

California Public Alert and Warning System (CalPAWS) Plan

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Executive Summary

The State of California has long been a national leader in preparing for and responding to emergencies and disasters, both natural and human-caused. The state's important role in emergency management dates back to the early 20th century during catastrophic events such as the 1906 San Francisco earthquake. This disaster highlighted California's significant risk of natural disasters. Timely and effective emergency alert and warning messages add to the state's inherent resilience by empowering citizens to make informed decisions and take action to save lives and reduce property losses. These actions reduce the impact of disaster and enable better community recovery. Effective alerts and warnings are a critical emergency management tool to help prevent hazards from becoming disasters.

Jurisdictions throughout the state strive to improve public safety through the rapid dissemination of emergency messages to as many people as possible over as many communication devices as possible before, during, and after a disaster. To accomplish this, the California Governor's Office of Emergency Services (Cal OES) has developed an integrated California Public Alert and Warning System (CalPAWS) Plan. The purpose of this plan is to formalize effective processes and recommended standardized policies for alerting and warning the general public during local and state disasters or emergencies.

The CalPAWS Plan integrates new and existing public alert, warning, and notification systems to provide state and local authorities who are responsible for alert and warning a range of capabilities and dissemination channels, thereby increasing the likelihood that a given message will reach both people in an affected area and those outside who can benefit from greater awareness.

The CalPAWS Plan details the roles and responsibilities of emergency managers and public safety officials at the local, state and federal level. It also documents the recommended criteria for issuing public alerts and warnings, types of alerts and warnings, governance, training, and technical requirements for activating alerts. This plan provides best practices for writing effective alert and warning messages, choosing appropriate alerting technology, and providing public education to ensure the people of California understand how to obtain, use, and respond to information from public safety officials.

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Purpose

“The state has long recognized its responsibility to mitigate the effects of natural, manmade, or war-caused emergencies which result in conditions of disaster or in extreme peril to life, property, and the resources of the state, and generally to protect the health and safety and preserve the lives and property of the people of the state.”

California Emergency Service Act, § 8550 California Government Code

This document sets forth policies, procedures and guidance of Cal OES to aid responsible officials in issuing emergency alerts, warnings and information to the general public of California.

Terminology

The words “alert,” “warning,” and “notification” often are used interchangeably, but in this document those words are used in specific senses:

Alert - A communication intended to draw the attention of recipients to some previously unexpected or unknown condition or event.

Warning – A communication that encourages recipients to take immediate protective actions appropriate to some emergent hazard or threat.

Notification – A communication intended to inform recipients of a condition or event for which contingency plans are in place.

These distinctions are significant in the development of effective public communication systems and messages. An alert (for example, the ringer on a telephone) attracts attention but does not provide detailed information or recommendations. A warning is actionable; it describes a hazard and recommends protective action to people at risk. A notification is targeted to an individual or organization by prior arrangement in order to trigger some pre-determined activity.

Roles and Responsibilities

Planning for, preparing, and disseminating alerts and warnings are the responsibility of multiple levels of government. No single entity holds sole responsibility or authority in the

State of California. It's a shared responsibility and dependent on the circumstances that necessitate an alert or warning.

Local Government

It is an inherent responsibility of local government organizations and officials to keep the public informed about both natural and manmade disasters, and what actions they need to take to protect themselves and their families. These actions could include: evacuation orders, locations of points of distribution (for food, water, medicine, etc.), direction to move to higher ground, shelter in place guidance, take cover, etc.

Typically local government officials have the most accurate and complete understanding of a situation, the immediate actions that are being taken and potential adverse impacts of the incident. It is incumbent upon local officials to rapidly and effectively communicate to the public what is occurring and any steps or actions the public needs to take. Generally, under California's Standardized Emergency Management System (SEMS) the individual responsible for alert and warning will be a single official in charge such as an Incident Commander (IC) or designee. Often alert and warning messages are delivered by a designated Public Information Officer working under the direction of an incident commander or Emergency Operations Center (EOC) Director.

Specifically, local entities are responsible for:

- Installation, maintenance, user training and exercise/testing of local public alert and warning capabilities within their jurisdiction;
- Obtaining authority and facilities for accessing federal warning systems via the Federal Emergency Management Agency (FEMA) Integrated Public Alert and Warning System (IPAWS);
- Enactment of ordinances and/or policies enabling the issuance and effective dissemination of alerts and warnings to the public by responsible officials including Incident Commanders within their jurisdictions regarding imminent threats to human life and health and extraordinary threats to property;
- Inclusion in warning procedures of provisions for cancelling and countermanding accidental alerts, and for rapidly correcting and updating alert details as additional information becomes available; and
- Coordination with adjoining jurisdictions, Operational Areas and the state regarding origination of alerts and warnings related to hazards that have effects across jurisdictional boundaries.

State Government

Recognizing that virtually all disasters emerge and exist on a local level, the main public alert and warning responsibility of the state is to provide training, consultation and guidance to local government entities. This includes establishing access to and utilizing available urgent communications tools such as the federal IPAWS network (see Attachment C). In rare cases an incident or emergency may be so severe, and include multiple jurisdictions at the same time, that the State may need to issue public alerts and warnings on its own authority.

