewed physics paper establishing that the globally-observed early arrivals were air-sea coupled waves driven by the Lamb wave rather than a conventional water-borne tsunami — the citation that a Hawai'i compendium needs to justify treating volcanic/atmospheric sources as a distinct warning problem from seismic ones.

H-58 · 2022 · **An agent-based model of short-notice tsunami evacuation in Waikiki, Hawaii**

Science & History · Karl Kim, Farnaz Kaviari et al. — Transportation Research Part D: Transport and Environment · paper, 16
<https://doi.org/10.1016/j.trd.2022.103239>

The peer-reviewed model behind the 2025 UH casualty figures (H-32) — simulating pedestrian, bicycle and vehicle evacuation of Waikiki's dense resident-plus-visitor population under short notice, and quantifying the marginal life-saving value of vertical evacuation, added Ala Wai Canal crossings, and reduced warning lead time. The only Hawai'i-specific agent-based evacuation model located.

F-04 · 2022-07 · **NWS Instruction 10-703, Post-Tsunami and Warning Effectiveness Surveys**

Federal · NOAA / National Weather Service · procedure, 5
https://www.weather.gov/media/directives/010_pdfs/pd01007003curr.pdf

Contains the only federal clock for post-event evaluation: the public feedback survey link must be posted on tsunami.gov within one day of a significant Warning or Advisory and removed after two weeks; the emergency-management questionnaire goes out within one week; final compiled results are due within ten weeks. It also assigns survey initiation authority to the AFSO Director or the affected state/territory for domestic events, and to UNESCO auspices for international ones. This is the document that would govern a post-event review of any Hawai'i warning.

After the evacuation

2023–2026 Current plans, the 2025 event, and what it exposed

F-01 · 2023-02 · **National Weather Service Policy Directive 10-7, Tsunami Warning Services**

Federal · NOAA / National Weather Service · procedure, 5 (plus Appendix A)
https://www.weather.gov/media/directives/010_pdfs/pd01007curr.pdf

The top-level policy instrument that legally splits the two warning centers' areas of responsibility: NTWC (Palmer, AK) covers "coastal regions of all U.S. states (except Hawaii)" plus Pacific/Atlantic Canada, while PTWC (Honolulu) covers "Hawaii and all U.S. territories" plus Pacific and Caribbean nations. It is the authority document that all NWSI 10-70x instructions hang from, and Appendix A is the authoritative index of which subordinate instruction governs which function. It is the only place the Hawai'i carve-out is stated as policy rather than as operational practice.

C-62 · **H-46** · 2023-03 · **Hawai'i Historical Tsunami Effects 1812–2022 (wall chart)** **UNVERIFIED; SUPERSEDED**

County · NOAA NWS International Tsunami Information Center · public education, 1 (24x36 wall chart)
https://www.weather.gov/media/itic-car/hawaii_tsunamis/HIHistoricalTsunamiEffects_1812-2022_24x36_20230320.pdf

The reference chart against which all four counties' public education materials are built, compiling every recorded tsunami effect in Hawai'i from 1812 to 2022 in a single 24x36 layout with per-island effects. It is the common data source that explains why the county brochures cite different event counts (24 on the Hawai'i Island edition, 33 on the Kaua'i edition) — the counties filter the same underlying record differently.

S-41 · 2023-03 · **NEWS RELEASE: Do You #KnowTheSigns? Meeting, Proclamation Mark the Start of Tsunami Awareness Month in Hawai'i**

State · HI-EMA / Office of the Governor · report, web page
<https://dod.hawaii.gov/hiema/news-release-do-you-knowthesigns-meeting-proclamation-mark-the-start-of-tsunami-awareness-month-in-hawaii/>

Documents the annual gubernatorial proclamation designating April as Tsunami Awareness Month, presented at NOAA's Inouye Regional Center on Ford Island to assembled emergency managers. Uses the state's alternate casualty figure of 293 killed since 1900 (vs. 263 on the HI-EMA hazard page — a real discrepancy in state materials), and 158 deaths in the April 1, 1946 event concentrated on Hawai'i Island and in Hilo. Carries the #KnowTheSigns campaign and the PSA tagline "Don't Fool Around; Get

to High Ground!" — the April Fool's Day framing that anchors the whole state public-education calendar. Parallel Governor's-office release: <https://governor.hawaii.gov/newsroom/office-of-the-governor-news-release-awareness-education-and-action-april-is-tsunami-awareness-month-in-hawaii%CA%BBi/>

F-24 · 2023-05 · **Emergency Alerts: NOAA Should Take Additional Actions to Help Ensure Tsunami Alerts Reach Those at Risk (GAO-23-105961)**

Federal · U.S. Government Accountability Office · report, ~50

<https://www.gao.gov/products/gao-23-105961>

The most recent independent audit of the tsunami alerting chain. It makes two recommendations with tracked status: (1) NOAA should assess and publish the extent to which NOAA Weather Radio coverage reaches populated tsunami-risk areas — closed as implemented in 2024; and (2) NOAA should work with the FCC and FEMA to establish clear responsibilities and procedures for using IPAWS to deliver tsunami alerts to the EAS — still open. It identifies coverage gaps in tribal, rural and remote coastal areas. This is the definitive statement of the unresolved IPAWS/EAS authority ambiguity.

H-42 · 2023 · **A qualitative review of tsunamis in Hawai'i**

Science & History · Scott Fisher, James Goff, Andrew Cundy, David Sear — Natural Hazards · paper, 36

<https://doi.org/10.1007/s11069-023-06076-w>

The best single modern synthesis of the whole Hawai'i record, with inflation-adjusted damage. Event-by-event: 1812 first recorded, minimal damage; 1837 (Chile) 14 deaths in Hilo, 66 homes destroyed, 2.4 m waves on O'ahu; 1860 homes destroyed at Māliki; 1868 (local, Ka'ū) 47 tsunami deaths + 34 from landslides, 108 homes destroyed, ~6 m waves; 1869 Nu'u, 270 m inland inundation; 1877 (Chile) 5 deaths, 37 dwellings destroyed, 12 m wave oscillations; 1878 (Aleutian) 8 homes at Māliki; 1923 (Kamchatka) 1 death, ~\$26 M (2023 dollars); 1946 159 deaths, >\$25 M then ≈ \$370 M (2023); 1957 54 homes destroyed, \$300,000; 1960 (Chile) 10.7 m bore height; 1975 (local) 2 deaths, ~\$5.2 M (2023); 2011 (Japan) ~\$8.7 M (2023); 2022 (Tonga) ~\$75,000 at Kailua-Kona**.

S-12 · 2023 · **State of Hawai'i Hazard Mitigation Plan 2023 — Section 4.13 Tsunami**

State · HI-EMA · report, ~40

https://dod.hawaii.gov/hiema/files/2023/01/Draft_Section-4.13-D_Tsunami-508-Check.pdf

The current statewide tsunami risk-assessment numbers. State-owned exposure under the Great Aleutian Tsunami scenario: 1,204 state buildings worth \$4.8 billion (Honolulu 801 buildings / \$3.38 billion), 146 miles of state roads, 386 critical facilities, and \$47.2 billion total economic loss including business interruption. Population: 161,942 residents in the primary inundation area (11.4% of state), 39,701 socially vulnerable, and 57,068 estimated injuries/fatalities at "fair" preparedness. Records the January 2022 Hunga Tonga event as \$3.32 million damage in Honolulu County with 0.86 m maximum wave at Makapu'u Point, and adds SOEST and ASCE inundation models alongside the GAT scenario for the first time.

S-18 · 2023-10 · **NEWS RELEASE: Hawai'i Emergency Management Agency Launches Siren Status Map**

State · HI-EMA · report, web page

<https://dod.hawaii.gov/hiema/news-release-hawaii-emergency-management-agency-launches-siren-status-map-offering-visual-tool-to-show-latest-statewide-test-results/>

The only official statewide siren-readiness figures published by the state. Inventory of 418 alert and warning sirens; from the October 2, 2023 test, 326 fully operational (78%), 29 needing HI-EMA in-house maintenance (6.9%), 37 needing contracted maintenance (8.9%), and 26 inoperable/beyond repair (6.2%). Defines the green/yellow/red/black status color scheme and locates the public map under the "Get Ready" tab at ready.hawaii.gov. This is the state's substitute for a formal siren audit.

S-14 · 2023-11 · **2023 Hawai'i State Hazard Mitigation Plan — Executive Summary**

State · HI-EMA · plan, ~20

https://dod.hawaii.gov/hiema/files/2023/01/2023_Hawaii_SHMP_0_ExecutiveSummary-5.pdf

Establishes the plan's frame — 15 natural and non-natural hazards assessed, 84 mitigation actions organized under 7 goals — and is the entry point that maps which numbered section file holds each hazard chapter. Needed to cite the SHMP as an adopted whole rather than as loose section PDFs.

F-11 · 2024-04 · **PTWC Tsunami Products Users' Guide for Puerto Rico, the U.S. Virgin Islands, and the British Virgin Islands, Version 1.22**

Federal · NOAA / NWS Pacific Tsunami Warning Center with ITIC · product guide, ~145

https://www.weather.gov/media/itic-car/PRVI%20User's%20Guide%20-%20Version%201.22_042824.pdf

The most complete published example of a PTWC domestic product user's guide, and therefore the structural template for what a Hawai'i guide would contain: WMO/AWIPS product IDs, UGC code tables, preliminary earthquake parameter block, evaluation section, recommended-action wording, forecast tables with ETAs and wave heights, sea-level observation tables, and impact statements. It documents PTWC's pre-determined threat criteria keyed to magnitude, depth and distance, with different thresholds for "nearby" earthquakes (under 3 hours travel time) versus distant ones. Confirms no Hawai'i counterpart guide exists.

C-26 · 2024 · **Up to 10% of Big Island tsunami warning sirens inoperable**

County · Honolulu Star-Advertiser (via Yahoo News), reporting HCCDA Administrator Talmadge Magno (Hawai'i) · report, web page

<https://news.yahoo.com/10-big-island-tsunami-warning-132336065.html>

The only source giving Hawai'i County's siren inventory and failure rate: 92 sirens installed island-wide, 9 non-functional during an October 1 monthly test (~10%). Also states the maintenance split that applies statewide — the state Emergency Management Agency owns maintenance, repair, and replacement, while county workers handle only minor repairs such as battery replacement. Attributed directly to Civil Defense Administrator Talmadge Magno.

C-28 · 2024 · **2025–2030 MEMA Strategic Plan: "Always Preparing, Stronger Together: Building a Resilient Maui Nui"**

County · Maui Emergency Management Agency (MEMA) (Maui) · plan, 37

<https://www.mauicounty.gov/DocumentCenter/View/152876/MEMA-Strategic-Plan-2025-2030>

The only county strategic plan in Hawai'i explicitly restructured around post-Lahaina alerting lessons. States MEMA was funded for 15 positions with an opportunity for 7 more in FY25 (to 22). Goal 4 (Public Information, Alerts and Warning) contains Objective 4.4 on the public siren warning system with performance measures for both siren functionality and community awareness of what sirens mean, and Objective 4.5 introducing Genasys Evac for targeted location-based alerting. Sets the redundancy requirement across SMS, email, social media, sirens, radio, TV, and mobile apps.

F-15 · 2024 · **United States National Tsunami Hazard Mitigation Program Strategic Plan for 2024–2029**

Federal · NOAA / NWS on behalf of NTHMP (NOAA, FEMA, USGS and 28 coastal states and territories) · plan, 38

<https://www.weather.gov/media/nthmp/NTHMP-Strategic-Plan-2024-2029.pdf>

The current governing strategy for the grant program that funds Hawai'i's tsunami mapping, evacuation zones and outreach. It sets the four strategic themes (Hazard and Risk Assessment; Education and Preparedness; Mitigation and Recovery; Alert, Warning and Response), names NOAA as lead agency and Coordinating Committee chair, and identifies the "Financial Assistance for Tsunami Activities" grant mechanism as the channel through which congressionally appropriated funds reach the 28 state and territory partners. Mission and vision language quoted here is what state applications must map to.

