Technical Memorandum

Agricultural Floodplain Ordinance Task Force

Recommended Administrative Refinements of the National Flood Insurance Program to Sustain Agriculture as a Wise Use of the Floodplain in Leveed Special Flood Hazard Areas

Sacramento, California
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Acknowledgments

Although this technical memorandum was prepared by HDR, it represents the collaborative work of the Agricultural Floodplain Ordinance Task Force (Task Force) and does not necessarily represent the views of HDR or of each Task Force member or their home organization. HDR would like to provide acknowledgment for members of the Task Force and others who provided research, offered editorial suggestions, and drafted sections of the document.

A special acknowledgment goes to the following individuals who drafted sections of the document:

- Barry O'Regan, Elizabeth Avelar, and Ronald Baldwin of KSN Inc. prepared the information on levee relief cuts, and the associated model floodplain management ordinances and *Guide to Utilizing Levee Relief Cuts to Lower Base Flood Elevations* contained in Appendix E.
- Kathleen Schaefer prepared the information on Community Choice Flood Risk Financing and the supporting information contained in Appendix D.
- Jeffrey Adams and Joseph Tootle of ENGEO Inc. prepared the information on Geologic Hazard Abatement Districts contained in Appendix D.
- Chris Fritz of Peterson Brustad Inc. prepared the section on Zone D rates and some of the Guide to Utilizing Levee Relief Cuts to Lower Base Flood Elevations.

Executive Summary

Agriculture is one of the most appropriate land uses within a Special Flood Hazard Area (SFHA) because it minimizes the population at risk, requires relatively few structures, uses the land productively to provide a much-needed commodity, and provides wildlife benefits. The deeper the floodplain, the more appropriate for agriculture to be the primary land use as the consequences of flooding are greatly increased for most other viable land uses. In other words, a vibrant, sustainable agricultural economy is a key defense against risky and unwise floodplain development. Yet the requirements of National Flood Insurance Program (NFIP) are interfering with the sustainability of agriculture in deep floodplains.

As the Federal Emergency Management Agency (FEMA) updates Flood Insurance Rate Maps (FIRM) to show new SFHAs behind previously accredited levees throughout many of the Sacramento Valley's agricultural areas, sustainability of Sacramento Valley agriculture has become a major concern. There are two primary impacts when an agricultural area is mapped into an SFHA: (1) land use requirements for elevating or floodproofing new and substantially improved (which includes substantially damaged) structures to or above the Base Flood Elevation (BFE), and (2) a requirement to purchase a flood insurance policy through the NFIP for each structure with a federally backed mortgage (aka mandatory insurance purchase requirement).

A review of FEMA's mapping procedures, insurance requirements, insurance rates, and policies indicates that agricultural facilities in leveed areas of the Sacramento Valley are beginning to bear a disproportionately large share of the financial burden of the NFIP. The financial burden is substantially greater than the risk exposure as a result of the following practices and policies:

- Insurance premiums are based on the assumption that a non-accredited levee provides no flood protection, when in fact most non-accredited levees provide a substantial amount of flood protection that can be quantified and recognized. Since agricultural areas can rarely afford to have accredited levees, the effect is that many leveed agricultural areas pay insurance premiums that are much higher than the associated flooding risk.
- Insurance premiums for agricultural structures are generally the same as for retail business and industrial structures, which are thought to be more vulnerable to flood damage than agricultural structures.
- Fully wet floodproofed structures are required to pay insurance premiums as if they had no floodproofing.
- Each structure on a parcel is required to have an individual policy with a $250 annual surcharge. Farms typically have far more structures than other types of businesses.
- Low value detached structures associated with agriculture are required to have flood insurance coverage when similar structures associated with a residence would not.

- Insurance premiums for structures in areas protected by reaches of levee that meet all federal requirements are charged at the Zone D rate instead of the lower Zone X (Shaded) rate, if the levee reach happens to be part of a larger levee system.
- Insurance premiums for structures in areas protected by well-studied sound reaches of non-accredited levee are charged at the Zone D rate, the same as areas of undetermined flood risk.

