Flood Safety Stakeholder Technical Workshop

Friday April 22, 2022
Meeting Facilitation
Atmospheric Rivers, Major Flooding, and the 100-Year Flood Concept

OCAC Meeting, April 25, 2022
Talk Overview

• Atmospheric Rivers (ARs) and California Water
• Components of Major Floods from ARs to Snow to Runoff
• The 100-year Flood – Statistical Estimates
Atmospheric Rivers (ARs)

• First identified in 1998 with new satellite technology
• Hundreds of miles wide; thousands of miles long; how 90% of the water vapor moves through atmosphere in 10% of the area
• Interact with winter storms to cause heavy rains/snow in California – key to water supply and flooding
Characterizing an Atmospheric River

• How much water vapor moving in atmospheric river (Integrated Vapor Transport or IVT)
• Duration – how long is the atmospheric river overhead for a watershed
• Freezing Elevation – where rain turns to snow
ARs drive flood damages in the western U.S.

Flood damages increase exponentially with AR Category

Components of a Major Flood

• Prior conditions in watershed including snow
• Large atmospheric river or multiple atmospheric rivers (called atmospheric river families)
• Timing, pace and scale of storms impact the timing pace and scale of runoff
• Observations and forecasts play key roles in managing flood response
Sizing a Flood with Statistics

• The 100-year flood is really a flood that is estimated to have a 1% chance of being equaled or exceeded in any given year
• Sized based on the statistics of the largest independent flows in a given year for as many years as data is available
The 100-Year Flood

• The 100-year flood is a flow peak or volume of water (a threshold) that has a 1% chance of being equaled or exceeded in any given year.
• It is a threshold based on historical events to guide engineering design
• Federal guidelines outline methodologies called Bulletin 17 (currently on Bulletin 17c)
Scenarios and Systematic Evaluations

• Systematic Evaluations use statistical methods for different size floods to establish the threshold of performance of a system to determine a level of protection to meet regulatory or statutory requirements.

• Scenarios use a real or constructed event to evaluate how system and response functions handle that event. ARkStorm is a scenario.
Summary – Key Points

• Atmospheric Rivers (ARs) are key to floods and water supply – timing, pace, and scale determine benefit versus hazard.

• Observations and forecasts key to maximizing benefits and minimizing hazard of AR driven floods.

• Flood evaluations use systematic evaluation of historical statistics (100-year flood) as well as scenario events (ARkStorm).
Q&A
USACE AUTHORITY FOR FLOOD OPS

- Section 7 of the Flood Control Act of 1944 (58 Stat. 890, 33 U.S.C. 709)
- Prescribe flood control rules and regulations for all reservoirs where:
  - Flood control is an authorized purpose
  - Reservoir was constructed using Federal funds
• Oversee flood operations
• Establish operating rules for flood control
• Update water control manuals
• Prepare deviation packages
RESERVOIR OPERATING ZONES

Simplified picture of Oroville Dam-Lake

Top of Dam
Surcharge Pool (Dam Safety)

Gated Spillway Crest
Flood Control Pool

Water Conservation Pool
(hydropower, water supply, environmental, recreation)

Outlet

Simplified Water Control Diagram for Oroville Dam-Lake

Emergency Spillway Release Diagram

Flood Control (ac-ft)

Note: NOT TO SCALE

*Varies based on wetness parameter
Oroville dam – d/s objective flows

Feather River between Honcut Creek and Yuba River confluence (RM 32.25)

180,000 cfs

Feather River Channel
Oroville dam – d/s objective flows

Feather River Channel

Feather River between Yuba River confluence and Bear River confluence (RM 25.0)

300,000 cfs
USE OF DIAGRAM

1. Parameters are computed daily from the weighted accumulation of seasonal basin mean precipitation by multiplying the preceding day’s parameter by 0.50 and adding the current day’s precipitation (inches).

2. Except when releases are governed by the emergency spillway release diagram currently in force (File No. 13-588), water stored in the flood control reservoirs may be released as rapidly as possible, subject to the following conditions:
   a. That releases are made according to the release schedule herein.
   b. That flows in Feather River above Yuba River do not exceed 480,000 c.f.s.
   c. That flows in Feather River above Yuba River do not exceed 300,000 c.f.s.
   d. That flows in Feather River below Yuba River do not exceed 200,000 c.f.s. or increased more than 50,000 c.f.s. in any 2-hour period.