H-13 · 2024 · **A great tsunami earthquake component of the 1957 Aleutian Islands earthquake**

Science & History · Y. Yamazaki, T. Lay, K. F. Cheung, R. Witter, S. La Selle, B. E. Jaffe — Earth and Planetary Science Letters · paper, 14

<https://doi.org/10.1016/j.epsl.2024.118691>

Resolves the 67-year-old 1957 puzzle and directly raises the Hawai'i design hazard.* Finds 12–26 m of shallow slip over a 600 km section of the *eastern Aleutians — a tsunami-earthquake component of Mw 8.3–8.6 embedded in an overall Mw 8.6–8.8 rupture spanning ~1,200 km. Only this eastern shallow slip explains the 6–12 m (20–40 ft) waves observed in Hawai'i, which prior

seismic-only models could not reproduce. This is the empirical proof that the eastern Aleutian segment — the segment aimed squarely at Hawai'i — slips shallowly and tsunamigenically.

H-14 · 2024 · Revisiting the 1957 Aleutian Earthquake: New Insights into Tsunami Hazards for Hawai'i

Science & History · U.S. Geological Survey, Pacific Coastal and Marine Science Center · report, 2

<https://www.usgs.gov/centers/pcmsc/news/revisiting-1957-aleutian-earthquake-new-insights-tsunami-hazards-hawaii>

The plain-language USGS explanation of H-13, useful as the citable agency statement that the eastern Aleutian slip "now accounts for the documented tsunami heights" in Hawai'i. Restates the 12–26 m slip / 600 km / Mw 8.6–8.8 numbers in a form suitable for a public compendium.

S-19 · 2024 · Hawai'i Revised Statutes Chapter 127A — Emergency Management (full chapter)

State · Hawai'i State Legislature · statute, web page (35 sections)

https://data.capitol.hawaii.gov/hrscurrent/Vol03_Ch0121-0200D/HRS0127A/HRS_0127A-.htm

The complete statutory architecture. Sections directly load-bearing for tsunami: 127A-3 (creates HI-EMA), 127A-5 (requires each county to have an emergency management agency), 127A-7 (State Warning Point), 127A-11 (on whom powers conferred and delegation), 127A-12/-13 (powers), 127A-14/-15 (state of emergency and proclamation service), 127A-16 Major Disaster Fund, 127A-18/-18.5 (mitigation and the Hazard Mitigation Special Fund), 127A-19 (shelters), 127A-20 (immunity for private shelter owners — the statutory basis making vertical evacuation into private hotels legally feasible), 127A-25 (rules and orders), and 127A-29/-30 (emergency-period offenses and price controls).

S-20 · 2024 · HRS § 127A-13 — Additional powers in an emergency period

State · Hawai'i State Legislature · statute, web page

<https://law.justia.com/codes/hawaii/title-10/chapter-127a/section-127a-13/>

The mandatory-evacuation authority. Subsection (a) confers twelve powers on the Governor only after a state of emergency is proclaimed, including (a)(7) to "direct and control the mandatory evacuation of the civilian population," plus authority to shut off water mains, gas mains and electric power connections, suspend laws impeding emergency functions, assume direct operational control, and regulate hoarding and rationing. Subsection (b) gives mayors five comparable county-level powers including mandatory evacuation. This is the hinge: without a proclamation there is no compulsory evacuation power in Hawai'i.

S-21 · 2024 · HRS § 127A-12 — Emergency management powers, in general

State · Hawai'i State Legislature · statute, web page

<https://law.justia.com/codes/hawaii/title-10/chapter-127a/section-127a-12/>

The everyday (no-proclamation-needed) power set, and the statutory basis for the siren system: the Governor and mayors may direct or control "alerts, warnings, notifications, activations, exercises, drills, and tests" and may control "any type of warning device, system, or method." Critically, evacuation power here is limited to directing and controlling the non-compulsory evacuation of the civilian population — mandatory evacuation requires 127A-13. Also authorizes control of the cessation of pedestrian and vehicular movement and restriction of public congregation in dangerous areas.

F-21 · 2024-07 · TsunamiReady® Program Recommendations

Federal · NTHMP Mitigation and Education Subcommittee (Tiger Team), for the National Weather Service · report, ~11 (core) plus 6 attachments

<https://www.weather.gov/media/nthmp/MES/NTHMP%20MES%20TsunamiReady%20Recommendations-final-July2024.pdf>

23 numbered recommendations in three categories (6 on guidelines and forms, 11 on NWS Directive 10-704, 8 general). The most consequential is the recommendation to state explicitly that baseline recognition "does not mean that a community has identified reasonable access to high-ground or safe refuge for all populations" — directly relevant to Hawai'i, where several recognized communities lack sufficient high ground. It also calls for maritime/ports-and-harbors guidelines, social-science research on whether recognition creates false security, and a full-time dedicated program manager.

S-09 · 2025-02 · HI-EOP SESF #8 — Public Health and Medical Services Annex

State · HI-EMA / Hawai'i Dept. of Health (DOH) · plan, ~6

<https://dod.hawaii.gov/hiema/files/2025/07/SESF-8-Public-Health-Medical-Services-FEB-2025.pdf>

Assigns DOH the specific post-tsunami tasks of testing air, potable water sources and near-shore waters for contamination and issuing warnings, and of issuing certified death records and disposition-of-body permits. Routes patient evacuation/relocation through the Hawai'i Healthcare Emergency Management (HHEM) coalition rather than direct state action. Records the constraint that statewide storage and mortuary capacity for fatalities is limited — the binding number for any mass-casualty tsunami scenario.

C-20 · 2025-03 · Hawai'i County Tsunami Evacuation Zone Lookup (interactive) UNVERIFIED

County · Hawai'i County Civil Defense Agency / Hawai'i County GIS (Hawai'i) · map, web page (application)

<https://hawaiicountygis.maps.arcgis.com/apps/instant/lookup/index.html?appid=d196b8925d534c1d9c4b0375110f5838>

The official Hawai'i Island zone-determination tool, named as such by HI-EMA and NWS/ITIC. Significant for a negative finding: NWS/ITIC's comparison table lists Maui, Kaua'i, and O'ahu as having two-tier (standard + extreme) evacuation mapping but does not attribute an extreme tier to Hawai'i County — so Hawai'i Island appears to operate a single-tier evacuation zone while the other three counties operate red/yellow. This should be confirmed directly with HCCDA.

S-30 · 2025-03 · Tsunami Safe Zones

State · Hawai'i Statewide GIS Program, OPSD · dataset, web page

<https://opendata.hawaii.gov/dataset/tsunami-safe-zones>

The least-known of the three zone products — an explicitly mapped safe (destination) zone rather than an evacuation zone, covering seven islands (Ni'ihau, Kaua'i, O'ahu, Kaho'olawe, Moloka'i, Lāna'i, Maui) and notably excluding Hawai'i Island. Created March 2025, it is the newest state tsunami map product and the only one that tells evacuees where to go rather than what to leave.

F-46 · C-54 · H-52 · 2025-04 · Hawai'i Tsunami Evacuation Zone Maps

Federal · NOAA / NWS International Tsunami Information Center · map, web page

https://www.weather.gov/itic-car/hawaii_tsunami_evacuation_zone_maps

The federal description of Hawai'i's two-tier evacuation zone system: Tier 1 standard zones based on historical events, and Tier 2 "Extreme" zones representing "a worst case, extreme, once in a thousand years tsunami event" with roughly 4–5 hours of evacuation time. It dates the modeling to 2010, names the eastern Aleutian Trench as "the most dangerous far-field tsunami to prepare for," and states that a magnitude 9.2 eastern Aleutian earthquake "would far exceed the flooding observed in Hawai'i from past historical tsunamis." Tier 2 maps exist for all four counties; interactive versions for O'ahu and Maui, PDF only for Kaua'i and Hawai'i County.

H-19 · 2025-04 · All Reported and Confirmed Locally Generated Tsunamis in the Hawaiian Islands (local-source event table)

Science & History · D. A. Walker, "Science of Tsunami Hazards" 17(2), p.77 (1999); reissued by UNESCO-IOC/NOAA International Tsunami Information Center, drawing on Lander & Lockridge (1989) and NCEI Global Historical Tsunami Database (March 2025) · catalog, 2

https://www.weather.gov/media/itic-car/hawaii_tsunamis/local_eq_causing_tsu_hawaii_20250403.pdf

The single most useful compact table for the local-source hazard, listing every confirmed Hawai'i-generated tsunami with magnitude, runup, and deaths: 1868-04-03 M7.5, 45 ft (13.7 m) Keauhou; 1908-09-21 M6.8, 4 ft Hilo, 0 deaths; 1919-10-02, 14 ft (4.3 m) Ho'opūloa; 1951-08-21 M6.9, 4 ft Ho'okena, 0; 1952-03-17 M4.5, 10 ft Kalapana, 0; 1975-11-29 M7.2, 47 ft (14.3 m) Keauhou, 2 deaths*; 1989-06-26 M6.5, 0.29 m Honu'apo, 0; 2006-10-15 M6.7, 0.1 m Kawaihae; 2018-05-04 M6.9, 0.4 m Kapoho, 0.

C-36 · 2025-04 · MEMA announces new evacuation planning and notification platform: Genasys Protect UNVERIFIED

County · Maui Emergency Management Agency (Maui) · procedure, web page

<https://www.mauicounty.gov/CivicAlerts.aspx?AID=16315>

The county's own announcement of the Genasys Protect zone-naming and real-time evacuation-status system, which is the current mechanism through which Maui issues zone-specific evacuation orders — a structurally different approach from the other three counties, which order evacuation by tsunami zone color rather than by named evacuation zone. Establishes the 1 May 2025 go-live and the multi-year Genasys contract for alerting plus AI traffic management.

C-22 · H-45 · 2025-04 · Tsunami Facts — Hawai'i Island (TsuFacts tri-fold, April 2025)

County · Hawai'i County Civil Defense Agency with NWS International Tsunami Information Center (ITIC) (Hawai'i) · public education, 2 (11x17 tri-fold)

https://www.weather.gov/media/itic-car/hawaii_information/TsuFacts_11x17_tri-fold_ITIC_Hawaii_FINAL_apr2025_20250428.pdf

The current Hawai'i County public-facing doctrine sheet. Contains the county-specific siren interpretation used on Hawai'i Island — "each ring equals 1 hour of tsunami travel time coming to Hawai'i" — a convention not used in Maui County's equivalent brochure. Directs evacuation "by foot or bicycle if at all possible," gives the vertical-evacuation fallback as 4th floor and higher of a concrete building, and prints the five-tier alert ladder (Information Statement / Watch / Advisory / Warning / Extreme Warning). Carries HCCDA contact (808) 935-0031 and civildefense@hawaiiicounty.gov, plus a 1819–2025 timeline of 24 tsunamis affecting Hawai'i.

C-29 · 2025-04 · Tsunami Facts — Maui County (TsuFacts tri-fold, April 2025)

County · Maui Emergency Management Agency with NWS/ITIC (Maui) · public education, 2 (11x17 tri-fold)

https://www.weather.gov/media/itic-car/hawaii_information/TsuFacts_11x17_tri-fold_ITIC_Maui_FINAL_apr2025_20250428.pdf

Maui County's siren doctrine differs materially from Hawai'i County's and Kaua'i's in this same brochure family: on Maui, sirens sounding means evacuation is necessary and "significant and widespread land flooding is expected" — not the "one ring per hour of travel time" convention used on Hawai'i Island and Kaua'i. Vertical evacuation threshold is stated as 4th floor or higher of a building at least 10 stories of reinforced concrete. Lists MEMA contacts (808) 270-7285 and Emergency.Management@mauicounty.gov, and prints the full five-tier alert ladder with the explicit zone mapping: Warning = evacuate red zones; Extreme Warning = evacuate yellow and red.

C-40 · 2025-04 · Tsunami Facts — Kaua'i County (TsuFacts tri-fold, April 2025)

County · Kaua'i Emergency Management Agency with NWS/ITIC (Kaua'i) · public education, 2 (11x17 tri-fold)

https://www.weather.gov/media/itic-car/hawaii_information/TsuFacts_11x17_tri-fold_ITIC_Kauai_FINAL_apr2025_20250428.pdf

The current Kaua'i edition, updated with a 1819–2025 map showing 33 tsunamis affecting Hawai'i — a higher count than the Hawai'i Island edition's 24, reflecting different inclusion criteria between county brochures in the same series. Uses the Hawai'i Island-style siren convention ("each ring equals 1 hour of tsunami travel time"), unlike Maui's. Includes a detailed inset evacuation map for the Wailua-to-Kealia corridor; notably does not carry a Hanalei or north-shore inset despite the north shore being the county's most constrained evacuation area.