The 2012 CVFPP states:

> "…to sustain agricultural communities and support the natural and beneficial functions of floodplains, FEMA should consider establishing a flood zone for agriculturally-based communities to allow replacement of reinvestment development in the floodplain for existing structures. The State will work with FEMA to consider a special, lower rate structure that reflects actual flood risks for agricultural buildings in rural-agricultural areas located in Special Flood Hazard Areas."

In 2014, FEMA officials and the Governmental Accountability Office encouraged exploration of ideas to address sustainability of modern agriculture in deep floodplains. The Agricultural Floodplain Ordinance Task Force (Task Force) was formed in late 2015, using Regional Flood Management Plan grant funding from the California Department of Water Resources (DWR), to explore ideas that could be implemented administratively by FEMA without changing law or regulation, for improving sustainability of agriculture in leveed SFHAs. The Task Force is comprised of officials from FEMA, DWR, the Central Valley Flood Protection Board, reclamation districts, levee districts, flood control agencies, counties, engineers, farmers, and non-governmental organizations (including various farm bureaus, the Association of State Flood Plain Managers (ASFPM), the National Association of Flood and Stormwater Management Agencies, and American Rivers).

This technical memorandum presents nine recommendations developed by the Task Force for modifying FEMA's rules and practices under the NFIP to improve sustainability of agriculture in leveed SFHAs. However, the home organizations of Task Force members have not yet acted to support or oppose the recommendations, with the exception of ASFPM (recommendations 3, 4, 5, 7, and 8 are supported by ASFPM; recommendations 1, 2, and 6 are not supported by ASFPM; and ASFPM is neutral on recommendation 9). The recommendations address how rules and practices could be modified to: (1) reduce or remove elevation and floodproofing requirements for new and substantially improved agricultural structures, and (2) reduce the cost of flood insurance for agricultural structures with a federally backed mortgage to a more appropriate portion of the financial risk in the NFIP.

Initial approaches for the Task Force to consider were identified in scoping discussions as early as 2013:

1. Use relief cuts to lower BFEs for new and substantially improved agricultural structures.
2. Use FEMA's existing Zone D to allow new and substantially improved agricultural structures to be constructed without elevation or floodproofing requirements.
3. Make recommendations for changes to FEMA's wet floodproofing requirements for agricultural structures.

Another approach identified for consideration was establishing a flood risk management model for rural areas that could allow for lower flood insurance rates or expanding the use of variances for agricultural structures.

Between February and December 2016 the Task Force met four times and its work groups met 16 times to consider these and other ideas for recommendations to FEMA in this technical memorandum. The Task Force explored ideas for addressing both land use requirements (i.e., elevation and floodproofing of new and substantially improved structures) and insurance requirements. This work by the Task Force resulted in the following nine recommendations to FEMA:

1. Levee Relief cuts with EOP and floodplain management ordinance

Levee relief cuts are not recognized on FIRMs and not considered when floodplain administrators issue permits for construction in Zone A. The Task Force recommends that FEMA recognize levee relief cuts that are properly planned and adopted by a community and:

- Update FEMA 265 to provide guidance on how a floodplain administrator should estimate the BFE in Zone A when considering a relief cut.
- In Zone A, FEMA should approve floodplain administrator use of lowered BFEs for relief cuts, coupled with a special floodplain management ordinance, for permitting new and substantially improved agricultural structures.
- Where a FIRM contains Zone AE that reflects ponding against a downstream levee, use the LOMR process to modify the Zone AE to reflect the lowered BFE that results from a planned relief cut, provided that the community adopts a special floodplain management ordinance. The ordinance would require new and substantially improved non-agricultural structures in Zone AE to be elevated (or floodproofed) to or above the BFE that would result without the relief cut.
- Where a FIRM contains Zone AE that reflects ponding against a downstream levee, use the LOMR process to modify the Zone AE to reflect the reduced extent of ponding that results from a planned relief cut. If there is no other source of flooding for the area that is removed from the pond-created Zone AE, that area should be identified on the FIRM as Zone D or Zone X (Shaded), provided that the community adopts a special floodplain management ordinance. The ordinance would require new and substantially improved non-agricultural structures in this Zone D or Zone X (Shaded) to be elevated (or floodproofed) to or above the BFE that would result without the relief cut.