RELEASE SCHEDULE

<table>
<thead>
<tr>
<th>Actual or Forecast Inflow (c.f.s.)</th>
<th>Flood Control Space Used</th>
<th>Required Releases (c.f.s.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 25,000</td>
<td>0 - 5,000</td>
<td>Power Demand</td>
</tr>
<tr>
<td>0 - 25,000</td>
<td>Greater than 5,000</td>
<td>Lesser of 20,000 or 5,000</td>
</tr>
<tr>
<td>15,000 - 30,000</td>
<td>Greater than 30,000</td>
<td>Greater than 30,000</td>
</tr>
<tr>
<td>0 - 30,000</td>
<td>Greater than 20,000</td>
<td>Lesser of maximum inflow</td>
</tr>
<tr>
<td>30,000 - 125,000</td>
<td>Lesser of maximum inflow</td>
<td>lesser than or equal to 60,000</td>
</tr>
<tr>
<td>120,000 - 175,000</td>
<td>Lesser of maximum inflow</td>
<td>Lesser of maximum inflow</td>
</tr>
<tr>
<td>Greater than 175,000</td>
<td>Lesser of maximum inflow</td>
<td>100,000 c.f.s.</td>
</tr>
</tbody>
</table>

FLOOD CONTROL DIAGRAM

Prepared Pursuant to Flood Control Regulations
For Oroville Dam and Reservoir

Approved: 
Director, Department of Water Resources
Effective Date: 4-13-588
Role of Oroville Dam in Flood Management
Flood Management from Dams
Flood Operations at Oroville

Pre-Oroville Dam:
- December 1955
- Feather River Flood ~ 203,000 cfs
  - 38 lives lost in Yuba City Area
  - 203,000 cfs

Actual Flood Reduction and Avoidance of Loss of Life and Damage over the Last 50 years:
- 1955: INFLOW 440,000 cfs
- FCO Design:
  - OUTFLOW 150,000 cfs
- 1964: INFLOW 250,000 cfs
  - OUTFLOW 157,000 cfs
- 1986: INFLOW 266,000 cfs
  - OUTFLOW 150,000 cfs
- 1997: INFLOW 302,000 cfs
  - OUTFLOW 160,000 cfs
- 2017: INFLOW 190,000 cfs
  - OUTFLOW 100,000 cfs
DWR Inspections

- DWR Bi-annual Levee Inspections
- Annual Inspection of:
  - Structures, Pumping Plants, Channels
- Utility Inspections
- Annual Designated Floodway Inspection
- Flood Fight Training And Response
- High Water Staking
Bi-Annual Levee Inspections

- Levee Inspections Performed Spring And Fall
- Inspected For:
  - Erosion
  - Cracking
  - Animal Burrowing Activity
  - Sloughing Or Instability
  - Trash And Debris
  - Vegetation, Etc.
- Reports Provided To Local Maintaining Agencies, The CVFPB And The USACE
Utility Inspections

- Pipes Through The Levees
- Every 5-years
- External Inspections
  - Identify And Report
    - Broken
  - Severely Corroded
  - Missing/Broken Closure Devices
  - Leaks Causing Erosion
- Reports Provided To Local Maintaining Agencies, The CVFPB And The USACE
Designated Floodway Inspections

- Aerial Imagery Review Of Delineated Sections Of Floodways
- Identifies Unauthorized Encroachments
- Reported To The CVFPB
- Helps To Reduce Impact To Capacity Of The Floodway
Flood Fight Training And Response

- Inspectors Teach Flood Fight Skills And Techniques
- Classes Provided Upon Request
- During A Flood Fight, Our Specialists Provide Technical Support When Requested
- Advanced Flood Fight measures
High Water Staking

- Survey Of High-water Marks Throughout The Affected River
- Can Be Used To Update Existing Models Or Validate New Models
- FPIAS Can Perform High Water Staking Upon Request
- Feather River High Water Surveyed after 2017
FEMA Floodplain Mapping