C-10 · 2025-05 · City and County of Honolulu 2025 Local Hazard Mitigation Plan — Executive Summary

County · City and County of Honolulu DEM (Honolulu) · plan, ~30

<https://www.honolulu.gov/dem/wp-content/uploads/sites/64/2025/06/Executive-Summary.pdf>

Establishes the plan's legal standing (adopted July 2025, valid through 1 July 2030) and the 20-hazard scope within which tsunami is ranked, plus the mitigation-strategy framing that governs which tsunami actions are fundable under FEMA HMA programs. Needed to cite Chapter 17's numbers with their governing adoption date and hazard-ranking context.

C-53 · 2025-05 · Tsunami Vertical Evacuation Guidance

County · NOAA NWS International Tsunami Information Center (ITIC) · guideline, web page

https://www.weather.gov/itic-car/vertical_evacuation_guidance

The technical basis behind the counties' "4th floor of a 10-story building" rule. States that all Hawai'i counties adopted by reference IBC section 1615, Tsunami Loads and Effects, effective 13 November 2018 — the single most important county-level building code fact for vertical evacuation. Gives ITIC's structural criteria: reinforced or steel-reinforced concrete, at least 2 stories above expected inundation depth, earthquake-resistant, minimum 1 m² per evacuee, designed for 12–24 hours of short-term protection, ASCE/SEI 7-16 tsunami load compliance. Explains Honolulu's specific rationale: "more than 50,000 tourists ... crammed into a three square mile area that has just 4 evacuation routes inland." Links FEMA P-646 Third Edition at https://www.weather.gov/media/itic-car/vertical_evac/FEMAP646_ThirdEdition_508.pdf.

C-01 • 2025 • **Tsunami (O'ahu hazard guidance page)**

County • City and County of Honolulu, Department of Emergency Management (DEM) (Honolulu) • guideline, web page
<https://www.honolulu.gov/dem/tsunami/>

This is the only official O'ahu page that states the activation criterion for the Extreme Tsunami Evacuation Zone (XTEZ) in plain terms: "If an earthquake happens in the Eastern Aleutian Islands with a magnitude 9.0 or greater, it will cause a rare, more extreme tsunami event." It defines the standard TEZ as based on historical impacts over the past 100 years (red) versus the XTEZ (yellow), and gives the operative vertical-evacuation rule — "proceed to the fourth floor or higher of a building that is 10 stories or taller." It also states the safe-condition test differs by zone: TEZ evacuees are safe on reaching yellow OR green; XTEZ evacuees must reach green.

C-04 • 2025 • **O'ahu Tsunami Evacuation Zones (interactive address-lookup web map)**

County • City and County of Honolulu DEM / CCH GIS (Honolulu) • map, web page (application)
<https://cchnl.maps.arcgis.com/apps/webappviewer/index.html?id=39a9e07068a14d01a85b437adcf50beb>

The authoritative parcel-level zone-determination tool for O'ahu, cited as the official O'ahu source by both HI-EMA and NWS/ITIC. It renders both the standard and extreme zones as separate toggleable layers, which is how a resident or hotel operator resolves an ambiguous address. It is the only O'ahu resource where the two tiers can be queried against a specific street address rather than read off a static sheet.

C-06 • 2025 • **HNL Alert (O'ahu mass notification system)**

County • City and County of Honolulu DEM (Honolulu) • procedure, web page
<https://www.honolulu.gov/dem/hnl-alert/>

Documents O'ahu's opt-in mass-notification architecture: full registration at hnlalert.gov for topic-selectable alerts, or zero-registration SMS-only enrollment by texting "HNLALERT" to 888777. Delivery is by SMS, email, and push through the Public Safety by Everbridge app. Explicitly positions HNL Alert as a complement to WEA, sirens, and broadcast interrupt — offering persistent messages with images and links, which sirens and WEA cannot carry. Names the current DEM Director (Dr. Randal A. Collins, CEM) and the DEM address at 650 South King Street, Basement.

C-07 • 2025 • **Get Alerts / Stay Informed (O'ahu alert and warning channels)**

County • City and County of Honolulu DEM (Honolulu) • public education, web page
<https://www.honolulu.gov/dem/stay-informed/>

Gives the O'ahu monthly test timing that differs from the generic statewide description — sirens and EAS are tested on the first business day of each month at 11:45 a.m. Defines what the O'ahu steady siren tone actually instructs ("tune into local radio, TV or other official online media" — not "evacuate"), enumerates the four WEA categories including local evacuation/shelter orders, and lists the official DEM social channels (@Oahu_DEM) used as the confirming source during warnings.

C-08 • 2025 • **Emergency Shelters (O'ahu tsunami assembly areas vs. hurricane refuge areas)**

County • City and County of Honolulu DEM (Honolulu) • procedure, web page
<https://www.honolulu.gov/dem/shelter/>

The single clearest statement of O'ahu's doctrinal split — for tsunami, the county opens assembly areas (outdoor parking lots or fields, minimal staffing, no services, bathrooms only if available), active only while the warning is in effect; for hurricane, it

opens Hurricane Refuge Areas (pre-engineered buildings, hours to days). Rationale given for the tsunami approach: "unsafe areas are known in advance." Also states all locations are pet-friendly with leash/carrier requirement and that refuge buildings "HAVE NOT been designed or hardened for hurricane conditions." This is the county difference that matters most: Honolulu opens parking lots for tsunami while Kaua'i, Maui, and Hawai'i County open school gyms and community centers.

C-19 · 2025 · **Hawai'i County Civil Defense Agency — Alerts**

County · Hawai'i County Civil Defense Agency (HCCDA) (Hawai'i) · procedure, web page

<https://hawaii-county-civil-defense-agency-hawaii-countygis.hub.arcgis.com/pages/alerts>

Documents Hawai'i County's opt-in enrollment keyword — text HAWAIIALERTS to 888777 (distinct from O'ahu's HNLALERT) — and confirms the county runs Civil Defense Alerts and separate Hawai'i Police Department alerts on the same platform. Uniquely publishes the full voluntary broadcast-partner list for Civil Defense messages: AM 670 plus 15 named FM frequencies (92.7, 93.1, 94.7, 95.9, 96.1, 97.1, 97.9, 98.5, 99.1, 100.3, 101.5, 102.7, 105.3, 106.9, 107.7). States the county's siren doctrine explicitly: a siren tone means go to radio/TV/mobile for the message, not evacuate on the tone alone.

C-24 · 2025 · **County of Hawai'i 2025 Hazard Mitigation Plan (update of the 2020 MHMP)**

County · Hawai'i County Civil Defense Agency, prepared by Tetra Tech (Hawai'i) · plan, web page (portal to the plan)

<https://hawaii-county-civil-defense-agency-hawaii-countygis.hub.arcgis.com/pages/mhmp>

Confirms the existence, authorship, and scope of the current Hawai'i County plan: prepared by Tetra Tech, led by HCCDA, with over 25 stakeholder organizations participating. This is the current governing mitigation document for Hawai'i Island tsunami risk and supersedes the 2020 draft. Direct chapter PDFs are not exposed on the hub page.

C-39 · 2025 · **Tsunami Facts: Frequently Asked Questions — Important Information You Need to Know (Kaua'i)**

County · Kaua'i Emergency Management Agency (KEMA) with NWS/ITIC (Kaua'i) · public education, 1

https://www.kauai.gov/files/assets/public/v/1/emergency-management/documents/tsufacts_11x17_2-fold-itic_kauai_nonbr_final.pdf

Contains a numeric threshold present in no other county document reviewed: for an Extreme Tsunami Warning it states a 3.5-hour window may be available. Also gives the Kaua'i-specific vertical-evacuation formulation (reinforced concrete buildings of 10+ stories, 4th floor or higher) alongside the recommendation to walk or bike rather than drive, and the three natural warning signs (severe shaking, unusual ocean behavior, roaring sound).

C-52 · 2025 · **Hawai'i Tsunami Information (ITIC county resource hub)**

County · NOAA NWS International Tsunami Information Center · public education, web page

<https://weather.gov/itic-car/hawaii>

The single index tying each county emergency management agency to its current public brochure and to its county tsunami runup observation map — a set that exists nowhere else: Kaua'i (Kauai_2013_11x17.pdf), O'ahu (Oahu_2013_11x17.pdf), Maui (Maui_2013_11x17.pdf), Moloka'i & Lāna'i (MolokaiLanaiRunup_apr17.pdf — the only dedicated Moloka'i/Lāna'i tsunami product found in this research), and Hawai'i Island (Hawaii_2013_11x17.pdf). Also indexes multilingual 2022 translations of the county brochures.

F-49 · 2025 · **Volcano Watch — Distant versus local earthquakes and tsunami response times in Hawaii**

Federal · U.S. Geological Survey Hawaiian Volcano Observatory · report, web page

<https://www.usgs.gov/observatories/hvo/news/volcano-watch-distant-versus-local-earthquakes-and-tsunami-response-times>

Gives the two timing regimes in concrete numbers. Distant: for the 29 July 2025 Kamchatka earthquake, PTWC issued the warning 1 hour 19 minutes after detection, with waves arriving just after 7:00 p.m. HST and a maximum measurement of 1.7 meters (5.7 feet) at Kahului, Maui. Local: "a tsunami generated from the south flank of the Island of Hawai'i can wrap around and reach Hilo Bay 4–5 minutes after the earthquake" — faster than any warning can be issued. It cites the 1975 M7.2 Kilauea

event with maximum run-up around 14 meters and the 2018 M6.9 event, and states residents should not wait for sirens or phone alerts when strong shaking occurs.

H-15 · 2025 · A 700-year rupture sequence of great eastern Aleutian earthquakes from tsunami modeling of stratigraphic records

Science & History · Y. Yamazaki, K. F. Cheung, T. Lay, S. La Selle, R. C. Witter, B. E. Jaffe — Nature Communications · paper, 14

<https://www.nature.com/articles/s41467-025-57802-w>

The recurrence backbone for Hawai'i PTHA. Models stratigraphic tsunami deposits to identify three eastern Aleutian ruptures — 18th century (Mw ~8.4), 15th century (Mw ~7.9), 14th century (Mw ~8.7) — giving ~200–300 year intervals over 700 years. Critically for Hawai'i: the 14th-century event could have exceeded the inundation of the 1957 tsunami, and the modeled waves crossed >3,910 km of Pacific. This is the strongest published argument that Hawai'i's historical record alone understates the hazard.

H-30 · 2025 · NOAA Center for Tsunami Research — July 29, 2025 Kamchatka Tsunami

Science & History · NOAA/PMEL Center for Tsunami Research · dataset, 5

<https://nctr.pmel.noaa.gov/kamchatka20250729/>

The source-inversion record for the most recent statewide Hawai'i evacuation. Mw 8.8 at 52.512°N, 160.324°E, 2025-07-29 23:24:52 UTC; over 100 Mw 5+ aftershocks within two days, five exceeding Mw 6. DART observations: 21416 peak 0.85 m at ~35 min — the second-largest DART amplitude ever recorded, exceeded only by the 1.9 m from 2011 Japan*; 21419 31 cm at ~1 hr; 21415 25 cm at ~1 hr. Final tsunami source modeled as Mw 8.7-equivalent over a 500 × 150 km rupture south of the epicenter, propagated globally with MOST from a three-DART inversion, including model estimates of inundation at selected Hawai'i locations.

H-31 · 2025 · 2025 July 29, Kamchatka Tsunami Event — DART and tide gauge data summary

Science & History · NOAA National Centers for Environmental Information · dataset, 3

<https://www.ncei.noaa.gov/products/natural-hazards/tsunamis-earthquakes-volcanoes/tsunamis/recent-significant-events/kamchatka-jul-2025-tsunami-dart-summary>

The archived water-level data package for the 2025 event: 25 DART buoys across the Pacific with raw observations, fitted tidal components and residuals at 15-minute, 1-minute and 15-second intervals, plus the four Hawai'i tide-gauge series — Nāwiliwili, Kahului Harbor, Honolulu, and Hilo Bay — with plots and downloadable data. This is where the actual Hawai'i observed amplitudes for 2025 live.