The State of California, acting through Cal OES, is responsible for:

- Relaying war emergency and other emergency alerts and notifications from federal authorities to appropriate offices and areas within the state;
- Managing the California State Warning Center (CSWC), the California Alternate State Warning Center, and the California Warning System (CALWAS), which is a state sub-circuit of the federal National Alert and Warning System (NAWAS) linking the State Warning Center and State Alternate Warning Center with Operational Area warning points;
- Assisting in coordination of public warning and alerting activities that affect multiple state Operational Areas;
- Promulgating standards of practice for effective and consistent public alert and warning practice;
- Training warning originators using the principles of SEMS and other first-responder training systems;
- Reviewing the operational security of public alert and warning systems and recommending preventative actions and repairs as needed to maximize the trustworthiness and reliability of such systems;
- Direction and management of Earthquake Early Warning within the State;
- Developing improved warning delivery systems as required to provide rapid dissemination of targeted alerts and warnings to meet the needs of people and institutions in the State; and
- Providing technical and programmatic guidance to Operational Areas and other state agencies regarding the implementation and use of public alert and warning facilities.

The CSWC is tasked on a daily basis with information-gathering and inter/intra-governmental notifications, and is described in detail in Attachment A.

Nothing in this plan is intended to conflict with or supersede any existing arrangement for dissemination of alerts and public warnings by local, state or federal agencies.

Federal Government

FEMA is the lead federal agency for coordination and implementation of IPAWS. FEMA ensures that this nationwide system is maintained and is operational. FEMA's stated goals for IPAWS are to:

- Operate NAWAS to notify state warning points and other critical operations centers of a wide variety of events including military attacks. NAWAS is controlled from FEMA's Operations Center and the FEMA Alternate Operations Center in the National Capital Region;
- Build and maintain an effective, reliable, integrated, flexible, and comprehensive alert and warning system;
- Diversify and modernize the broadcast Emergency Alert System (EAS);
- Create an interoperability framework by establishing or adopting standards such as the Common Alerting Protocol (CAP);
- Enable alert and warning to those with disabilities and others with access and functional needs and to those without an understanding of the English language;
- Partner with NOAA for seamless integration of message transmission through National Weather Service (NWS) national networks;
- Receive and authenticate alert messages, then simultaneously deliver to all IPAWS-compliant public alerting systems; and
- Ensure that required Emergency Management Institute (EMI) courses are available and updated periodically.

The NWS has specialist responsibility for originating public warnings regarding weather hazards. NWS also provides dissemination services to the United States Geological Survey (USGS) (see below). The NWS operates several public alert and warning delivery systems, most notably the National Weather Radio network of VHF radio transmitters serving most of the population of the United States.

The USGS has responsibility for the study and characterization of geophysical hazards such as tsunamis, volcanos, and landslides and issues alerts and warnings for state and local dissemination from centers including:

- The California Volcano Observatory located in Menlo Park, California;
- The National Earthquake Information Center in Golden, Colorado;
- The Landslide Information offices for the San Francisco Bay Area and Southwestern California; and
- The National Tsunami Warning Center located in Palmer, Alaska.

Recommended Practices for Public Warning

Issuing a public warning requires the exercise of reasonable and well-informed judgment. There is no all-encompassing formula for making warning decisions. There are, however, some evidence-based principles and best practices that can help guide the decision maker:

- 1) A public warning is a communication intended to persuade members of the public to take one or more recommended protective actions in order to reduce losses or harm. A public alert is a communication intended to attract public attention to an unusual state of affairs. The measure of merit of a public warning message is the extent to which it elicits appropriate public behavior. The measure of an alert is the extent to which the intended audience becomes attentive and searches for additional information.
- 2) Under SEMS and the National Incident Management System (NIMS) the responsibility for issuing alerts and warnings during an emergency rests with an Incident Commander (IC) or an IC's designee, typically a Public Information Officer (PIO). The lack of an assigned PIO or other specialist should not prevent or delay the issuance of a warning by the IC.
- 3) Common protective action recommendations include:
 - a. Shelter in place (with or without detailed instructions such as sealing and/or locking doors and windows)
 - b. Evacuate immediately
 - c. Prepare to evacuate (or to take some other specified action when advised)
 - d. Observe or be on the lookout
 - e. Minimize use of telephones or other utility or resource
 - f. Taking health precautions (e.g., boil water)
 - g. Distribution instructions (for food, water, ice, building materials, medications, etc.)
- 4) While it is impossible to pre-script message templates for every possible hazard, those responsible for alerts and warnings should prepare templates ahead of time with recommended foreseeable protective action measures, such as those listed above.

- 5) Evacuation messages are particularly demanding on their originators, as they must be coordinated with agencies responsible for transport, traffic control and evacuee reception and sheltering. Confusing and/or uncoordinated evacuation orders can have unintended adverse consequences. Evacuation messages should address a variety of issues such as:
- a. Direction and destination of travel;
 - b. Routes to be used and routes to be avoided;
 - c. Means of travel (by auto, by bus, on foot, etc.);
 - d. Things to take along (papers, medications, pets, etc.); and
 - e. Expected duration of relocation (a few hours, a day, etc.?)
- 6) Use of large-scale, wide ranging public warning systems is usually restricted to identified officials. However, when imminent danger threatens, anyone can and should issue a warning to people with whom they have communication, using whatever means are at their disposal, especially if it allows others to avoid injury or losses.
- 7) Messages should not come from anonymous or unfamiliar sources, as messages that do not clearly identify a known source will be treated with skepticism by the public. Whenever possible the responsible source of a warning should be well known to the target audience as knowledgeable and authoritative as to the threat.
- 8) Every warning message should be directly attributable to an individual who is accountable for the content of the message. The use of shared “agency accounts” to control access to warning systems can undermine the enforceability of usage policies. All warning systems to which access is restricted should use at least password authentication; two-factor authentication is preferred. Fear of triggering “panic” is not a valid reason to delay or avoid issuing a warning. “Mass panic” very rarely occurs as the result of a warning message. Note that justified anxiety or physical flight is not the same thing as panic. ¹

¹ Extensive sociological research has identified three conditions that must be met in order to induce a group panic (See Quarantelli, E. L. “The Nature and Conditions of Panic.” *American Journal of Sociology*, vol. 60, no. 3, 1954, pp. 267–275. www.jstor.org/stable/2772684.):

- a. Perception of a dread threat that is expected to cause death or extreme pain;
- b. Perceived competition for limited opportunities to escape the threat; and,
- c. Limited social cohesion within the at-risk group.