- Risk MAP Discovery and Resiliency Planning
- Acquisition of New Topographic Data
- New Hazard Studies & Flood Map Revisions
- Questions & Answers

https://msc.fema.gov/nfhl (National Flood Hazard Layer)

FEMA Mapping & Insurance eXchange (FMIX)
FEMA-FMIX@fema.dhs.gov
1-877-336-2627 or live chat (6am to 2pm PT)
FEMA Steps & Engagement Process

RiskMAP Project Lifecycle

- Project Planning
- Discovery
- Data and Product Development
- Risk Awareness
- Preliminary NFIP Map Release
- Planning for Mitigation Action
- Due Process
- FIS and FIRM Delivery

Flood Risk Project Production and Mapping Activities
Q&A
Considerations for Safe and Reliable Flood Management in face of Climate Change

Dr. R. Storesund, PE., GE,  
Executive Director, UC Berkeley’s Center for Catastrophic Risk Management

April 22 2022
About Rune

- Dual Degree Program UC Santa Cruz/UC Berkeley
  - BA Anthropology (UC Santa Cruz)
  - BS Civil Engineering (UC Berkeley)
- Masters in Geotechnical Engineering (UC Berkeley)
- Doctorate in Civil Systems (UC Berkeley)
- Executive Director, UC Berkeley’s Center for Catastrophic Risk Management
- Consulting Engineer, Storesund Consulting
- President & CEO, NextGen Mapping, Inc. (Software Development)
- President & CEO, Storesund Construction, Inc. (Class A, B, C-57)
- President & Director, SafeR³ (Non-Profit)
- Adjunct Professor, Memorial University of Newfoundland
My Disaster Research

• 1986 NASA Challenger
• 2003 NASA Columbia
• 2005 Hurricane Katrina
• 2010 San Bruno PGE Explosion
• 2010 Deepwater Horizon
• 2014 Oso Landslide (WA State)
• 2015 Aliso Canyon Gas Leak
• 2017 Oroville Dam Spillway Failure
• 2017 US Navy Ship Collisions
• 2018 California Wildfires (Butte County)
• 2019 Brumadinho Landslide
• 2019 Boeing 737 MAX
• 2020 Michigan Dam Failures
• 2021 Surfside Condo Collapse
• 2018 to ??? Millennium Tower (ongoing)
Intriguing Terms

• Extreme Event – period of record; confidence interval?

• Risk – what is the Pf? and Cf? we’re talking about?

• Residual Risk – what have we/have we not looked at?

My research finds there is no shared understanding or communication of these terms...mean different things to different people.

For infrastructure, my first question is always “what was it supposed to do?” Turns out, systems are rarely ‘overwhelmed’....

They tend to fail in ‘under-whelming’ conditions
What is “Safe”?
High Reliability Organizations (HROs)

- Have a clear and explicit concept of “reliability” that is shared consistently across the organization
- Highly integrated reliability and safety-minded organizational culture (widely held assumptions, attitudes, values, and practices)
- Recognize and utilize “uncertainty” as a formal resource
- Use ‘precursor conditions’ as proactive risk-reduction approaches
- Embrace and support “Reliability Professionals”
- Exhibit a strategic degree of organizational flexibility
- Are constantly on the lookout for errors
Deepwater Horizon

Organizational Safety Culture Traits

• Inquiring attitude
• Hazard identification and risk management
• Leadership commitment to safety values and actions
• Effective safety and environmental communication
• Respectful work environment
• Environment of raising concerns
• Personal accountability
• Work processes
• Continuous improvement
Risk Management Frameworks

(1) Integrity Management
Explicitly Identifying What is Acceptable/Unacceptable Performance
“Safe = ....”