2. Zone D with floodplain management ordinance and flood insurance instrument

Elevation and floodproofing requirements for new and substantially improved agricultural structures in deep SFHAs can be costly and burdensome, impacting agriculture sustainability. There is no direct way under current regulations to provide relief from these requirements in a SFHA. But there is an indirect way, using Zone D. The Task Force recommends that FEMA offer an option to remap SFHAs as Zone D in leveed areas that meet the following requirements:

- The community adopts a special floodplain ordinance that requires elevation (or floodproofing) to or above the BFE for new and substantially improved non-agricultural structures in the new Zone D.
- The community implements a self-reporting program that indicates compliance with the special floodplain management ordinance in the new Zone D.
- The community adopts a levee risk management plan for the new Zone D.
- The community mitigates the loss of the mandatory purchase requirement for the structures in the new Zone D. Exceptions may include structures without federally backed mortgages, residential detached structures, and low value structures. The goal would be to have more insurance coverage than currently exists in the SFHA. The Task Force has identified two potential mechanisms for achieving this: (1) an ordinance requiring flood insurance purchase, and (2) Community Choice Flood Risk Financing (e.g., purchase of a multi-year group flood insurance policy from a private insurance carrier).

3. Zone X (Shaded) for certified levee reaches

FEMA's Operating Guidance 12-13 does not allow accreditation of a reach of levee unless the entire levee system can be certified and accredited, and therefore Zone D is used on the FIRM behind reaches of levee that meet all requirements for certification. The Task Force recommends that FEMA should revise its Operating Guidance 12-13 to map areas behind a certified reach of levee as Zone X (Shaded) instead of Zone D if the certified reach of levee is part of a larger levee system and it is providing protection from the Base Flood. If the levee reach does not meet freeboard requirements, FEMA should continue to implement Operating Guidance 12-13 as currently written and map the area behind it as Zone D.

4. Wet floodproofing rules for agricultural structures

FEMA's rules require flood vents (or openings) for entry and exit of floodwaters in all wet floodproofed agricultural structures. The Task Force recommends allowing human intervention for providing entry of floodwaters into agricultural structures in situations when large doors on at least two sides of the building could be locked open. If human intervention is authorized, appropriate conditions should be established in a Flood Emergency Operation Plan approved by the community and/or community's floodplain administrator. This should be provided through updates to ASCE 24-14 and TB 7-93. The Task Force also recommends that a factor of safety of 1.5 or other appropriate, technically justified factor of safety should be used for venting of agricultural structures and that the update to TB 7-93 should provide guidance on the number and size of openings for agricultural structures, including in floodplains deeper than 6 feet.

5. Insurance rates for non-accredited levees

FEMA's insurance rates for structures behind a non-accredited levee are the same as if there was no levee at all. Yet many non-accredited levees provide protection from frequent floods and significantly reduce flood risk. The Task Force recommends that FEMA use sound actuarial science to amend its insurance rates to reflect the flood protection provided by a non-accredited levee as documented by a civil engineer,

following a specific methodology and meeting specific criteria recommended by the Task Force.

6. Insurance rates for Zone D protected by a sound reach of levee

FEMA's Operating Guidance 12-13 created a new type of Zone D – one that has been studied and the flood risk is known. The Task Force recommends that FEMA amend its insurance rates to include two separate rating tables for Zone D. One rating table would be for areas identified on the FIRM as 'Zone D Undetermined/Unknown' – the historic Zone D. Another (new) rating table would be for areas identified on the FIRM as 'Zone D Protected by Levee' – for areas mapped as Zone D following FEMA's Operating Guidance 12-13.

7. Insurance rates for agricultural structures

The Task Force understands that when FEMA developed insurance rates for agricultural structures decades ago, there was insufficient claims data to develop rates unique to agricultural structures. Therefore, agricultural structure rates are generally the same as rates for retail business and industrial structures and may be higher than necessary. The Task Force recommends that FEMA develop insurance rates for agricultural structures separately from other types of structures, update the Flood Insurance Manual with the new rates, and apply them expeditiously.