- 9) Incomplete or imperfect information is not a valid reason to delay or avoid issuing a warning. Warning messages can, and should be, updated and refined as additional information is received, and cancelled when no longer deemed necessary. Time is of the essence, as recipients of warnings will need time to consider, plan and act after they receive a warning message.
- 10) While repeated false alarms can be damaging to the credibility of both the source and the delivery channel, historically false alarms or erroneously issued warnings have not significantly eroded public confidence in issued warnings as long as they were issued if they were accidental and promptly corrected or retracted. Warning originators should use their best judgment but err on the side of public safety.
- 11) Many warning delivery systems have limitations on character length or composition that require a warning message to be brief. However, “keep it short” is not necessarily a good guideline for composing a warning message. The most effective warning messages answer five (5) key recipient questions:
 - a. Why are we at risk?
 - b. Do you really mean me? (Does this affect my location or situation?)
 - c. How long do I have to act?
 - d. What should I do?
 - e. Who says so?

Warning messages that do not answer these questions may lead to those affected seeking additional information from uninformed friends or relatives, or other sources of misinformation such as superstitions and urban myths.

Care should be taken to avoid creating such conditions. Actions that should be avoided include delaying a warning until some at-risk people no longer have time to respond in an orderly fashion, constriction of egress routes, and messages or actions that undermine social solidarity or encourage competition among the at-risk group. (Aguirre, Benigno E. "Emergency evacuations, panic, and social psychology." *Psychiatry* 68.2 (2005): 121-129.)

Note also that “crushes” in crowds are not necessarily the result of panic, but typically result from excessively high crowd density (typically greater than 4 persons per square meter.) Officials responsible for events or situations that may involve large, dense crowds should familiarize themselves well in advance with the scientific and operational literature on crowd management. (See Johansson, Anders, et al. "From crowd dynamics to crowd safety: a video-based analysis." *Advances in Complex Systems* 11.04 (2008): 497-527.)

- 12) To maximize warning effectiveness the tone and language of a warning message should be:
- a. **Specific** – The message should make it clear which people are at risk and what protective action they should take. Inevitably, some people will receive the message who are not at risk; they should be able to determine that from the message text.
 - b. **Consistent** – The public should receive consistent and mutually reinforcing messages through all media and from all sources.
 - c. **Confident** – Even if the underlying information is uncertain, there should be no hedging or ambiguity about the protective action recommendations.
 - d. **Clear** – Wording must be in simple language that can be easily understood. Technical jargon should be avoided.
 - e. **Accurate** – If people learn or suspect they are not receiving correct and complete information they may begin to ignore both the message and source.
- 13) Irrelevant warnings can fatigue the public rapidly and lead to recipients discounting further warning messages. Every effort should be made to limit warning delivery to people actually at risk. Warning delivery systems become more useable to the extent they can target limited areas or specific at-risk populations.
- 14) People rarely act on a single warning message alone. To be effective, warnings should be delivered in various formats via various media, both to increase reliability of warning delivery and to provide a sense of corroboration that will encourage recipients to take protective actions.
- 15) When dealing with uncertain or conflicting information about a threat, the alert originator should choose to err on the side of protecting the public. Some warning delivery systems have provisions for communicating the general degree of certainty associated with threat information, but many only permit a yes-or-no decision as to warning the public. Reasonable detail should be provided, but a warning message is not the place for an extended discussion of scientific data and probabilities. The public would rather be safe than sorry.
- 16) Warning messages should be distributed to all members of the community who are at risk, including people with access and functional needs, non-English speakers, people in remote or isolated areas, the elderly and people with limited technology, no telephones, etc. In some cases it may be useful to offer alternative protective action recommendations for people who cannot implement the preferred recommendation. Also, as it may take longer for such people to respond to a warning, earlier “pre- warnings” directed to them may be useful. However, initial

warnings should not be delayed while alternate versions are being prepared. Translations or other variants of a warning message should be treated as updates.

- 17) Warnings need not respect jurisdictional boundaries. To the extent a warning originator has the ability, warnings should be targeted to the entire area known to be at risk, with prompt coordination with any other jurisdictions as soon as possible. If the initial warning originator lacks the ability to deliver warnings to the entire at-risk area, an initial warning to the extent of the originators' capacity should be issued immediately, followed by coordination with other jurisdictions to warn people in those jurisdictions, with priority given to the areas closest to the origin of the threat or the areas that will be affected soonest.
- 18) If a warning is issued from a higher level of government or jurisdiction, lower levels within the target area of the initial warning need not repeat that warning. However, local jurisdictions should issue additional warning messages if needed to communicate local variations on the recommended protective action, to expand the target area for the message, or to utilize local warning dissemination capabilities that will enhance delivery of the warning to people at risk.
- 19) Warnings should be issued when there is an imminent threat to life, health or property. Warning systems should not be used for the purpose of reassuring the public that an ongoing situation or an upcoming event is not hazardous; other public information channels should be used for those purposes instead.
- 20) For flexibility and interoperability, new or updated public alert and warning systems should support the current version of the Common Alerting Protocol (CAP), described below.