H-60 · 2025 · Hawai'i Maximum Tsunami Runups (1900–2025) and Tsunami Deaths and Damage (1812–2022) — statewide summary graphics

Science & History · UNESCO/IOC-NOAA International Tsunami Information Center · public education, 1 each

https://www.weather.gov/images/itic-car/hawaii_information/Hawaii_MaxTsunamiRunups_1900-2025.jpg

The two single-image reference charts ITIC maintains for Hawai'i: the maximum-runup-by-location plot spanning 1900–2025 (including the 2025 Kamchatka event), and the deaths-and-damage series for every Hawai'i tsunami since 1812 causing over \$500,000 in losses. Also on the same ITIC index: county-level historical run-up observation maps (Kaua'i, O'ahu, Maui, Moloka'i & Lāna'i, Hawai'i Island, all 2013) and the Distribution of Tsunamis affecting Hawai'i (1812–2025) source-frequency chart.

C-09 · 2025-07 · City and County of Honolulu 2025 Local Hazard Mitigation Plan — Chapter 17: Tsunami

County · City and County of Honolulu DEM (Honolulu) · plan, 33 (pp. 17-1 to 17-33)

<https://www.honolulu.gov/dem/wp-content/uploads/sites/64/2025/07/Chapter-17.pdf>

The richest quantitative tsunami source for any Hawai'i county. Standard tsunami inundation area: 40,026 residents (4.0%) and 10,186 buildings worth \$20.4B; extreme inundation area: 149,936 residents (14.8%) and 36,967 buildings worth \$72.2B. Evacuation-zone counts differ from inundation counts (TEZ 69,483 / 6.9%; XTEZ 121,659 / 12.0%). Critical facilities: 321 in standard, 883 in extreme (incl. 125 health/medical and 57 energy in extreme). Debris estimates 8,474 tons standard vs. 300,630 tons extreme. Historic runups: 11.3 m Makapu'u and 10.9 m Ka'ena Point in 1946; 9.1 m Ka'ena 1957; 5.2 m Camp Erdman 2011.

Costs: 2011 Tōhoku \$3.4M to the City plus \$1M Ke'ehi and \$300K Hale'iwa small boat harbors; 2022 Hunga Tonga \$3.32M. Record of 111 tsunamis measured on O'ahu 1819–2025 (107 distant, 4 local), 8 with deaths or damage. Warning time 4.5 hrs from Alaska, 14–15 hrs from Chile, 30–60 min local. New development 2020–present: 406 units in the extreme zone, with Ko'olau Loa at 75.0% of new development in the extreme zone.

C-11 · 2025-07 · **Local Hazard Mitigation Plan (LHMP) landing page and chapter index**

County · City and County of Honolulu DEM (Honolulu) · plan, web page

<https://www.honolulu.gov/dem/lhmp/>

The authoritative index tying each LHMP chapter number to its PDF URL — Ch. 4 Risk Assessment, Ch. 5 Hazard Identification, Ch. 6 Climate Change & Sea Level Rise, Ch. 17 Tsunami, Ch. 23 Mitigation Strategy. Ch. 6 matters for a tsunami compendium because sea-level-rise projections are the input that shifts future inundation extents beyond the current mapped zones.

C-34 · 2025-07 · **Maui County evacuations issued at 3:22 p.m. as NWS upgrades to Tsunami Warning for Hawai'i (MEMA press release)**

County · Maui Emergency Management Agency (Maui) · report, web page

<https://www.mauicounty.gov/CivicAlerts.aspx?AID=17621>

The primary-source timeline for Maui County's 2025 activation, with times found nowhere else: MEMA full activation at 2:30 p.m., NWS Tsunami Warning at 2:45 p.m., MEMA-issued evacuations at 3:22 p.m., first wave expected 7:17 p.m. Establishes the authority chain in the county's own words — "Maui Emergency Management Agency (MEMA) ... issued evacuations via sirens, Emergency Alert System, Wireless Emergency Alert," i.e., MEMA itself is the evacuation-ordering body on Maui, not the mayor. Notably, the release directs the public to NOAA's national viewer for zone lookup rather than to county maps.

C-58 · 2025-07 · **Tsunami warning: Here's where emergency shelters are open and roads are closed**

County · Hawai'i Public Radio · report, web page

<https://www.hawaiipublicradio.org/local-news/2025-07-29/tsunami-warning-heres-where-emergency-shelters-are-open-across-the-islands>

The only consolidated county-by-county roster of what actually opened on 29 July 2025, and it exposes the doctrinal difference cleanly. Honolulu opened 16 "Tsunami Assembly Areas" — McKinley High, Hāhā'ione Valley Neighborhood Park, Waimānalo District Park, Niu Valley Middle, plus twelve district parks and community facilities — plus three Fort Weaver Rd makai-bound closures. Kaua'i opened 9 shelters and closed 10 bridge/intersection points. Maui opened 7 shelters (Moloka'i High, Kihei Community Center, Velma McWayne Santos Center, Lahainaluna High, Hāna High, Mayor Hannibal Tavares Community Center) with Maui Police Department announcing closures of all Kahului Beach Road access points. Hawai'i County opened 10 (Ka'ū District Gym, Kea'au Armory, Kealahou High Gym, Nā'ālehu Community Center, Pāhoa Neighborhood Facility, Panaewa Park, Pu'ueo Community Center, Waimea Community Center, Waikoloa Elementary, Yano Hall). Note that Honolulu's are parking-lot assembly areas while the other three counties opened staffed indoor facilities.

C-59 · 2025-07 · **Hawai'i Tsunami Warning: Here's How The Islands Fared**

County · Honolulu Civil Beat · report, web page

<https://www.civilbeat.org/2025/07/hawai%CA%BBi-evacuates-coastal-areas-amid-tsunami-warning/>

The best single cross-county operational narrative of the Kamchatka event, with observed wave data by island: Kahului 5.7 ft amplitude above normal sea level (highest in the state), Hilo 4.9 ft, Hale'iwa 4.0 ft (~11 ft crest-to-trough at all three), Hanalei 3.0 ft. Records tactics unique to each county: Hawai'i County blocked downtown Hilo entrances, flew helicopters with loudspeakers over beaches, hiked a crew into Waipi'o Valley, and evacuated Keaukaha residents across the Hilo airport runway with the airport closed; Maui County evacuated the Maui Beach Hotel door-to-door and proactively closed water valves in Wailuku, Kahului and Lahaina and shut wastewater pump stations; O'ahu opened Asian Pacific International School in Hau'ula for 600–700 vehicles, stopped bus service at 6 p.m., and hit gridlock by 3:30 p.m.; Kaua'i blocked Hanalei to vehicular entry as the highest-risk coastal town. Names Mayor Kimo Alameda leading the Hawai'i County response.

C-49 · 2025-07 · **Tsunami Warning triggered mass evacuation on Kaua'i, resulting in some gridlock, visitor confusion**

County · Kauai Now (Kaua'i) · report, web page

<https://kauainownews.com/2025/07/30/tsunami-warning-triggered-mass-evacuation-on-kaua%CA%BBi-resulting-in-some-gridlock-visitor-confusion/>

The most complete Kaua'i timeline with counts: PTWC watch 1:25 p.m., warning 2:44 p.m., KEMA evacuation notices 3:00 p.m., sirens 3:25 p.m., Hanalei Bridge westbound closed before 4:00 p.m., nine refuge areas opened 4:15 p.m., coastal roads and 11 bridges closed 6:10 p.m., all-clear 11:15 p.m.. Refuge areas took approximately 1,800 people, with about 150 staying overnight — the only per-county occupancy figures located for the event. Carries KEMA Administrator Elton Ushio's statement and the commitment to post-incident review. Documents that visitors in vacation rentals (as opposed to hotels) were the group least able to find evacuation guidance.

C-61 · 2025-07 · **Tsunami warning: first wave expected to hit state at 7:10 p.m. (Maui County response, incl. Moloka'i and Lāna'i)**

County · Maui Now (Maui) · report, web page

<https://mauinow.com/2025/07/30/tsunami-warning-first-wave-expected-to-hit-state-at-710-p-m-governor-warns-of-significant-damage-on-coast/>

Records the three statewide siren activations at 5:10 p.m., 6:10 p.m., and 6:40 p.m. — the actual siren cadence used, which no county document states. Documents that MEMA lifted evacuation orders after 11 p.m. when NWS downgraded to advisory, and gives the Kahului Harbor observation of water receding approximately 15 feet around 8 p.m. Contains the only Moloka'i/Lāna'i operational detail found: Kalaupapa Airport staff prepared to evacuate to the lighthouse and water service was shut down in Moloka'i coastal areas. Maui Bus ended operations by 6:30 p.m.

C-17 · 2025-08 · **Tsunami Warning Revealed Gaps in Hawaii Evacuation Plans**

County · Government Technology / Emergency Management (Honolulu) · report, web page

<https://www.govtech.com/em/preparedness/tsunami-warning-revealed-gaps-in-hawaii-evacuation-plans>

Records the measured O'ahu evacuation travel times of 29 July 2025: Hawai'i Kai to Pearl City over 2 hours; Ala Moana to Kalihi 90 minutes with minimal movement; typical commutes 1.5–3 hours. Documents that the military opened Kulekole Pass as an emergency route and that it took roughly 400 vehicles before closing — the only quantified figure on that bypass. Names single-egress communities (Lanikai, East Honolulu, Windward O'ahu) as the structural constraint, and carries HDOT Director Ed Sniffen's revised doctrine: "Next time ... if you're safe, stay there."

C-30 · 2025-08 · **County of Maui, Hawai'i 2025 Hazard Mitigation Plan**

County · Maui Emergency Management Agency (Maui) · plan, 400+

<https://www.mauicounty.gov/DocumentCenter/View/155657/2025-County-of-Maui-Hazard-Mitigation-Plan>

Uniquely assesses three separate tsunami inundation scenarios by recurrence interval — SOEST (400-year), GAT (1,500-year), and ASCE (3,500-year) — rather than the two-tier red/yellow framing used operationally. Finds 29.5% of the county's critical infrastructure and community lifeline facilities sit in tsunami inundation zones, and that more than 20% of Maui County residents live in tsunami-vulnerable areas — the highest proportional population exposure of any Hawai'i county. Rates tsunami as a "Low" overall hazard despite that exposure, a ranking judgment that differs from Honolulu's treatment. Covers Maui, Moloka'i, and Lāna'i in one countywide analysis.

C-16 · 2025-08 · **Tuesday's tsunami warning confirms 2022 research on gridlock, vertical evacuations**

County · Hawaii News Now (reporting University of Hawai'i Dept. of Urban and Regional Planning research by Farnaz Kaviari et al.) (Honolulu) · report, web page

<https://www.hawaiinewsnow.com/2025/08/02/tuesdays-tsunami-warning-confirms-2022-research-gridlock-vertical-evacuations/>

Only accessible account of the UH agent-based Waikīkī evacuation model: 18,000 residents plus ~29,000 hotel-room occupants, 30 minutes of warning. Modeled outcomes — car evacuation produces ~40% fatality among vehicle evacuees (~11,000 deaths);

vertical evacuation clears all evacuees to safety within 22 minutes; bicycle evacuation yields a 0.02% fatality rate. Includes City Transportation Director Roger Morton's resulting messaging position: "if you're in a safe place, stay there." This is the quantitative basis for the county's post-2025 pivot to vertical evacuation.

H-32 · S-47 · 2025-08 · Tsunami warning puts focus on Waikīkī evacuation plan modeled by UH

Science & History · University of Hawai'i System News (reporting research by Karl Kim and Farnaz Kaviari, UH Dept. of Urban and Regional Planning) · report, 3

<https://www.hawaii.edu/news/2025/08/04/tsunami-evacuation-plan-waikiki/>

Ties the 2025 evacuation directly to modeled casualty numbers — the most alarming quantitative claim in the Hawai'i evacuation literature. Simulating pedestrian, bicycle and vehicle evacuation of Waikīkī under a catastrophic scenario: 38,760 projected deaths with no improvements; vertical evacuation could save over 55,000 lives; a proposed Ala Wai Canal bridge ~13,860 lives; improving warning lead time from 10 to 5 minutes over 4,500 lives**; bridge plus faster alerts reduces the fatality rate to roughly 20%. Also records that the July 29, 2025 M8.8 Kamchatka alert produced mass evacuation from Waikīkī with significant congestion on evacuation routes.