8. Insurance rates for wet floodproofed structures

FEMA's rules allow for wet floodproofing of agricultural structures by variance. But insurance rates for wet floodproofed structures are the same as if there was no floodproofing. The Task Force recommends that FEMA recognize wet floodproofing of agricultural structures in its insurance rates and address it similar to dry floodproofing, by updating the Flood Insurance Manual with the new rates.

9. Add levee risk management activities to CRS

FEMA's Community Rating System (CRS) provides credits that can reduce insurance premiums in CRS-participating communities. Several CRS credit categories are applicable in rural/agricultural areas. But in leveed areas of a community, the credits would be dissipated throughout the larger community, rendering them ineffective for rewarding good levee risk management in a particular leveed area of a community. The Task Force recommends that the CRS program recognize a subcommunity within a community and offer CRS credits for the following activities:

- High ground evacuation locations
- Federal levees with System Wide Improvement Frameworks
- Risk-based levee system improvements
- Levee risk management plans

The Task Force also recommends that federal levees should be eligible for CRS points for levee maintenance, unless the levee is operated and maintained by the federal government. Most of the federal levees in the Sacramento Valley are not operated or maintained by the federal government.

1 Introduction

Agriculture is one of the most appropriate land uses within a Special Flood Hazard Area (SFHA) because it minimizes the population at risk, requires relatively few structures, uses the land productively to provide a much-needed commodity, and provides wildlife benefits. The deeper the floodplain, the more appropriate for agriculture to be the primary land use as the consequences of flooding are greatly increased for most other viable land uses. In other words, a vibrant, sustainable agricultural economy is a key defense against risky and unwise floodplain development.

Executive Order 11988, signed in 1977, and updated with Executive Order 13960, signed in January 2015, recognized the importance of limiting development in floodplains by requiring federal agencies to avoid the direct or indirect support of development in the floodplain whenever there is a practical alternative. One way to limit development in the floodplain is to support agricultural use. Yet the requirements of National Flood Insurance Program (NFIP) are interfering with the sustainability of agriculture in deep floodplains.

The NFIP was enacted in 1968, during a time of profound social change. The NFIP, reflecting the country's values at the time, was designed as both an insurance program and a social program. Using a three legged stool approach the NFIP links universal flood insurance, a form of prefunded disaster relief, to land use restrictions through Flood Insurance Rate Maps (FIRM). The legislation and implementing land use regulations were developed with the small Midwestern family in mind and many aspects of the program have not changed since its inception. The Midwestern family farm of the 1960's bears little resemblance to today's technology driven Sacramento Valley agribusiness providing high value consumer products to the world. In deep floodplains, NFIP requirements for elevating structures and providing vented openings interfere with efficient and sanitary food processing and storage.

Unlike the San Joaquin Valley, and many other agricultural areas of the nation, the Sacramento Valley is protected from flooding by a system of federal levees that, until recently, was accredited as providing protection from the one percent annual chance flood event (Base Flood). For generations, agricultural structures have been constructed in reliance upon that system of federal levees. As the Federal Emergency Management Agency (FEMA) updates FIRMs to show new SFHAs behind previously accredited levees throughout many of the Sacramento Valley's agricultural areas, sustainability of Sacramento Valley agriculture has become a major concern.

Agricultural areas generally do not have the financial means to improve levees sufficiently for accreditation, so it is not possible in most cases for agricultural areas to avoid being mapped into an SFHA or to perform the levee investigations and repairs required for being mapped out of an SFHA. Further, many agricultural areas were developed prior to the NFIP or after original FIRMs showed these agricultural areas as low risk areas protected by levees (Zone X). Although development was basically unrestricted, these areas continued to maintain low risk agricultural development. It was not until FEMA's Map Modernization began in 2001 and the requirement in 2005 for communities to document that these levees meet rigorous engineering standards that these areas began to be mapped as SFHAs and were forced into strict building

provisions and expensive flood insurance premiums that greatly impact the sustainability of agriculture.

There are two primary impacts when an agricultural area is mapped into an SFHA: (1) land use requirements for elevating or floodproofing new and substantially improved (which includes substantially damaged) structures to or above the Base Flood Elevation (BFE), and (2) a requirement to purchase a flood insurance policy through the NFIP for each structure with a federally backed mortgage (aka mandatory insurance purchase requirement). Insurance from a private insurer can be purchased instead of NFIP insurance, but many lenders are currently unwilling to accept private insurance.