Integrated Public Alert and Warning Systems

Historically, public warning systems have been tailored to the media technologies available: the Emergency Alert System (EAS) was designed for radio and TV broadcasting, Wireless Emergency Alerts (WEA) for cellular telephones, so-called "reverse 9-1-1" systems for wireline telephones, etc. Until the pioneering work of the non-profit Partnership for Public Warning in the early years of the 21st century, interoperability among public warning systems received little attention. The result was a patchwork of warning capabilities and services across the nation and across the wide variety of threats that might create a need for public warning.

Wide adoption of digital controls in warning systems led to development of technology-independent Common Alerting Protocol (CAP)². For the first time, a standardized protocol allowed a single warning message to activate and control a variety of available and emerging warning delivery systems. The advent of CAP led to updates California's existing Emergency Digital Information Service (EDIS) -- which served as a model for the federal Integrated Public Alert and Warning System (IPAWS).

Consistent, coordinated delivery of urgent warnings over multiple delivery systems is beneficial to the public in several ways:

- Reach of the coordinated warning message is maximized: Each warning delivery technology has inherent limitations and gaps in its public coverage, which are mitigated when multiple delivery systems are used simultaneously.
- Reliability of warning delivery is maximized when diverse delivery channels and technologies are used rather than “putting all eggs in one basket” by relying on a single warning system.
- Effectiveness of the warning is maximized by virtue of consistently reinforced messaging across multiple communication channels, while minimizing potential confusion due to inconsistent messaging.

CAP messages can be created in multiple languages, and processed by modern computer-controlled devices to present alerts in various forms, such as flashing lights or mechanical shaking, that may better serve the needs of people with access or functional needs.

Warning Delivery Methods and Technologies

A variety of technologies are used for warning delivery in different areas of California, including:

In-Person Notifications – “Door-to-Door” notification, preferably by uniformed public safety personnel can be highly effective, especially when reaching people who are asleep or not reached by other warning media. These personnel should be trained in assisting individuals with access or functional needs and as well as people who speak languages other than English. This form of notification is labor intensive and time consuming.

Loudspeakers and Public Address Systems – Built-in audio announcement systems exist in many buildings and outdoor venues. These can be valuable provided a) the warning message is effectively written, and b) the amplified audio is intelligible. Public Address

² <http://docs.oasis-open.org/emergency/cap/v1.2/CAP-v1.2-os.html>

loudspeakers are sometimes attached to aircraft to notify people in more remote areas. Careful attention must be paid to the intelligibility of a message by those on the ground, and keeping messages brief so that the entire message can be heard at a single point as the aircraft flies past. Loudspeakers systems can be very effective, but constructing them to provide intelligible sound in complex acoustic environments can be technically demanding.

Public Sirens – Often used for outdoor alerting, the effectiveness of sirens in penetrating well-insulated homes and buildings can be limited. Sirens can be programmed to emit multiple distinctive sounds, but associating individual sounds with particular meanings can be problematic, requiring intensive public education. Likewise, visitors from other areas may not recognize the meaning of a siren alert. Some siren systems are combined with a voice public address system, which can provide additional information once the siren sound attracts attention. However, reverberation amongst buildings and sound absorption by foliage can limit the intelligible range of voice messages. Sirens can be very effective for alerting people outdoors in parks or other public spaces.

Less Orthodox Alternatives – Especially when addressing communities with well-developed cultural institutions it is wise to consider what alerting and communication channels are already in place and familiar and to integrate them into a comprehensive warning system. For example, existing church or community-center bells or foghorns may be useful in directing local people’s attention to a hazardous situation.

Tone-Activated Weather Radios – Using technology similar to old-fashioned portable radio pagers, desktop radio receivers can be activated when they receive particular tone or data signals. The alerting signal is typically followed by audio information. The nationwide National Weather Radio network operated by the National Oceanographic and Atmospheric Administration (NOAA) is the best known and most widely deployed example of this technology. Tone-alert radios can provide both alerting and warning detail quickly over a wide area, but require an investment in the receiving equipment that many members of the public decline to make.

FM “Subcarrier” Datacasting – Data encoded at frequencies beyond the range of human hearing can be transmitted over FM broadcast stations, and such signals can be used to deliver brief text messages. Special receivers are required to recognize and decode such “subcarrier” messages. Like tone-alert radios, these can deliver both an alert and a warning text, but require investment in special receivers.

Traditional Radio and TV Broadcasts – The federal Emergency Alert System (EAS) enables the President to interrupt all broadcasts in one or more counties with an emergency announcement. On a secondary basis, EAS can be used by local authorities in accordance with a pre-determined local plan. Participation in local use of EAS is voluntary on the part of broadcasters. EAS messages are delivered to all listeners or viewers of

stations serving a targeted county; many listeners may perceive alerts as irrelevant to their particular location. Satellite and cable TV carriers also participate in EAS, but their capacity to geographically target dissemination is even more limited. EAS can distribute warning messages over large areas very quickly, but cannot reach people who are not watching or listening to broadcast media, particularly people who are asleep.

Cable TV Override – In addition to participation in the EAS, many cable TV systems have a provision by which local authorities can interrupt the audio, and sometimes the video, of all channels with emergency notifications. The strengths and weaknesses of these systems are similar to those for EAS. An additional consideration is the risk of blocking or otherwise limiting access to news and other valuable information.

Telephone Notification – Many localities have a capacity for calling telephone numbers in an organizational database and playing an audio message. This is sometimes referred to as “reverse 9-1-1.” Such systems can be very effective when notifying a known list of recipients such as the members of a team, organization or student body, and ad-hoc notification lists often can be computed for a specified geographic area. The possibility of precise geographic targeting of messages has made such systems extremely popular, although the precision and completeness of such notifications has dwindled somewhat in recent years due to the growth in Voice-over-IP and wireless phone adoption. Telephone notification systems can provide extensive warning information, but the speed of calling large groups can be limited by the local telephone switching infrastructure or the capabilities of the technology initiating the calls.