(2) Prevention Through People
Leveraging Employees on Front-Lines to Reduce Risk

(3) Regulation
Avoiding Past Mistakes
# Event Types

<table>
<thead>
<tr>
<th>Preventable</th>
<th>Unpreventable</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Knowable</strong></td>
<td><strong>Unknowable</strong></td>
</tr>
<tr>
<td>“Probabilities”</td>
<td>“Prevention Through People”</td>
</tr>
<tr>
<td>“Possibilities”</td>
<td>“Today’s Focus!!”</td>
</tr>
<tr>
<td><strong>Risk Transfer</strong></td>
<td><strong>Mindfulness</strong></td>
</tr>
<tr>
<td><strong>Risk Acceptance</strong></td>
<td></td>
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</tbody>
</table>
Risk Management and Socio-Technical Systems

Risk Management in systems designed, operated, and managed by people.
Investment Decisions

Lack of considering total (life-cycle) costs

Over-emphasis on minimizing short-term cost!!

Best Quality

System Quality
Failure is Time-Dependent

- Decreasing Failure Rate
- "Constant" Failure Rate
- Increasing Failure Rate

- Burn-In Failures
- Observed Failure Rate
- Constant (Random) Failures
- Wear-Out Failures

Few (if any) Risk Analyses identify time at which failure rates increase.

Most Risk Analyses Characterize the "Constant" Failure Rate.
Traditional Risk Analysis (TRA)

\[ \text{RISK} = \text{Pf} \times \text{Cf} \]

\( \text{Pf} = \) Probability of Failure

\( \text{Cf} = \) Consequence of Failure

Frequently, ‘Demand’ and ‘Capacity’ distributions are ‘imagined’ by “Subject Matter Experts” rather than by data or actual system configuration.
Statistics vs. Probability

Statistics
Past, Recorded Data

Probability
Future, Predicted

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UNIVERSITY OF CALIFORNIA
In this case, the past is likely not a perfect predictor of the future.
Limited “Imagination” for Scenarios

Failure Scenarios

- Credible: 10%
- Non-Credible: 20%
- Unrecognized & Credible (Not Considered): 70%

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NEED DIFFERENT TOOLS/METHODS/STRATEGIES FOR EACH REGION!

NOTE, THESE REGIONS ARE NOT DISCRETE, BUT VERY FLUID AND TIME-DEPENDENT!!
Traditional “Risk” & Crisis (Box 1 & Box 2)

“Residual Risk”

Possible “Risk” (Box 3)
Uncertainties

Probability, Statistics, and Reliability for Engineers and Scientists

Ignorance

- Conscious Ignorance
  - Inconsistency
  - Incompleteness
- Blind Ignorance
  - Fallacy
  - Unknowable
  - Irrelevance

- Inaccuracy
  - Confusion
  - Incompleteness
  - Unknowns

- Uncertainty
  - Conflict
  - Uncertainty
  - Absence

- Approximations
  - Vagueness
  - Coarseness
  - Simplifications

- Likelihood
  - Nonspecificity
  - Unspecificity

- Ambiguity
  - Randomness
  - Sampling

FIGURE 1-2 Ignorance types.
## Problem “Crispness”

### Crisp

- Bounded
- Structured
- Well-Defined
- Existing Algorithms
- Established "Rules"
- All stakeholders in strong agreement

### "Messy"

- Unbounded
- Unstructured
- Ill-Defined
- Heuristics (judgment)
- No established "Rules"
- Strong Stakeholder Disagreement
- Ineffective Communication

### EXERCISES

- Establish base assumptions
- Questions to be answered
- Abstracted from messes
- Well-Specified
- Identify plausible "Rules"
- Requires Effective Communication

### PROBLEMS

- Establish base assumptions
- Questions to be answered
- Abstracted from messes
- Well-Specified
- Identify plausible "Rules"
- Requires Effective Communication

### MESSES

- Unbounded
- Unstructured
- Ill-Defined
- Heuristics (judgment)
- No established "Rules"
- Strong Stakeholder Disagreement
- Ineffective Communication

<table>
<thead>
<tr>
<th>Quantitative</th>
<th>Qualitative</th>
<th>Ill-defined</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type I: Analytic</td>
<td>Type II: Crisis</td>
<td>Type III: &quot;Possibilities&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Type IV: &quot;Unexpected&quot;</td>
</tr>
</tbody>
</table>
Traditional “Risk” & Crisis (Box 1 & Box 2)

“Residual Risk”
Traditional “Risk” & Crisis (Box 1 & Box 2)