C-35 · 2025-08 · Evacuation maps, new leadership, more staffing mark changes at Maui Emergency Management Agency after fires

County · Maui Now (Maui) · report, web page

<https://mauinow.com/2025/08/05/evacuation-maps-new-leadership-more-staffing-mark-changes-at-maui-emergency-management-agency-after-fires/>

The clearest account of Maui's post-Lahaina alerting doctrine change and its tsunami implications. Records the siren policy shift: sirens now activate based on communication disruption (e.g., cell service failure) rather than on hazard type, with Administrator Amos Lonokailua-Hewett's rationale — "the siren is a sound — it doesn't provide a message." Genasys Protect launched 1 May 2025 with predetermined evacuation zones all modeled to clear in 30 minutes or less, plus Ladris AI traffic modeling prioritized to Lahaina and Pā'ia. Staffing nearly tripled from 9 to 25 employees (3 more from 1 Oct 2026); Lonokailua-Hewett took over January 2024 after Herman Andaya's resignation. Critically states that during the July 2025 tsunami warning, the state Emergency Management Agency controlled siren activation — the single most important authority distinction found in this research.

S-40 · 2025-08 · Lessons Learned and Evacuation Takeaways — July 29 Kamchatka Tsunami Warning (House Informational Briefing)

State · Hawai'i Dept. of Transportation (HDOT) · report, ~15 (slide deck)

<https://hidot.hawaii.gov/wp-content/uploads/2025/08/House-Informational-Briefing-Aug-28-2025-2.pdf>

The only minute-by-minute official state timeline of a real Hawai'i tsunami evacuation. Tsunami Watch 1:25 p.m.; Tsunami Warning 2:43 p.m.; government employees released 2:56 p.m.; Kolekole Pass opened for evacuation 3:15 p.m.; Nānākuli contraflow shutdown directed 3:30 p.m.; Likelike townbound (Wilson Tunnel) reopened 3:30 p.m.; tsunami warnings posted on freeway variable message signs 3:42 p.m.; all evacuation-zone roads confirmed clear 7:00 p.m.; estimated first wave 7:17 p.m. — a 17-minute margin. Seven JIC/social updates between 4:00 p.m. and 7:30 a.m. Identifies gaps in public understanding of Watch vs. Advisory vs. Warning and commits to a Hawaii Tsunami Traffic Mitigation Plan targeted for November 2025.

C-02 · 2025-09 · Tsunami Map Resources (O'ahu evacuation map book index — 43 regional map sheets)

County · City and County of Honolulu DEM (Honolulu) · map, web page indexing 43 PDF sheets

<https://www.honolulu.gov/dem/tsunamimaps/>

The only complete, itemized index of O'ahu's tsunami evacuation map book, broken into four regions with 43 named inset sheets (Windward 14, South Shore 13, Leeward 7, North Shore 9), each a separate PDF with a stable honolulu.gov URL. This is the operational map-book structure a compendium would need to reference sheet-by-sheet (e.g., "Waikiki-map-1", "Pearl-Harbor-map20_inset1"). No other source lists O'ahu's sheet-level map inventory.

H-10 · 2025-09 · **The 4 November 1952 Kamchatka Tsunami (event overview factsheet)**

Science & History · International Tsunami Information Center / UNESCO-IOC · public education, 4

<https://tsunami.ioc.unesco.org/sites/default/files/medias/fichiers/2025/09/1952.pdf>

Puts Hawai'i's 1952 experience in Pacific-wide context with matched numbers: Mw 9.0 source; runup 18.4 m on Paramushir, 15 m at Severo-Kurilsk, 13 m at Olga Bay (travel time ~42 min); 6.1 m on the Island of Hawai'i and 4.5 m on the O'ahu north shore; 1.4 m in Alaska/California, 1 m in New Zealand. Damage in the Hawaiian Islands \$800,000–\$1,000,000 (1952 dollars) with no deaths — the demonstration case that warning + evacuation converts a lethal event into a property-loss event.

H-12 · 2025-09 · **The 9 March 1957 Aleutian Islands Tsunami (event overview factsheet)**

Science & History · International Tsunami Information Center / UNESCO-IOC · public education, 4

<https://tsunami.ioc.unesco.org/sites/default/files/medias/fichiers/2025/09/1957.pdf>

The compact quantitative record for 1957 in Hawai'i: Mw 8.3 south of the Andreanof Islands; 16 m runup on Kaua'i near Hā'ena point, 3.9 m at Hilo, 2–3 m average elsewhere; Coconut Island covered by 1 m of water and its footbridge destroyed. No lives lost. Approximately \$5 million (1957 dollars) damage in Hawai'i — bridges destroyed, highways flooded, houses washed away. Includes a one-hour-per-contour travel-time chart from the Aleutian source.

S-05 · 2025-09 · **HI-EOP State Emergency Support Function #1 — Transportation Annex**

State · HI-EMA / Hawai'i Dept. of Transportation (HDOT) · plan, ~20

<https://dod.hawaii.gov/hiema/files/2025/10/HI-EOP-SESF-1-Annex-September-2025-part-1-signed.pdf>

Establishes HDOT as Primary Agency with the authority to close state airports, roadways, bridges and tunnels, and to close commercial harbors — the statutory-operational link between HI-EMA and the three HDOT divisions. Divides responsibility explicitly by mode (Highways signage/barricades and damage assessment; Harbors closure and USCG-coordinated port restoration; Airports closure orders and evacuation support). Notably does not contain contraflow procedures — that gap is what the November 2025 Tsunami Traffic Mitigation Plan (S-40) was created to fill.

C-13 · 2025-09 · **Revised Charter of the City and County of Honolulu 1973 (Amended 2017 Edition) — Article VI, Chapter 19, Department of Emergency Management (§§ 6-1901 to 6-1904)**

County · City and County of Honolulu, Office of the City Clerk / Corporation Counsel (Honolulu) · ordinance, ~150

<https://www.honolulu.gov/cor/wp-content/uploads/sites/17/2025/09/Charter-FINAL-9-11-25.pdf>

The constitutive authority for O'ahu emergency management. Establishes DEM under the executive branch (§6-1901), sets the director's qualification requirement in emergency management/disaster response (§6-1902), assigns powers/duties/functions (§6-1903), and — uniquely among the four counties — creates a Citizens Advisory Commission on Emergency Management (§6-1904). The charter also records that an earlier department was repealed and functions re-established under Chapter 19. No other county charter creates a standing citizens' advisory commission on emergency management.

S-08 · 2025-09 · **HI-EOP SESF #6 — Mass Care, Emergency Assistance, Housing and Human Services Annex**

State · HI-EMA / Dept. of Human Services · plan, 14

https://dod.hawaii.gov/hiema/files/2025/10/SESF6-Annex_30SEP25.pdf

States flatly that "the state is not a shelter provider" — counties and the American Red Cross open and run shelters, the state only coordinates resources on county request. This is the decisive authority answer for tsunami refuge areas. Gives the state planning factor that 11%–35% of residents may need emergency shelter, feeding and sanitation after a disaster, plus ADA/access-and-functional-needs and pet/service-animal shelter requirements.

S-27 · 2025-11 · **Extreme Tsunami Evacuation Zones (statewide GIS layer, Hazards MapServer ID 12)**

State · Hawai'i Statewide GIS Program, OPSD · dataset, web page

<https://geodata.hawaii.gov/arcgis/rest/services/Hazards/MapServer/12>

The authoritative machine-readable extreme/yellow zone. Documents per-island provenance and currency exactly: Hawai'i Island from County of Hawai'i March 2025 with corrections applied November 2025; O'ahu from City and County of Honolulu

April 2025; Moloka'i, Lāna'i and Maui from County of Maui 2013 (i.e., Maui County's extreme zone has not been refreshed in over a decade); Kaua'i from County of Kaua'i March 2025. Field schema: Island, Zone_Type, Zone_Desc, Zone_Code, Tsu_Evac, Evac_Zone plus area/perimeter. Hub/download page: <https://geoportal.hawaii.gov/datasets/extreme-tsunami-evacuation-zones>

S-28 · 2025-11 · **Tsunami Evacuation Zones (statewide GIS layer, Hazards MapServer ID 2)**

State · Hawai'i Statewide GIS Program, OPSD · dataset, web page

<https://geodata.hawaii.gov/arcgis/rest/services/Hazards/MapServer/2>

The standard (red) evacuation zone as an authoritative statewide layer, covering all eight islands including Ni'ihau and Kaho'olawe, with the same per-island provenance/date stamps as S-27. Open-data mirror with CSV/Shapefile/GeoJSON/KML/WFS/WMS distributions and "No License Provided" terms: <https://opendata.hawaii.gov/dataset/tsunami-evacuation-zones1>

S-29 · 2025-11 · **Tsunami Evacuation — All Zones (combined layer, Hazards MapServer ID 11)**

State · Hawai'i Statewide GIS Program, OPSD · dataset, web page

<https://geodata.hawaii.gov/arcgis/rest/services/Hazards/MapServer/11>

The single layer in which all three state zone classes coexist and are formally enumerated as a controlled vocabulary — Tsunami Evacuation Zone, Extreme Tsunami Evacuation Zone, and Tsunami Safe Zone — with distinct cartographic symbology (backward-diagonal, vertical, and square-marker fills) and 13 fields. This is the definitive state answer to "how many tsunami zone classes are there and what are they called."

C-50 · **H-53** · **S-25** · 2025-11 · **Tsunami and Extreme Tsunami Evacuation Zone Maps – Cautions and Additional Information**

County · Hawai'i Statewide GIS Program, Office of Planning and Sustainable Development, State of Hawai'i · guideline, ~3

<https://files.hawaii.gov/dbedt/op/gis/data/tsunevac.pdf>

The definitive provenance record for who made each county's zones and when — Kaua'i April 2025 (updated scientific techniques, in coordination with county officials); O'ahu April 2025 (based on peer review of UH researchers' inundation models plus responder operational input); Maui County August 2013 (via Pacific Disaster Center — twelve years older than the others); Hawai'i County March 2025, with corrections applied 20 November 2025 after the State layer was found to be inaccurate; Ni'ihau October 2016 from NOAA. Also states the standing legal caution that "the evacuation zone is a guideline and should be considered the minimum safe evacuation distance" and that the maps "do not consider the destructive effects of a locally generated tsunami." The Maui 2013 vintage and the Hawai'i County data error are both findings available only here.

S-02 · 2026-02 · **State of Hawai'i Emergency Operations Plan (HI-EOP): Base Plan**

State · HI-EMA · plan, ~200

<https://dod.hawaii.gov/hiema/files/2026/03/HI-EOP-Base-Plan-Final-Signed.pdf>

Current signed base plan (Approval #5, Gov. Green / MG Logan / Administrator Barros). Its Record of Changes is the only place the evolution of HI-EMA activation levels is documented by number and date — Change #23 (2/28/22), #41 (5/31/23), and #54 (6/5/2025) each revised the activation table; Change #7 folded coordinating-agency duties into Primary Agencies and the "SEOC Manager" position was deleted. Carries the state's planning-assumption numbers: 90% of food and 100% of fuel imported, 5–7 days of food on hand, 5–8 days for West Coast cargo, and the statement that all seaports and most major airports sit inside tsunami/hurricane inundation zones.

S-17 · 2026-03 · **NEWS RELEASE: Monthly Siren and Emergency Alert System Test for April 2026**

State · HI-EMA · procedure, web page

<https://dod.hawaii.gov/hiema/news-release-monthly-siren-and-emergency-alert-system-test-for-april-2026/>

Fixes the standing monthly test protocol: first business day of each month at 11:45 a.m., one-minute Attention Alert Signal (steady tone) on all statewide outdoor warning sirens, coordinated with the EAS Live Audio Broadcast test. Lists the four county siren-malfunction reporting numbers (Honolulu 808-723-8960; Maui 808-270-7285; Kaua'i 808-241-1800; Hawai'i 808-935-0031).