Wireless Alerts and Texting – Alerts can be targeted to cellphones in a geographic area via the federal Wireless Emergency Alerts (WEA) system. A unique alert tone and vibration is accompanied by a brief (90 character) text message. This is a relatively new system and the speed and precision of targeting of alerts has yet to be fully studied. Alternatively, other non-government systems utilize Short Message Service (SMS) “text” messaging addressed to pre-determined wireless devices via a subscription or organizational roster. These alerts lack the unique sound and display of WEA alerts, and there is no mechanism for ensuring that a received “text” alert is authentic. WEA and other alerts to wireless devices can reach targeted audiences very quickly, but the limited length of WEA/SMS messages makes them most effective when used in concert with EAS or other systems.

Internet-based Services – A wide array of internet-based alerting systems have been devised, including alerting via Internet advertising channels. These tend to target pre-identified users of particular applications, although the advertising channel approach can theoretically target recipients geographically across a wide range of websites, games and other applications. Such systems are generally not interoperable with each other, which

limits the percentage of the at-risk population they can serve, even within the limited audience of people attending to the Internet at any one time.

Changeable Message Signs – Remotely programmable text and graphic displays exist along many highways, at mass transit stations and other public areas. Many of these signs can only display very short texts. More sophisticated signs are deployed by advertising firms, which might also be used for public alerting. Specialized “kiosk” devices such as lottery displays also exist and might be used for public alerting. Such displays are very effective at disseminating location-specific information, but may not be seen by everyone at risk.

Digital Television Datacasting – Since the transition to digital television broadcasting, a fraction of each TV station’s signal capacity is unused. Public television stations in particular have made some of this “bandwidth” available for broadcast of public alerts and warnings in digital form to low-cost receivers. (This is comparable to, but has much greater data capacity than, the “FM subcarrier” technique mentioned above.) This technology can serve large areas very rapidly, but requires investment in encoding and receiving devices.

Security and Testing

Security of warning systems involves protecting the system from:

1. Unauthorized activation;
2. Improper use; and
3. Interference with authorized activation or control (denial of service.)

A key component of any system to which access is restricted is the mechanism for “authentication”; that is, the mechanism for determining that the user is in fact who he claims to be. Only when users can be authenticated accurately does it become possible to grant or withhold “authorization,” which is a determination of what acts the given individual is permitted to perform.

Physical access controls that keep unauthorized users from gaining access to warning system controls are the first step in system security. However, for operational speed and convenience it is common for warning systems to offer activation tools that are available over data networks from other locations. These require particular attention to security.

The most common authentication mechanism is use of a user ID and password combination known only to an authorized user. More elaborate “two factor” schemes also require a physical “key” or “key card” or entry of a changeable code generated by some

automated device. “Biometric” authentication schemes use observable physical characteristics to identify an individual, such as fingerprints and retinal scans.

Warning system authentication should be implemented in such a way as to provide an auditing mechanism that permits any activity of the system to be attributed to an authorized individual. Without individual attribution that cannot be denied (repudiated), it is difficult or even impossible to enforce system usage rules. A common shortcoming of alerting system authentication practices is the use of shared user IDs or passwords, which makes it impossible to trace a use of the system to the responsible individual. If such a policy is in place, the only way to penalize misuse of the system is to penalize the entire jurisdiction or agency. Individual access credentials should be the standard.

In order to prevent “network sniffer” monitoring from determining a users’ password, and to prevent spoofing of an alert under an already-authenticated users’ auspices -- a form of “man in the middle” (MITM) attack -- any network connection used to control a warning system should utilize encryption, such as Transport Layer Security or Secure Sockets Layer (often referred to as “TLS” and “SSL”). This is particularly important for wireless or radio control links that can easily be monitored and/or overpowered by an attacker.

To protect against denial of service attacks, warning systems should have multiple methods for activation, preferably including at least one that does not rely on publically-accessible media such as radio, Internet or telephone.

Warning systems must be tested regularly to assess reliability and detect malfunctions. Some systems provide a controlled “test mode” that allows exercising much or all of the system without disturbing the public; an example are the “silent” or “growl” tests possible in some siren systems. However, other systems must be tested in a “live” full-function mode, and occasional full-system “live” tests should take place at least annually to ensure that there are no problems with parts of the system bypassed in the “silent” test mode.

Tests that can be received by any members of the public should make it clear in the message that there is no actual threat and that no actual protective action is required. Prior to training and testing, procedures should be established to cancel or correct inadvertent or erroneous warnings that accidentally reach the public.

Social Media Platforms and Apps in Public Alert and Warning

Social Media have generally not been as a *primary* public alert and warning medium. The Los Angeles Fire Department (LAFD) maintains a separate Twitter account just for public alerts. LAFD has also used podcasts as a vehicle for post-disaster recovery public

information. A National Weather Service office in North Carolina pioneered the use of Twitter and Facebook to deliver weather warnings.

Some local warning systems repeat their messages via Twitter, Facebook or other commercial social media providers. Social media platforms can facilitate and accelerate the crucial word-of-mouth transmission and discussion of a warning among recipients, a process which noted warning researcher Dennis Mileti has named “milling.” It is in the milling phase that individuals confer with their companions and associates and collaboratively decide on a response. Social media platforms aid in this process and make a valuable contribution to the warning process as a whole.

The observable nature of online milling presents an opportunity for warning officials to follow and evaluate public reaction to their alerts. However, extracting factual information is still difficult due to the informal and largely unstructured style of social media communications and the limits of reliable attribution of social media messages to known sources. LAFD successfully used social media service Foursquare to identify individuals who had been at the site of an explosion at Los Angeles International Airport in order to contact them by telephone and get eyewitness reports. The National Earthquake Information Center has used Twitter data to form rapid estimates of earthquake effects as well as to disseminate seismic information.