“Residual Risk”
Believed Credible

Possible “Risk” (Box 3)
Believed Non-Credible

Unimagined “Risk” (Box 4)
Lack of Imagination
…to address the weather whiplash that we’re now experiencing. To address the extremes that we’re experiencing for the first time in our lives. The fact that this facility shutdown last August, that never happened before, just never happened before, it was imagined, but we never thought it would be realized in our lifetime. It happened and the prospect that will happen again or very real particularly because we had the driest January the driest February and driest March in California history…

https://youtu.be/8Yolbq0xKHI?t=507
Confronting Belief

**Strategies/Tools**

- Integrity Management
- Prevention Through People
- Enhanced Regulation
- Uncertainty as a Resource
- Safety Culture Principles
- HRO Principles
- Life-Cycle Management
- Total Cost Analysis
- Embracing ‘extreme’ thinking
- Crisp Communication
  (Safe = ???)
LEVERAGE PEOPLE (HRO) & BUILD ORGANIZATIONAL CAPABILITIES ACROSS UNCERTAINTY DOMAINS (BOXES 1-4)

A. Have a clear and explicit concept of "reliability" that is shared consistently across the organization

B. Highly integrated reliability and safety-minded organizational culture (widely held assumptions, attitudes, values, and practices)

C. Recognize and utilize “uncertainty” as a formal resource

D. Use ‘precursor conditions’ as proactive risk-reduction approaches

E. Embrace and support “Reliability Professionals”

F. Exhibit a strategic degree of organizational flexibility

G. Are constantly on the lookout for errors
SCRaM – Crowdsourcing Tool

Create Scenario

Step 1
- Allow sharing for this scenario?
- Scenario Name

Step 2
- What type of disruption are you going to experience?
  - Select Type
    - Select

Step 3
- Select boxes in the chart below to represent your range of consequence and likelihood.

Consequence (Exposure)

<table>
<thead>
<tr>
<th>Likelihood</th>
<th>None</th>
<th>Minor</th>
<th>Moderate</th>
<th>Serious</th>
<th>Catastrophic</th>
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</thead>
<tbody>
<tr>
<td>Expected</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Very Likely</td>
<td></td>
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</tr>
<tr>
<td>Likely</td>
<td></td>
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<tr>
<td>Medium Likely</td>
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<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Unlikely</td>
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</tr>
<tr>
<td>Very Unlikely</td>
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</tr>
<tr>
<td>Unexpected</td>
<td></td>
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</tbody>
</table>
Elevated Releases Study

1997 Oroville Evacuation @ ~165,000 cfs

ELEVATED OROVILLE DAM RELEASES

VERY LIKELY

150,000 cfs

200,000 cfs

300,000 cfs

400,000 cfs

500,000 cfs

625,000 cfs

VERY UNLIKELY

Drought/Water Shortage
Flooding (Localized Stormwater)
Severe Weather
  - Extreme Heat
  - Freeze/Winter Storm
Wildfires

Earthquake > Mw 7.0
Full Dam Failure
Volcano
“Ark Storm”

Knowable

“Probabilities”
“Possibilities”
Today’s Focus!!

Unknowable

“Prevention Through People”

Preventable

Risk Transfer
Risk Acceptance

Unpreventable

Mindfulness

1986

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32 years ago, 300,000 people flattened the Golden Gate Bridge

ANTICIPATED
80,000

ACTUAL
800,000

Dr. Rune Storesund, D.E.ng. P.E., G.E.
Executive Director
Center for Catastrophic Risk Management (CCRM)
University of California, Berkeley
rune@berkeley.edu
10 NWS Offices -
(NWS Sacramento)
- Watch Warning Program
- Multiple Aspects of Weather
- EM Interface
- Public Interface
- 24 x 7

CA-NV River Forecast Center
- Hydrologic expertise
- Mainstem Rivers
- Reservoirs
- Snowpack/water supply

...the protection of life and property...
• Partner Email – 3-5 days out – approaching impactful weather

• Watch - Strong possibility of event to occur in next 12 - 48 hours. Occurrence, location, and/or timing is still uncertain

• Warning – Imminent or Occurring – Life threatening
  • Serious, Long or Short Duration Events
  • EAS and WEA messages

• Advisory – Non life threatening, significant weather events
  • May become life threatening if precautions are not taken

• Statements - Follow up/continuation products
EAS & WEA

Webpage
weather.gov/sacramento

Partner Emails
California NWS Offices - The CNRFC!