The April edition ties the test to the 1946 tsunami anniversary. The parallel September 2022 release (<https://dod.hawaii.gov/hiema/news-release-monthly-siren-and-emergency-alert-system-test-for-september-2022/>) adds the only documented additional tone: a "whooping" HAZMAT tone tested near Campbell Industrial Park covering Kalaeloa, Makakilo, Nānākuli, Kapolei and 'Ewa Beach.

H-33 · 2026-04 · **No tsunami threat to Hawaii after large quake off Japan (19–20 April 2026 Sanriku M7.7)**

Science & History · Honolulu Star-Advertiser; corroborated by Newsweek · report, 3

<https://www.newsweek.com/japan-tsunami-april-2026-warning-updates-11852539>

The only 2026 event bearing on Hawai'i found in this survey. ** M7.7 (initially 7.4) off Sanriku, northern Japan, ~20 km depth, ~4:53 p.m. local April 20, 2026. Japan forecast up to 10 ft in Iwate; observed ~2.6 ft at Kuji port and 1.3 ft elsewhere in Iwate. PTWC: "Based on all available data, a destructive Pacific-wide tsunami is not expected and there is no tsunami threat to Hawaii." Useful as the contrasting negative case — an M7.7 Japan source that produces no Hawai'i action, against the M8.8 of 2025 that emptied Waikīkī.

C-42 · 2026-05 · **Notification Services — ALERT Kaua'i**

County · Kaua'i Emergency Management Agency (Kaua'i) · procedure, web page

<https://www.kauai.gov/Government/Departments-Agencies/Emergency-Management-Agency/Notifications>

Documents ALERT Kaua'i on the Everbridge platform, delivering phone calls, text, and email — notably including voice phone calls, which the O'ahu and Hawai'i County descriptions do not emphasize. Records the county's hazard scope for the system (tsunamis, hurricanes, earthquakes, flash flooding) and that the Kaua'i Department of Water shares the platform for water outage and boil-water notices. Registration by portal, phone (808) 241-1800, or kema@kauai.gov.

C-43 · 2026-05 · **Kaua'i County switches to new emergency notification service**

County · Spectrum News Hawai'i (Kaua'i) · report, web page

<https://spectrumlocalnews.com/hi/hawaii/news/2026/05/05/kauai-county-switches-to-new-emergency-notification-service>

Dates and explains Kaua'i's platform migration from Inspiron to Everbridge on 5 May 2026, selected by a county committee, and the operational reason it matters: Everbridge's Resident Connect database reaches on-island contacts beyond traditional opt-in lists — a materially broader reach than an opt-in-only roster. Also establishes that Hawai'i County Civil Defense and the Hawai'i Police Department moved to Everbridge in July 2025, meaning three of four counties now run the same platform.

F-20 · 2026-05 · **United States Tsunami Alerting Analysis 2026 (Public Version)**

Federal · Washington State Emergency Management Division Tsunami Program, on behalf of NOAA and NTHMP · report, 91

https://www.weather.gov/media/nthmp/WCS/260507_United%20States%20Tsunami%20Alerting%20Analysis%202026%20PUBLIC%20VERSION.pdf

The newest and most comprehensive cross-jurisdiction inventory of how tsunami alerts actually reach people, state by state. For Hawai'i it documents the WEA/NOAA Weather Radio/EAS/siren stack under PTWC jurisdiction, flags multilingual communication as a critical Hawai'i gap requiring duty officers to translate English alerts into clearer instructions for non-English-speaking populations, and records Hawai'i's stated dependence on the DART buoy network as a potential single point of failure given the state's geographic isolation. No other federal-sponsored document assembles alerting-pathway gaps this way.

C-46 · 2026 · **County of Kaua'i Multi-Hazard Mitigation and Resilience Plan, Volume 1 of 2 (2026)**

County · Kaua'i Emergency Management Agency (Kaua'i) · plan, several hundred (9 MB)

<https://www.kauai.gov/files/content/public/v/18/government/departments-agencies/emergency-management-agency/multi-hazard-mitigation-and-resilience-plan/2026-kauai-county-multi-hazard-mitigation-and-resilience-plan-final.pdf>

Section 7 is Kaua'i's tsunami hazard chapter, containing Table 7-2 (exposed population and property in the tsunami inundation zone), Table 7-3 (communities with high-or-above social vulnerability located in tsunami inundation area — the only county plan indexing tsunami exposure against a social vulnerability threshold by community), Figure 7-3 (critical facilities in tsunami

inundation areas), and Table 7-4 (loss impact). The plan carries exactly one tsunami-specific mitigation action countywide, the lowest of any county plan reviewed. Volume 2 appendices at [.../2026-kauai-county-multi-hazard-mitigation-and-resilience-plan-volume-2-appendices.pdf](#).

F-06 · 2026 · **Tsunami Message Definitions**

Federal · NOAA / NWS U.S. Tsunami Warning Centers ([tsunami.gov](https://www.tsunami.gov)) · product guide, web page

https://www.tsunami.gov/?page=message_definitions

The canonical public wording of the four domestic alert levels, verbatim: Warning — "A tsunami with the potential to generate widespread inundation is imminent, expected, or occurring"; Advisory — "...potential to generate strong currents or waves dangerous to those in or very near the water..."; Watch — "A tsunami may later impact the watch area"; Information Statement — "An earthquake or tsunami has occurred of interest to the message recipients." It also distinguishes the two international product types PTWC issues from Honolulu (Tsunami Threat Message and Tsunami Information Statement), which is the split created in 2014.

F-23 · **C-51** · 2026 · **TsunamiReady Communities — Hawaii**

Federal · NOAA / National Weather Service · dataset, web page

<https://www.weather.gov/tsunamiready/hi-tr>

The authoritative federal roster of Hawai'i recognitions: 17 TsunamiReady entities comprising 4 counties, 13 communities and 1 government site. Named communities include Aina Haina, Ewa Beach, Kailua, Hanapepe-Eleele, Hauula, Maili, Makaha, Manoa, Nanakuli, South Maui, Waianae, Wahiawa, and Marine Corps Base Hawaii. This is the only place the specific Hawai'i community list is published by NWS.

F-38 · 2026 · **NCEI/WDS Global Historical Tsunami Database, 2100 BC to Present**

Federal · NOAA National Centers for Environmental Information / World Data Service for Geophysics · dataset, web page (documentation)

<https://www.ncei.noaa.gov/products/natural-hazards/tsunamis-earthquakes-volcanoes/tsunamis/global-historical-data>

The authoritative event catalog: over 2,200 source events with validity rating above zero and more than 27,000 runup observations, distributed 70 percent Pacific, 15 percent Mediterranean, 9 percent Caribbean/Atlantic, 6 percent Indian Ocean. It is the only compilation that merges scientific literature, regional catalogs, tide gauge records, deep-ocean sensors and unpublished research into one queryable record, accessible through the HazEL interface, and its Hawai'i entries are the underlying data behind every Hawai'i runup statistic cited elsewhere.

F-39 · 2026 · **Tsunami Capable Tide Stations**

Federal · NOAA National Ocean Service, Center for Operational Oceanographic Products and Services (CO-OPS) · dataset, web page

<https://tidesandcurrents.noaa.gov/tsunami/>

The operational registry of coastal water-level gauges hardened and configured for tsunami detection, organized by region (West Coast, Alaska, Pacific, Caribbean, East Coast, Gulf Coast) and distinguishing active "Tsunami Capable Tide Station" from "Inactive Tsunami Tide Station." These are the instruments that produce the confirmed wave-height observations PTWC uses to upgrade, downgrade or cancel a Hawai'i alert, and the associated CO-OPS 1-Minute Tsunami Water Level Data product is the higher-rate feed used during events.

F-40 · 2026 · **47 CFR Part 10 — Wireless Emergency Alerts**

Federal · Federal Communications Commission · rule, web page (~30 printed)

<https://www.ecfr.gov/current/title-47/chapter-I/subchapter-A/part-10>

The rules that determine whether a tsunami alert reaches a phone in Waikiki. § 10.400 establishes the four alert classes and sets the Imminent Threat threshold — Urgency must be Immediate or Expected, Severity Extreme or Severe, Certainty Observed or Likely (a tsunami warning qualifies; an advisory generally does not). § 10.430 requires support for 360 characters, with a 90-character fallback for technically incapable infrastructure. § 10.450(a) requires delivery to 100 percent of the target area with no

more than 0.1 mile overshoot, which is what makes shoreline-only geotargeting of a Hawai'i evacuation zone technically feasible. No tsunami-specific provision appears anywhere in Part 10.

F-41 · 2026 · 47 CFR § 11.31 — EAS Protocol (Emergency Alert System)

Federal · Federal Communications Commission · rule, web page

<https://www.ecfr.gov/current/title-47/chapter-I/subchapter-A/part-11/subpart-B/section-11.31>

Contains the actual event-code table rows: TSW for Tsunami Warning and TSA for Tsunami Watch — and notably no EAS event code exists for a Tsunami Advisory, a structural gap for Hawai'i advisory-level events. It also defines the PSSCCC location code (P = county subdivision 0–9, SS = state/territory ANSI 01–56 and 60–78, CCC = county ANSI with 000 meaning the whole state) and the four originator codes EAS, CIV, WXR and PEP. WXR is the code carried by NWS-originated tsunami alerts.

F-42 · 2026 · Integrated Public Alert and Warning System (IPAWS) — Frequently Asked Questions

Federal · FEMA · procedure, web page

<https://www.fema.gov/emergency-managers/practitioners/integrated-public-alert-warning-system/faqs>

Establishes the aggregator layer between PTWC and the public: IPAWS as FEMA's national local-alerting system distributing through WEA, EAS and NOAA Weather Radio, using CAP as the common digital format so one message reaches all channels simultaneously. It defines the Collaborative Operating Group (COG) as the unit of alerting authority, which is the mechanism by which HI-EMA and the four county agencies — not PTWC — originate the alerts that actually move Hawai'i residents. Read alongside GAO-23-105961, which found the NOAA-FCC-FEMA responsibilities at this handoff are still undefined.

F-43 · 2026 · NOAA Weather Radio All Hazards — Hawaii Transmitter Network

Federal · NOAA / NWS Weather Forecast Office Honolulu · dataset, web page

<https://www.weather.gov/hfo/nwr>

The only listing of the actual Hawai'i NWR broadcast infrastructure that carries tsunami alerts: KBA99 (Mt. Ka'ala, O'ahu, 162.550 MHz; Hawai'i Kai, O'ahu, 162.450 MHz) covering Kaua'i, O'ahu, Moloka'i, Maui, Lāna'i and parts of Hawai'i Island; WWG75 (Haleakalā, Maui, 162.400 MHz); WWG27 (South Point 162.550, Kulani Cone 162.500, Kamuela 162.500) for parts of Hawai'i Island; and WZ2557 (Līhu'e 162.450, Kōke'e 162.400) for Kaua'i. Four channels total — 1, 3, 6 and 7. This is the coverage picture GAO-23-105961 ordered NOAA to assess.

F-44 · 2026 · Hawaii Tsunami Preparedness and Safety Information

Federal · NOAA / NWS Weather Forecast Office Honolulu (WFO HFO) · product guide, web page

https://www.weather.gov/hfo/tsunami_safety

The clearest federal statement of WFO Honolulu's actual role, which is narrower than commonly assumed: PTWC "has responsibility for tsunami monitoring, and the subsequent issuance of any necessary watches or warnings," and the WFO functions as an information conduit and educator, not the warning originator. It also gives the siren rule by alert level — sirens sound for an urgent local warning and for a confirmed tsunami warning, but a watch from a distant earthquake involves "No siren sounding" — and gives the natural-warning instruction that falling or difficulty standing during a local earthquake is itself the cue to leave the evacuation zone immediately.

F-45 · 2026 · Hawai'i Tsunami Warnings

Federal · NOAA / NWS International Tsunami Information Center · procedure, web page

https://weather.gov/itic-car/hawaii_tsunami_warnings

The only federal page that states the federal-state-county authority handoff in Hawai'i explicitly: "The PACIFIC TSUNAMI WARNING CENTER (PTWC) provides the official tsunami warnings for the state of Hawai'i"; "EACH COUNTY is responsible for TSUNAMI EVACUATIONS, and issuing the ALL-CLEAR"; and "The Hawai'i Emergency Management Agency (HI-EMA) coordinates the statewide sounding of the first siren. Subsequent siren soundings are the responsibility of each County." That three-way split — federal alert, state first siren, county evacuation and all-clear — is documented nowhere else this cleanly.