The National Academies of Science workshop report quoted above also noted the following observations from workshop participants:

- Although the public response to alerts and warnings has been studied for some time, as have more general questions about the information needs of the public during disasters, there has been comparatively little research on the use of newer technologies such as mobile devices (e.g., cell and smart phones) or social media during disasters. Research would help shed light on such key questions as how the new technologies could help shorten the milling time between receipt of an alert or warning and the taking of protective action.
- The particular characteristics of social media platforms yield different “affordances” of use during disaster situations. For example, social networks on Facebook are usually user-defined: messages to one’s network might help target localized attention and allow extended discussion. Facebook newsgroups, however, are public and can draw collected attention. Twitter supports rapid communications that are most often public. The communications are short and can easily be “retweeted” or propagated publicly. Those that are propagated have a chance of receiving attention; those that are not die out quickly.

- It is important not to think of these platforms as better or worse; rather, it is critical to understand that they are different places along sometimes circuitous paths to seeking and finding information.

Alerting and Warning People with Access and Functional Needs

Titles II & III of the Americans with Disabilities Act require state and local governments, business and non-profit organizations to communicate effectively with people who have disabilities or access and functional needs (AFN). The goal is to ensure that communication is equally effective for everyone.

During a disaster, communication becomes especially critical. As such, information delivered via public alert and warning systems during disasters needs to be effective, understood, consumable, and actionable by the whole community.

To better understand the appropriate considerations needed to ensure effective communication, it is necessary to know that access and functional needs refers to individuals who are or have:

- Physical, developmental or intellectual disabilities
- Chronic conditions or injuries
- Limited English proficiency
- Older adults
- Children
- Low income, homeless and/or transportation disadvantaged (i.e., dependent on public transit)
- Pregnant women

According to the 2010-2014 American Community Survey, more than 3.8 million Californians, or about ten percent of the State's population, have a disability. This number increases greatly when the full scope of access and functional needs are factored in. While it has historically been difficult to quantify the numbers of people in a given community who may have disabilities or access and functional needs; planners can use demographic information from the U.S. Census or American Community Survey to develop a better sense

of how many people with disabilities and access and functional needs live within a given communities.

The California Highway Patrol (CHP) is responsible for public alerts regarding the well-being of at-risk children (AMBER Alerts) and elders (SILVER Alerts.) Refer to Attachment G, below, for details about those programs.

Warning planners and managers at all levels of government in California should actively seek information from and about the individuals with access or functional needs that they serve. By reaching out to organizations such as local Independent Living Centers, Regional Centers, and resource providers; planners should engage and meet with people with access and functional needs to discuss:

- **Personal Preparedness:** Organizations that serve community members with access and functional needs can provide emergency preparedness education and materials to their consumers. They may need some training and access to preparedness materials from local emergency responders.
- **Capability Building:** Identify gaps in service to people with access or functional needs in existing public alert and warning systems. Survey best practices in addressing those gaps. Propose and advocate for improvements to existing capabilities.
- **Education and Exercises:** Involve representatives with access and functional needs to participate in emergency response exercises. Organizations that provide services to people with access and functional needs may also need help in exercising their agency emergency and continuity of operations plans.

People with access and functional needs, and agencies that provide services for them, may not be familiar with what happens during a response and may not easily see how they can help unless they are involved together in planning, training and exercising. Conversely, contributions from agency representatives will shed new light on access and functional needs concerns and resources.

Having just one or two types of notifications systems may not meet the needs of the whole community. Notification and warning systems should support effective communication. Emergency notification messages should use short sentences with plain, concrete words to be effective for everyone in the community.

Access and Functional Need	Considerations	Warning Alternatives
Deaf or hard of hearing	<ul style="list-style-type: none"> • 35 to 38 million Americans have a hearing loss. • Only 30-40% of spoken words are visible on the lips, as a result lip reading is challenging for most people with hearing loss. • Not all people who are deaf know sign language; many that do use American Sign Language which has a different grammatical structure than English. • Not all hearing aid users can hear and understand speech; some wear them to be alerted to environmental sounds. • Many people with a hearing loss cannot effectively receive information audibly from the TV, radio or telephone. • Some individuals have a combined hearing and vision loss, others may be deafblind. 	<ul style="list-style-type: none"> • Flashing lights: Many people who are deaf or hard of hearing have their doorbells/buzzers connected to a light that flashes when someone is at the door. Flashing lights or strobe lights can also be used in conjunction with fire alarms in buildings such as schools, office buildings, shopping malls, and apartments. • NOAA weather all hazard radio: Besides having a tone alert, NOAA weather all hazard radio has a lighted digital display giving the code for the watch or warning being issued. The radio can be hooked to a light that flashes to indicate that a watch or warning is being issued. During the night, pillow vibrators or bed shakers hooked up to the NOAA radio can rouse a person from sleep when a watch/warning is issued. • Text messaging/paging: People can subscribe to many computerized alerting systems available through TV stations, The Weather Channel, and other news and weather sources. There are also local text paging systems that can be set up to allow 9-1-1 dispatch centers to send out text messages to those in the community who carry pagers compatible with their system. The new IPAWS alerting mechanisms provide a variety of accessible messaging systems. • Door- to-door notification: Take along a note pad and pencil or pen to