10 NWS Offices - (NWS Sacramento)
- Watch Warning Program
- Multiple Aspects of Weather
- EM Interface
- Public Interface
- 24 x 7

CA-NV River Forecast Center
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...the protection of life and property...
Weather Forecast Office
Sacramento, CA

Tuesday, January 25

River Forecast Distribution

weather.gov/sacramento

cdec.water.ca.gov

CNRFC.noaa.gov

Friday, April 22
NEW!!! CNRFC Daily Briefing

CNRFC Daily Briefing

Out Issued Tue Apr 22, 2023 at 08:31 AM PDT (updated daily by 10 AM Pacific Time).

Click image for full resolution version.
Additional Communication and Notification

- Emergency Management Contacts
  - Hourly / Daily / Weekly
- Phone, CalWAS, text, video, etc
- iNWS
- CalOES SOC
- County EOC Deployments
- State and Local briefings
- 24x7 NWS Operations access
  - Response
  - Recovery
  - Mitigation
  - Preparedness
If you have questions please contact:

NWS SACRAMENTO

cindy.matthews@noaa.gov

916-979-3064
Q&A
5 Minute Break
State-Federal Flood Operations Center

Oroville Dam Citizens Advisory Commission
Technical Workshop
FOC Responds to...

- High water / flooding
- Large and/or intense storms
- Earthquakes / tsunamis
- Dam incidents

FOC’s Role

Coordinate DWR’s response to flooding statewide
FOC Coordination

Provides:

• Situational awareness
• Technical and direct assistance
• Conduit for federal assistance under Public Law 84-99

Does NOT:

• Declare emergencies
• Order evacuations
• Repair levees
Situational Awareness

Provide year-round daily forecasts of:
- Reservoir inflows
- River flows and water levels
- For CA and parts of OR & NV

Users
- Flood Operations Center
- Cooperating Agencies
- State and County Offices of Emergency Services
- Public and media
High Water Notifications

Based on river forecasts
Notifications and updates provided to downstream agencies potentially impacted by high river flows and stages
Local, city, county, state & federal partners
These are not evacuation orders
FOC’s Relationship to Oroville Dam

Notifications and updates provided to downstream agencies potentially impacted by high flows or failure scenario
   LMAs, cities, counties, state & federal partners

Built-in redundancy

These are *not* evacuation orders

Participate in annual meetings and exercises
FLOOD OPERATIONS CENTER

(916) 574-2619  flood_center@water.ca.gov

Resources

California Data Exchange Center (CDEC)
http://cdec.water.ca.gov

CA-NV River Forecast Center (CNRFC)
http://www.cnrfc.noaa.gov/
Q&A
Dam Safety Planning Division

Emergency Action Plans
Water Code Sections 6160 and 6161

- Owners of state-regulated, jurisdictional dams must submit an Emergency Action Plan (EAP) to Cal OES and DWR if classified as EH, H, or S
- EAP must include a DWR-approved inundation map
- Includes deadlines for submissions
- Cal OES review timelines are given
- Owners must update the EAP, including the map, at a minimum every 10 years
Government Code Section 8589.5

- EAP must be developed in consultation with local public safety agencies
- EAP must adhere to FEMA’s Guidelines
  - 6 Elements of an EAP
    - Emergency Notification Flowcharts
    - Preparedness Activities
    - Response Process
    - Responsibilities
    - Inundation Maps
    - Additional Info in Appendices
- Dam owner must conduct an EAP notification exercise with local public safety agencies once a year
Emergency Action Plans

What is an EAP?

• Identifies potential emergency conditions at a dam
• Specifies actions to be followed to minimize property damage or loss of life
• Based on approved inundation maps, which show critical areas of evacuation in case of a dam emergency
Dam Owner Outreach to Public Safety Agencies

Who
• Those impacted by dam incident
  • Local: law enforcement, fire, OES,
  • State/Fed: NWS, DWR (DSOD, FOC), Cal OES

How
• Meetings, phone calls, etc.