F-48 · 2026 · **NOAA Tsunami Forecasting (SIFT — Short-term Inundation Forecasting for Tsunamis)**

Federal · NOAA Pacific Marine Environmental Laboratory, NOAA Center for Tsunami Research · procedure, web page
<https://nctr.pmel.noaa.gov/tsunami-forecast.html>

Documents the forecast engine both warning centers run. SIFT matches real-time DART and tide-gauge observations against a pre-computed generation/propagation database of unit-source scenarios to select the best-fitting combination, then produces amplitude, flow-velocity and arrival-time estimates for offshore, coastal and inundation zones. The site references a full set of 77 high-resolution community forecast models, with Hawai'i among the covered regions — this is the mechanism by which a Hawai'i alert gets upgraded or cancelled based on mid-ocean measurement rather than magnitude alone.

C-05 · 2026-06 · **O'ahu Hazard Explorer**

County · City and County of Honolulu DEM (Honolulu) · map, web page (application)
<https://experience.arcgis.com/experience/d44ac270b13b4bf893c7bc4ad7e22a58>

Multi-hazard successor tool that overlays tsunami evacuation zone with flood zone, dam/levee evacuation area, and wildfire risk for a single pinned address, and produces a printable result sheet intended for inclusion in a family or business disaster plan. It is specifically named in the DEM July 2025 after-action report as the recommended remedy for public confusion about zone membership, so it is the tool the county is steering people to post-2025.

C-12 · 2026-07 · **City and County of Honolulu Department of Emergency Management After Action Report — July 2025 Tsunami (Final.CCH_DEM_07-25Tsunami_AAR)** **UNVERIFIED**

County · City and County of Honolulu DEM, with Ascentra (consultant) (Honolulu) · report, unknown (PDF; direct fetch blocked)
https://download.veoci.com/ZF0i6y4jRaAVlHFx/Final.CCH_DEM_07-25Tsunami_AARdocx.pdf

The single most important county document for the 2025 event. Finding that 92% of vehicle trips made during the O'ahu evacuation were unnecessary (drawn from an initial HDOT congestion study). States DEM staff relied on "institutional knowledge" rather than documented protocols, that new employees had no tsunami-specific training, and — critically — that tsunami-specific protocols were NOT in the City Emergency Operations Plan and must be added. Records DEM at 15.5 positions running 24/7 operations at the time, with 13 new positions subsequently funded by City Council (8 of them DEM-requested). Recommends promoting vertical evacuation and redesigning evacuation maps to show only the relevant zone.

C-60 · 2026-07 · **New report lays out highs and lows of Honolulu tsunami response**

County · Hawai'i Public Radio (Honolulu) · report, web page
<https://www.hawaiipublicradio.org/local-news/2026-07-16/new-report-lays-out-highs-and-lows-of-honolulu-tsunami-response>

The most detailed accessible account of the DEM after-action report's contents, including the file identifier (CCH_DEM_07-25Tsunami_AAR) and its download URL. Reports the finding that DEM ran the response with 15.5 positions covering 24/7 operations, that staff depended on institutional knowledge rather than documented protocols, and the recommendation set: add tsunami-specific protocols to the City EOP, expand training, add capacity (13 new positions funded), develop emergency response reserve personnel (the reserve-corps concept the user asked about — it is a recommendation, not an existing program), and improve hazard awareness via the O'ahu Hazard Explorer.

C-21 · current · **Tsunami Evacuation Map 01 — Hilo (Part 01)** **UNVERIFIED**

County · Hawai'i County Civil Defense Agency (Hawai'i) · map, 1 (large-format sheet; part of a numbered series)
[https://records.hawaiicounty.gov/weblink/1/edoc/73305/Tsunami%20Evacuation%20Map%2001%20Hilo%20\(Part%2001\).pdf](https://records.hawaiicounty.gov/weblink/1/edoc/73305/Tsunami%20Evacuation%20Map%2001%20Hilo%20(Part%2001).pdf)

Sheet 1 of Hawai'i County's numbered tsunami evacuation map series, covering Hilo — the single most tsunami-consequential locality in the state. The full series is browsable in the county's Laserfiche WebLink repository (folder startid=24604, dbid=1). Establishes that Hawai'i County distributes its evacuation maps through its records-management system rather than a public web map library, which is why they are hard to find.

C-27 · current · **Hawai'i County Civil Defense Agency — Emergency Preparedness**

County · Hawai'i County Civil Defense Agency (Hawai'i) · public education, web page

<https://hawaii-county-civil-defense-agency-hawaiicountygis.hub.arcgis.com/pages/emergency-preparedness>

Hosts Hawai'i County's own preparedness instruments not published by any other county: Project 360 – 'Ohana Emergency Plan, a Business Emergency Evacuation Plan Template (Word), and a Community Emergency Response Plan Template (Word). The business evacuation plan template is directly relevant to county hotel/resort evacuation requirements — it is the closest thing any of the four counties publishes as a self-service commercial evacuation planning instrument.

C-32 · current · **Mitigate Maui Nui — Tsunami Hazard Profile**

County · Maui Emergency Management Agency (FEMA-grant-funded planning portal) (Maui) · public education, web page

<https://www.mitigatemauiinui.com/hazards/tsunami>

The most specific Maui County historical tsunami dataset available online. 61 tsunami events 1800–2020, 7 causing significant damage/injury/death; recurrence roughly one event every 3.5 years, rated "likely." The 1946 event was Maui's deadliest with 14 fatalities, 2 injuries, 3 homes destroyed, waves to 33 feet, damaging Kahului, Honolua, Honokōhau, Hāmoa, Ke'anae, Lower Pā'ia, and Māla. Disaster declarations for Wailuku-Kahului followed March 1957 (\$5M) and May 1960 (\$763,000); the 1960 waves "washed inland for a distance of about 3,000 feet." March 2011 was the costliest at \$6.37M, hitting south and west Maui. Risk zone stated as within one mile of shore and below 25 feet elevation.

C-41 · current · **Kaua'i Emergency Management Agency (agency page and document index)**

County · County of Kaua'i (Kaua'i) · guideline, web page

<https://www.kauai.gov/Government/Departments-Agencies/Emergency-Management-Agency>

The authoritative index of KEMA's published instruments, and the only place linking the Emergency Refuge Area Status Page (a live ArcGIS app showing which refuge areas are currently open — no other county publishes real-time refuge status) and the Monthly Siren Reporting Tool (arcg.is/1riain5), a crowd-sourced siren-audibility reporting instrument unique to Kaua'i.

C-44 · current · **Kaua'i Siren Locations**

County · Kaua'i Emergency Management Agency (Kaua'i) · map, web page (with four regional sub-pages)

<https://www.kauai.gov/Government/Departments-Agencies/Emergency-Management-Agency/Kauai-Siren-Locations>

States plainly what the other counties leave implicit: Kaua'i's sirens are "owned and operated by the Hawai'i Emergency Management Agency (HI-EMA)," not by the county. Breaks siren locations into four regional sub-pages (North, East, South, West Kaua'i), each separately addressable — the most granular public siren geography published by any Hawai'i county.

C-45 · current · **Potential Refuge Area List and Map for Kaua'i**

County · Kaua'i Emergency Management Agency (Kaua'i) · procedure, 2 (list plus map)

<https://www.kauai.gov/files/content/public/v/80/government/departments-agencies/emergency-management-agency/potential-refuge-area-list-and-map-for-kauai.pdf>

Lists 19 potential refuge facilities across three regions (North/East, Central, South/West), including the Kaua'i Humane Society. Carries the standing caveat that "not every refuge area on this list will be opened during an emergency." The most consequential detail is a negative: the only North Shore entries are Kilauea Neighborhood Center Gym and Kilauea Elementary — there is no Hanalei refuge area, which is precisely why Hanalei residents and visitors must cross the Hanalei Bridge to reach refuge and why the bridge became the county's controlling constraint on 29 July 2025.

C-48 · current · **TSUNAMI UPDATE: Additional bridges to close at 6:10 p.m.; additional shelters open**

County · The Garden Island (reporting County of Kaua'i / KEMA actions) (Kaua'i) · report, web page

<https://www.thegardenisland.com/2025/07/29/hawaii-news/tsunami-watch-issued-for-hawaii-2/>

The only itemized record of Kaua'i's 2025 tsunami road-closure plan as executed. Names all ten closure points activated at 6:10 p.m. (Kaumuali'i Hwy at Fort Elizabeth; Kaumuali'i west of Lele Rd; Kaumuali'i at Waialo Rd; Po'ipū Rd roundabout; Ala Kinoiki at Weliweli; Nāwiliwili at Lala; Rice at Mōkoi; Kūhiō at Kapule; Kūhiō at Kāmole; Kūhiō at Hanalei Plantation Rd) and — the

operationally decisive detail — that at 3:50 p.m. westbound Hanalei Bridge traffic was halted while eastbound remained open, converting the island's single north-shore lifeline into a one-way evacuation route. Records that "an emergency proclamation has been issued by the Office of the Mayor," establishing that on Kaua'i the mayor proclaims while KEMA orders evacuation. Names all nine shelters opened.

C-55 · S-32 · current · Tsunami Evacuation Zones (state portal to county zone tools)

County · Hawai'i Emergency Management Agency (HI-EMA), State of Hawai'i Department of Defense · guideline, web page
<https://dod.hawaii.gov/hiema/tsunami-evacuation-zones/>

The state's designation of which tool is authoritative for each county — and the finding that Maui County and Kaua'i County are both routed to NOAA's national viewer (tsunami.coast.noaa.gov) while Hawai'i County and Honolulu are routed to their own county GIS applications. Also states the operative caution that residents stay at least 100 feet from ocean-connected waterways, and that the mapped zone is a minimum, not a maximum.

C-56 · S-16 · current · All-Hazard Statewide Outdoor Warning Siren System

County · Hawai'i Emergency Management Agency (HI-EMA) · procedure, web page
<https://dod.hawaii.gov/hiema/all-hazard-statewide-outdoor-warning-siren-system/>

Establishes that the sirens all four counties rely on are a single state-operated system, described as "the largest single integrated Outdoor Siren Warning System for Public Safety in the world." Gives the engineering specification — 121 decibels, manufacturer radius 3,400 ft, battery power with photovoltaic charging — which is the number that determines whether a given coastal community is actually covered. Confirms the joint monthly test on the first business day of each month "in collaboration with County Emergency Management/Civil Defense Agencies" and broadcast partners.

H-05 · 2026-08 · 1 April 1946, Mw 8.6, Aleutian Islands, USA — event page and 1946 Tsunami Overview factsheet

Science & History · International Tsunami Information Center / UNESCO-IOC, Honolulu · public education, 3
<https://tsunami.ioc.unesco.org/en/1-april-1946>

Gives the operational travel-time number used in Hawai'i preparedness messaging: the tsunami arrived at Hilo 4.9 hours after generation. States 96 deaths in Hawai'i (ITIC's Hilo-area figure, contrasting with the 159–173 statewide totals elsewhere), \$26 million in 1946 dollars, and >100 ft runup at Unimak. Its distinctive framing is educational rather than forensic: "There was no Tsunami Warning Center in 1946 but if people would have been educated on the tsunami hazard and understood tsunami natural cues, loss of life in Hilo would have been minimal to none."

H-16 · current · The Effects of the March 27, 1964 Alaska Tsunami in the Hawaiian Islands

Science & History · George Pararas-Carayannis · report, 6
<https://www.drgeorgepc.com/Tsunami1964Hawaii.html>

The only compiled Hawai'i-by-station record for 1964 with matched arrival times, runups, and wave periods: Midway arrival 4.9 hr / 0.1 m gauge / 15-min period; Honolulu 5.3 hr / 4.8 m max runup / 0.5 m gauge / 21-min period; Kahului 5.2 hr / 3.7 m max runup / 23-min period; Hilo 5.4 hr / 3.0 m max runup / 2.1 m gauge / 19-min period. Damage \$53,000 at Kahului and \$15,000 at Hilo (1964 dollars); no loss of life on any Hawaiian island. The period data are what make this uniquely useful for harbor-resonance work.