		<p>write short messages for communicating with a person who is deaf or hard of hearing. Appropriate facial expressions and gestures will also help to convey the meaning of your message.</p> <ul style="list-style-type: none"> Local TV stations: Work with local TV stations to have open captioning of emergency broadcasts or captioned with an ASL interpreter visible on the screen. The trend now is to have the interpreter standing next to the presenter/commentator. When TV is augmented with crawls, captioning and interpreting, the information becomes accessible for people who are deaf or hard of hearing.
Blind or low vision	<ul style="list-style-type: none"> More than 10 million people have some type of vision loss Individuals' coping strategies vary: Some use service animals, some use white canes, some read Braille, and some can read documents with large print. Most people with vision loss cannot see a map on TV that shows an evacuation route 	<ul style="list-style-type: none"> Automated phone call notification: Some communities have systems that call resident and business phone numbers rapidly to notify them of an emergency situation and give short messages for protective actions. Door- to-door notification: For people with low vision, tell them verbally about the emergency. When writing notes, use a large black marker. Local TV stations: Work with local TV stations to ensure there is an audio transcription of information on TV screens that comes across as a silent crawl or map.
Cognitive Disabilities (e.g. autism)	<ul style="list-style-type: none"> People with cognitive disabilities may need more time to process what is being said before 	<ul style="list-style-type: none"> Signage: pre-done posters and laminated cards for door- to-door notification; digital signs on highways to indicate evacuation

	<p>they respond. They may not make eye contact and may not use or respond to some social norms. They also may be extremely fearful of loud noises, flashing lights, sirens and crowds of people.</p>	<p>routes</p> <ul style="list-style-type: none"> • Strobe lights on siren towers (Note however that strobe lights can cause seizures for people with epilepsy.) • Alarms with varying frequencies or pitches. The pitch coming from a traditional fire alarm often does not wake up people with a hearing loss. There are some recently designed fire alarms with varying pitch patterns.
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Evacuations are particularly demanding of effective warning and communication. Evacuations can be required on very short notice because of fires, chemical spills, floods or other hazards. Evacuating can be upsetting for everyone, but it can be particularly challenging or even dangerous for people with access and functional needs. Emergency planners should involve individuals with access and functional needs in discussions of evacuation procedures to better understand the difficulties they may face in evacuating their familiar living environments.

People with access and functional needs live in every part of the community. They may live very independently or they may rely on family, community-based services, or institutional services. They may also have transportation needs during an evacuation. Planning for delivering accessible evacuation warnings to individuals with access and functional needs should be coordinated with transportation agencies and providers, highway and traffic control agencies, and care and shelter providers to ensure that warning messages deliver accurate and complete guidance to everyone involved in an evacuation.

Many communities maintain telephone hotlines to provide up- to-date information to community members on a variety of topics. Many people who are deaf or hard of hearing use relay services to communicate by phone. Here are some items to consider for hotline accessibility:

- Teletypewriter (TTY): Many emergency services agencies had or may still have TTY machines and publicize the TTY number alongside the regular phone number. In the past few years, the number and type of relay services available for people who are deaf, hard of hearing or have speech disabilities has grown exponentially as new technologies have become available. TTY usage has declined in favor of a multitude of relay service options more tailored to individual needs. If the hotline has a TTY

and continues to publicize the number, there must be someone available that is trained in its use.

- Relay service calls: Receiving calls from a relay service provider does not require any specialized equipment for a hotline operation. However, operators should have some training or guidance available on recognizing and responding to calls made through relay services (for example, there are often longer pauses in the communication to allow for translation or transcribing by the relay service communication assistant).
- Relay services and community hotlines can help spread and corroborate public warning messages, and should be priority targets for public alert and warning distribution.

Official websites are another important source of corroboration and additional information regarding public warnings. For a website to be accessible it must be fully usable with or without a wide variety of assistive technologies. Section 508, added by amendment to the federal Rehabilitation Act of 1973, requires federal agencies to make their electronic and information technology accessible to people with disabilities, and includes a number of useful technical standards that can be applied to non-federal information systems as well.

Multilingual Alerting and Warning

Many warning delivery channels are capable of delivering alerts and warning messages in languages other than English. The Common Alerting Protocol (CAP) provides a mechanism for coordinating a warning message in an unlimited number of different languages.

At present there exists no standard or method of measurement for determining whether automated language translation technologies, such as Google Translate or other widely accessible online translation platforms, can adequately translate messages that may have life-or-death implications. As a result, human translation remains the only widely accepted method for providing public warnings in multiple languages. However, public safety and emergency management agencies frequently have limited capacity for rapid translation of unscheduled warnings. In some areas of the United States it is common for warning originators to be bilingual in English and Spanish, and in those areas it has become common for alerts to be issued in both languages.

The Federal Communications Commission (FCC) issued an order in March 2016 which requires that future state EAS plans describe the manner, if any, in which EAS alert message content will be made available to persons who communicate in languages other than English. The FCC limited its action to this reporting requirement, noting that

mandating multilingual alerts “would be difficult if not impossible to do within the existing EAS architecture.”³

Citing a large number of comments questioning the feasibility of multi-lingual EAS broadcasts, FCC Order explain that:

“This information will enable the Commission to ensure that any existing multilingual EAS alerting activities are consistent with the Part 11 rules, and may provide insight into what mechanisms may work best. Similarly, information identifying why multilingual EAS activities are not being planned may provide insight into structural impediments that might be ameliorated by future Commission or federal action, if appropriate. The collection and availability of this information also will aid states, EAS Participants, non-governmental organizations and other interested parties in their efforts, if any, to establish mechanisms for disseminating multilingual EAS content and other emergency information.”⁴

In the past, many California EAS plans relied on non-English broadcasters to translate important messages into their languages of service. However, due to the industry-wide trend toward automatic and remote control of broadcast stations this approach may be less practical than it once was. Current common practice across all warning systems is to approach multilingual alerting on a best effort basis, but not to delay transmission of English language warning messages while multilingual translations are prepared.