When
• Earlier is better
• Have something to show those groups
Incorporating Outreach into Plan

Methods to Meet Statutory Requirement:

• Signature Page

• Narrative explaining which agencies were consulted during development of the plan and what the contributions were

• Agenda, sign-in roster, and minutes from EAP development meeting(s)

• Include the agencies’ roles within the EAP
Notification Flowcharts

Flowcharts

• Identifies who is to be notified of a dam safety incident, by whom, and in what order

• One chart or a set of charts may be needed depending on the complexity on the hazards associated with the dam and affected downstream areas

• Should include emergency level, individuals who will conduct notifications, prioritization of notifications, individuals who will be notified
Notification Flowchart for High Flow, Non-Failure, Potential and Imminent Failure

1) Santa Rosa County Sheriff Dispatch
   000-100-0000
   24 Hour Contact

2) National Weather Service - Los Angeles Office
   000-988-6610
   24 Hour Contact

3) SLWC Management
   Anthony Sanchez, General Manager
   000-000-0001
   24 Hour Contact

4) DSOD
   During business hours:
   Andrew Mangney, Chief Field Engineering Branch
   000-227-9800

   Outside of business hours:
   Bob Smith
   Area 9 Engineer
   000-227-4700

   If unable to reach Area Engineer:
   Tim Thomas
   Southern Regional Engineer
   000-227-4600

1) California State Water Resources Control Board
   000-845-8900
   24 Hour Contact

2) DWR Flood Operations Center
   000-574-2600
   24 Hour Contact

3) Santa Rosa County OES
   000-227-2222
   24 Hour Contact

4) California Highway Patrol
   000-333-3333
   24 Hour Contact

5) California Department of Transportation
   000-444-4444
   24 Hour Contact

6) Santa Rosa Water Works Facility
   000-400-0000
   24 Hour Contact

SLWC Operations (on site)
Ben Powell, Dam Supervisor
000-000-0002
24 Hour Contact

City of Santa Rosa
Fire Department
000-111-1111
24 Hour Contact

City of Santa Rosa Police Department
000-800-0000
24 Hour Contact

City of Santa Rosa
Field Services
000-777-7777
24 Hour Contact

City of Santa Rosa
Public Works
000-800-8000
24 Hour Contact

City of Santa Rosa
Utilities
000-800-8000
24 Hour Contact

City of Santa Rosa
Public Works
000-800-8000
24 Hour Contact

City of Santa Rosa
Public Works
000-800-8000
24 Hour Contact

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Questions?

Casey Meredith
Dam Safety Planning
Cal OES
Q&A
Making Investments to “Buy Down” Flood Risk

Oroville Citizens Advisory Commission
Flood Management Stakeholder Workshop
April 22, 2022
Outline of Today’s Topics

• “Buying Down Risk Concept”
• Central Valley Flood Protection Plan (CVFPP) Overview
• Using the CVFPP to Guide Future Investment Need
• Example of a Risk Assessment from the CVFPP
“Buying Down” Risk

Many of today’s other presentations have focused on understanding flood risk through better understanding of flood hazards, mapping, inspections, forecasting, and sharing information.

OCAC has previously featured presentations on reservoir storage operations.
Central Valley Flood Protection Plan

Key Features (as of 2017):

• Land area size of State of Florida
• Highest net agricultural production region in United States
• 1,600 miles of Federal-State levees
• Extensive system of bypasses & floodways
• 2 completely different river basins, each w/ over 5 major rivers
• Over 1.3 million people living in floodplains
• +$80B property / assets at risk
Recommended 2017 CVFPP Update Investment

CVFPP $17 to 21 billion Investment over 30 years

ONGOING INVESTMENTS $M/Y
Annual funding for routine activities: $250–310 M/year

+ CAPITAL INVESTMENTS $$$
One-time funding for construction or improvements: $12–16.2 B

CALIFORNIA DEPARTMENT OF WATER RESOURCES
Example of a Risk Assessment
Q&A
Public Comment
Thank You