H-25 · current · NCEI Global Historical Hazard Database — 11 March 2011 Japan (Honshu) Tsunami event record

Science & History · NOAA National Centers for Environmental Information · dataset, 3
<https://www.ngdc.noaa.gov/hazel/view/hazards/tsunami/event-more-info/5413>

The authoritative source of the \$30 million Hawai'i damage figure for 2011, together with the linked per-location runup records for Hawaiian stations. NCEI's parallel 1960 record independently gives 61 deaths, 43 injuries and \$23.5 million (USD) damage in Hawai'i, and its 2022 Tonga record notes >1 m at Hawaiian tide gauges.

H-43 · current · NCEI/WDS Global Historical Tsunami Database, 2100 BC to Present

Science & History · NOAA National Centers for Environmental Information / World Data Service for Geophysics · dataset, n/a (database)
<https://doi.org/10.7289/V5PN93H7>

The canonical runup record and the numerical authority behind nearly every figure in this inventory. Over 2,400 tsunamis in two linked files. The Source file carries date/time/location, cause and validity code, tsunami magnitude and intensity, maximum water height, fatalities, injuries, houses destroyed and damaged, and USD damage estimates. The Runup file is the one that matters for Hawai'i: location name and coordinates, wave arrival time, maximum water height, and inundation distance**, plus per-location socio-economic data. Covers Atlantic, Indian and Pacific Oceans plus the Mediterranean and Caribbean, updated from NOAA centers, USGS and post-event reconnaissance reports.

H-44 · current · NCEI Global Historical Hazard Database — Tsunami Runup Search (HazEL)

Science & History · NOAA National Centers for Environmental Information · dataset, n/a (interface)
<https://www.ngdc.noaa.gov/hazel/view/hazards/tsunami/runup-search>

The live query interface for extracting the Hawai'i runup subset from H-43 — the practical tool for generating a per-island, per-event runup table for the compendium, with map viewers for tsunamis, earthquakes, volcanoes and runup observations.

H-50 · current · Pacific Tsunami Museum — Collections and Oral History Archive

Science & History · Pacific Tsunami Museum, 130 Kamehameha Ave., Hilo, HI 96720 · museum/archive, n/a (archive)
<https://tsunami.org/collections-2/>

The irreplaceable human record — over 600 interviews and written accounts from people who survived or witnessed a Pacific tsunami. Holds original 1946 event footage (licensable), historic photographs of Hawai'i and particularly Hilo town, plus documents, artifacts and maps, with donations from Chile, Colombia, Japan and Russia. Image collections are indexed by event year — 1946, 1950, 1960, 1975, 2010, 2011 — with matching survivor-narrative pages. Offers an Interactive Hilo Bay Tsunami Map** that surfaces post-1946 photographs by cursor position. Mission statement: "Through education and awareness, we believe that no one should die due to a tsunami." Currently weekends only, 10:00–14:00, during revitalization.

H-54 · S-31 · current · Hawai'i State Tsunami Evacuation Maps (interactive viewer)

Science & History · Pacific Disaster Center, Kihei, Maui, for the State of Hawai'i · dataset, 70 map sheets
<https://static.pdc.org/tsunami/index.html>

The operational public map product referenced by HI-EMA as the downloadable evacuation zone maps. Sheet counts by island: Kaua'i 10, O'ahu 21 (with multiple insets), Moloka'i 7, Lāna'i 5, Maui 12, Hawai'i Island 15** — 70 sheets total. Carries the extreme tsunami evacuation zones for O'ahu alongside standard zones elsewhere, and directs users to the City & County of Honolulu Department of Emergency Management and Maui County for the most current versions.

H-55 · 2026-08 · Extreme Tsunami Evacuation Zones (PacIOOS Voyager data layer)

Science & History · Pacific Islands Ocean Observing System, School of Ocean and Earth Science and Technology, University of Hawai'i at Mānoa · dataset, 2 per layer
https://www.pacioos.hawaii.edu/voyager/info/tsunami_extreme_zones.html

The SOEST-hosted delivery of the extreme zones with the provenance sentence: "Boundaries are based on peer review of inundation models provided by University of Hawai'i researchers," combined with county first-responder and emergency-management operational input. PacIOOS also carries per-event historical tsunami wave height layers keyed by year (e.g. 1952, which it notes has recorded wave heights only for O'ahu and Hawai'i Island, against \$800,000–\$1,000,000 in 1952-dollar damage: beached boats, damaged houses, destroyed piers, scoured beaches).

H-56 · S-33 · 2026-08 · Tsunami — Hazard information, evacuation zones and warning systems

Science & History · Hawai'i Emergency Management Agency (HI-EMA), State of Hawai'i Department of Defense · public education, 3
<https://dod.hawaii.gov/hiema/tsunami/>

The official state definition of the two zones in the state's own words — Red Zones are "tsunami inundation zones that must be evacuated during any tsunami warning"; Yellow Zones are "extreme tsunami inundation zones" for evacuation scenarios involving rare 9.0-magnitude earthquakes.** Notes tsunami travel speeds exceeding 500 mph and that dangerous currents last for days. Enumerates the alerting stack: EAS on TV and radio, Wireless Emergency Alerts, and the outdoor siren system. Links the interactive zone map, the PDC downloadable maps, and the UH Sea Grant Boater's Hurricane & Tsunami Manual (2025).

S-36 · 2026-08 · Keeping Our Schools Safe

State · Hawai'i State Dept. of Education (HIDOE) · guideline, web page

<https://hawaiipublicschools.org/school-services/keeping-our-schools-safe/>

Contains the two school numbers found nowhere else: thirteen schools statewide lie inside primary (red) tsunami evacuation zones, and those schools must be able to evacuate within 10 minutes because a locally generated tsunami can arrive in 15–30 minutes; separate guidance applies to distant tsunamis where more warning time exists. Also names tsunami as one of five mandatory drill types statewide (alongside lockdown, shelter in place, evacuation, earthquake) and describes the parent-reunification component of evacuation drills.

S-44 · 2026-08 · About the Agency (HI-EMA)

State · HI-EMA · guideline, web page

<https://dod.hawaii.gov/hiema/about-the-agency/>

Defines the State Warning Point as a "state emergency communications center staffed 24 hours, 7 days a week" handling statewide communications with county emergency officials — the operational description matching HRS 127A-7. Names the four county counterparts precisely (Hawai'i County Civil Defense Agency, Maui Emergency Management Agency, City and County of Honolulu Department of Emergency Management, Kaua'i Emergency Management Agency) and current leadership (Director MG Stephen F. Logan; Administrator David Lopez), which is how the state/county interface is formally constituted for tsunami alerting.

S-45 · 2026-08 · Natural Disasters (Office of Public Health Preparedness)

State · Hawai'i State Dept. of Health · guideline, web page

<https://health.hawaii.gov/prepare/natural-disasters/>

DOH's only public-facing tsunami content; establishes that the health department defers entirely to HI-EMA/county evacuation-zone guidance and contributes only natural-warning-sign recognition and family preparedness messaging, routing the public to preparenowhawaii.org. Its thinness is the finding: there is no DOH tsunami-specific procedure outside SESF #8.

S-46 · 2026-08 · Hawai'i Visitor Emergency Guide

State · HI-EMA · guideline, web page

<https://dod.hawaii.gov/hiema/hawai%CA%BBi-visitor-emergency-guide/>

The state's designated tourism-facing tsunami product — filling the role HTA does not. Maps each county to its mass-notification vendor, which appears together nowhere else: Hawai'i County = Everbridge, Maui County = Genasys, O'ahu = HNLAAlert, Kaua'i = WENS. Provides resources in 13+ languages including Japanese, Korean, Spanish, Tagalog and Vietnamese, and warns that HI-EMA social accounts are not monitored 24/7.

What has to be requested directly

These documents are known to exist — cited, referenced, or confirmed by the agencies themselves — but are not published. Several are central.

- 01 No Hawai'i PTWC product user's guide exists.** Guides are published for American Samoa, Guam and the CNMI, Puerto Rico and the USVI, and "Canada / US except Hawaii." Hawai'i is the only PTWC-served US jurisdiction without one. Worth asking PTWC and ITIC directly.
- 02 The O'ahu Emergency Operations Plan and any tsunami annex.** Never published. Honolulu's own after-action report says why: it recommends that tsunami protocols be added to the City EOP, which implies there were none. Request from DEM.
- 03 Hawai'i County, Maui and Kaua'i emergency operations plans and tsunami annexes.** None of the three is published in any form found. Request from HCCDA, Emergency.Management@mauicounty.gov, and kema@kauai.gov.
- 04 Part 2 of the State Tsunami Incident Annex.** Only "part 1 signed" exists online, matching a naming convention used across the state annexes. HI-EMA should be asked whether a Part 2 exists.
- 05 HI-EMA State Warning Point standard operating procedures.** Including the New Urgent Local Tsunami Warning Procedures memorandum, which survives only as an enclosure inside the annex.
- 06 The Hawai'i Tsunami Traffic Mitigation Plan.** HDOT committed to it for November 2025 in its legislative briefing on the Kamchatka evacuation. Not published.
- 07 The HDOT congestion study behind the 92 percent figure.** Honolulu's after-action report cites it as an initial State DOT finding. The study itself is not public.
- 08 Whether Hawai'i County has a yellow zone at all.** NOAA's comparison lists two-tier mapping for O'ahu, Maui and Kaua'i but not Hawai'i Island, while the county's own brochure prints an Extreme Warning tier. This contradiction needs a direct answer and may be the most consequential county difference in the inventory.
- 09 After-action reports from Hawai'i, Maui and Kaua'i counties for July 2025.** Only Honolulu published one. KEMA's administrator publicly committed to a review.
- 10 Per-county siren counts.** Only Hawai'i Island's is public — 92 installed, 9 inoperable at one October test. HI-EMA owns the statewide roster.
- 11 The roster of the thirteen public schools inside primary evacuation zones.** The count is published by the Department of Education; the list is not.
- 12 Recognition and expiry dates for Hawai'i's seventeen TsunamiReady designations.** NWS publishes the names and the count but not the dates.
- 13 Hawai'i County's full tsunami evacuation map series.** Distributed through a cookie-gated Laserfiche repository rather than a public map library. Sheet 01, Hilo, resolves; the rest do not.
- 14 Kaua'i's standing traffic-control procedure for the Hanalei Bridge.** The one-way conversion at 15:50 on 29 July 2025 was clearly pre-planned, but no written procedure was found.

- 15 Any county requirement that hotels hold a tsunami evacuation plan.** None appears to exist in any of the four counties. The closest instrument is Hawai'i County's voluntary business template.
- 16 The Cox and Mink Hawai'i runup technical reports.** Beyond the 1963 paper, Doak Cox's later HIG and Water Resources Research Center reports appear to exist only in the UH Mānoa Hawaiian Collection. The largest gap in the scientific layer.
- 17 A formal probabilistic tsunami hazard assessment for Hawai'i.** None found as such. What exists is the deterministic scenario envelope of Butler et al. 2017 plus recurrence constraints from the paleotsunami work.

About this reference

This is the research spine behind the novel *Four Hours to Impact* — the factual record of how Hawai‘i detects a distant tsunami, decides to warn, and moves four counties out of the water. Four parallel research passes surveyed the federal, state, county, and scientific-historical record and returned 205 unique verified sources spanning 1947 to 2026. Every entry states the one fact it alone holds — a number, a threshold, a timing, or an authority found nowhere else.

What is inside

- The alert thresholds and the chain of authority — who detects, who warns, who orders, who clears.
- The evacuation-zone system and where the four counties diverge.
- The event record, and the 2025 after-action findings.
- A full 205-source bibliography, each entry with the unique data it holds.

About the author

*Jerry Perone lives in Honolulu and has trained with the National Weather Service on the Aleutian-earthquake tsunami scenario. He has served in disaster response with Team Rubicon and the Medical Reserve Corps, and is the author of the novel *Four Hours to Impact*.*

Reference only. Nothing here substitutes for the official guidance of the Pacific Tsunami Warning Center, the Hawai‘i Emergency Management Agency, or your county emergency-management agency.

≈ 3,700 km
nearly 5 hours to cross —
about 4 hours to move

PACIFIC OCEAN

HAWAII