³ Order, FCC Enforcement Bureau Docket No. 04-296, adopted March 23, 2016, in the matter of Independent Spanish Broadcasters Association, the Office of Communication of the United Church of Christ, Inc. and the Minority Media and Telecommunications Council, Petition for Immediate Relief.

Plan Maintenance

This California Public Alert and Warning System (CALPAWS) plan will be regularly reviewed and updated with input from collaborators on the federal, state and local levels.

References and Authorities

Authority and reference information for this plan is found in the following policies and legislations:

- California Emergency Services Act; California Government Code § 8550 et seq.,
- Standardized Emergency Management System; California Code of Regulations, Title 19, Division 2, Chapter 1
- State of California Emergency Plan, July 2009
- Standardized Emergency Management System Guidelines, November 2009
- National Incident Management System, FEMA, December 2008
- 'Public Alert and Warning System,' Presidential Executive Order 13407, June 26, 2006
- Warning, Alert, and Response Network (WARN) Act, October 13, 2006
- National Response Framework, Second Edition, Federal Emergency Management Agency, May 2013
- "National Strategy for Integrated Public Warning", Partnership for Public Warning, February 2003, Washington DC
- "Effective Disaster Warnings", Report of the National Science and Technology Council, 2000

Much of the material on serving people with Access and Functional Needs was adapted from the State of Minnesota's "Functional Needs Planning Toolkit," which is gratefully acknowledged.

Glossary and Acronyms

Alert – A communication intended to redirect the attention of recipients to some previously unexpected or unknown circumstance or event.

APTS – Association of Public Television Stations, a national organization of the operators of public television stations, most of which are also PBS affiliates.

Cal EOC – A statewide digital emergency information sharing and communication system maintained by Cal OES and used by Operational Areas and other state agencies;

Cal OES – California Governor’s Office of Emergency Services, an executive arm of the Governor’s Office responsible for coordinating the State’s emergency planning, mitigation, preparedness, response, and recovery activities.

CalPAWS – California Public Alert and Warning System, an integrated, interoperable statewide system-of-systems for public alerting and warning by local jurisdictions and state agencies in California.

CALWAS – California Warning System, an audio communication network linking the CSWC with county warning points throughout California; a component of FEMA’s NAWAS.

CAP – Civil Air Patrol, a volunteer auxiliary of the United State Air Force.

CAP – Common Alerting Protocol, a standardized digital message format for interoperable communication of public alerts and warnings; the core technology of IPAWS, EDIS and CalPAWS.

CSWC – California State Warning Center, a 24/7/365 facility operated by CalOES, described in Attachment A.

DTV – Digital Television, the current system of television broadcasting in the U.S. which permits multiple television programs and additional data dissemination from each station.

EAS – Emergency Alert System, a federal system administered jointly by FEMA and FCC which permits the interruption of broadcast radio and television, cable and public satellite services for emergency messages from the President; secondarily available to other federal, state and local emergency agencies for public alert and warning when not preempted by the President.

EMI – Emergency Management Institute, the training arm of FEMA which offers both classroom courses and online instruction.

IPAWS – Integrated Public Alert and Warning System, a “system of systems” for public alert and warning maintained by FEMA; a mechanism for activating EAS, NWR and WEA.

FCC – Federal Communications Commission, an independent federal agency responsible for the regulation and coordination of electronic communications.

FEMA – Federal Emergency Management Agency, the component of the U.S. Department of Homeland Security responsible for coordinating federal activities in disaster prevention, response, recovery and mitigation.

MITM -- Man In The Middle, a type of cyber-attack in which the attacker intervenes between the originator of a message and its recipient, or between a controlled system and the authorized controller.

NAWAS – National Warning System, a FEMA-managed audio communication network linking state and federal warning points for urgent notifications, alerts and warnings.

NOAA – National Oceanic and Atmospheric Administration, the component of the U.S. Department of Commerce responsible for scientific research in and monitoring of sea and air, parent organization of the National Weather Service (NWS).

Notification – A communication intended to inform recipients of an unscheduled event for which contingency plans are in place.

NWR – National Weather Radio, a nationwide network of specialized radio transmitters operated by NWS for dissemination of weather information, alerts and warnings to the public.

NWS – National Weather Service, the weather observing and forecasting branch of NOAA.

OASIS – Organization for the Advancement of Structured Information Standards, a non-profit standards development organization recognized by the International Telecommunications Union and other standards bodies.

OASIS – Operational Area Satellite Information System, a network of over 80 fixed and transportable satellite earth stations (terminals) located statewide. The terminals provide broadband internet and telephone access immune to regional failures in the terrestrial network.

PBS – Public Broadcasting System, a nationwide programming network for non-commercial and educational television content.

SECC – State Emergency Communications Committee, a body appointed and empowered by the FCC to plan and document the EAS within the state. The California EAS Plan appears as Attachment B to this Plan.

SEMS – Standardized Emergency Management System, a regulatory framework within the State of California for responding to and managing emergencies and disasters.

ShakeAlert - An evolving earthquake early warning system for the West Coast of the United States and the Pacific Northwest sponsored by the USGS in partnership with Cal OES, and a number of seismic laboratories and academic institutions.

USGS – United States Geological Survey, the component of the U.S. Department of the Interior responsible for study and observation of the earth, and the lead agency for study and predictions of earthquakes, landslides and other phenomena.

Warning – A communication encouraging recipients to take immediate protective action in response to some emergent hazard or threat.

WEA – Wireless Emergency Alerts, a program of FEMA and FCC for delivery of emergency alerts to cellular telephones and other personal wireless devices.