In recognition of the difficulty and cost required to elevate or dry floodproof agricultural structures in deep floodplains, FEMA allows for most agricultural structures to be wet floodproofed though a variance issued by the community. Wet floodproofing of an enclosed structure requires vents that add to the cost of the structure and may conflict with the food safety requirements. Food stored within a wet floodproofed structure usually cannot easily be moved in advance of a flood and is subject to loss during a flood.

Although structures are few and far between in agricultural areas, farms typically have many structures; some of the structures may have little value to the farm. But in an SFHA, all are required to carry flood insurance, if there is a federally backed mortgage. A review of FEMA's mapping procedures, insurance requirements, insurance rates, and policies indicates that agricultural facilities in leveed areas of the Sacramento Valley are beginning to bear a disproportionately large share of the financial burden of the NFIP – impacting the sustainability of agriculture in the Sacramento Valley. The financial burden is substantially greater than the risk exposure as a result of the following practices and policies:

- Insurance premiums are based on the assumption that a non-accredited levee provides no flood protection, when in fact most non-accredited levees provide a substantial amount of flood protection that can be quantified and recognized. Since agricultural areas rarely can afford to have accredited levees, the effect is that many leveed agricultural areas pay insurance premiums that are much higher than the associated flooding risk.
- Insurance premiums for agricultural structures are generally the same as for retail business and industrial structures, which are thought to be more vulnerable to flood damage than agricultural structures.
- Fully wet floodproofed structures are required to pay insurance premiums as if they had no floodproofing.
- Each structure on a parcel is required to have an individual policy with a $250 annual surcharge. Farms typically have far more structures than other types of businesses.
- Low value detached structures associated with agriculture are required to have flood insurance coverage when similar structures associated with a residence would not.
- Insurance premiums for structures in areas protected by reaches of levee that meet all federal requirements will be charged at the Zone D rate instead of the much lower Zone X (Shaded) rate, if the levee reach happens to be part of a larger levee system.

- Insurance premiums for structures in areas protected by well-studied sound reaches of non-accredited levee will be charged at the Zone D rate, the same as areas of undetermined flood risk.

This technical memorandum presents recommendations developed by the Task Force for modifying FEMA's rules and practices under the NFIP to improve sustainability of agriculture in leveed SFHAs. The recommendations address how rules and practices could be modified to: (1) reduce or remove elevation and floodproofing requirements for new and substantially improved agricultural structures, and (2) reduce the cost of flood insurance for agricultural structures with a federally backed mortgage to a more appropriate portion of the financial risk in the NFIP.

Previous efforts to change law and regulation on behalf of agriculture have not been fruitful. Several years ago the Agricultural Floodplain Management Alliance (AFMA) was formed to advocate for changes to law and regulation. However, AFMA was largely centered in Northern California and was not able to obtain support from other portions of the country. In addition, Congress did not have the appetite to explore such focused legislative changes in advance of NFIP reauthorization. **Consequently, this technical memorandum:**

- **explores ideas that could be implemented administratively by FEMA without a change to law or regulation, and**
- **excludes from consideration recommendations specific to residential structures associated with agriculture due to the potential for injury and loss of life and the controversial nature of relaxing floodplain management requirements for these structures**.

2 Background

FEMA began a nationwide program to update and digitize FIRMs in 2001, called the Map Modernization Program. Under Procedure Memorandum 34, FEMA required that for a levee system to be accredited on the updated FIRM as providing protection from the Base Flood, the community would need to provide an engineer's certification of the levee system. Otherwise, the updated FIRM would show the area behind the levee system as a SFHA. Many of the levees in the Sacramento Valley and other rural/agricultural areas across the United States do not have sufficient data to meet FEMA's accreditation criteria for protection against the Base Flood; or the existing data indicate that the levees do not provide protection against the Base Flood. FEMA has been mapping these SFHAs to reflect the levee deaccreditation status.

After losses from Hurricanes Katrina and Sandy, the Biggert-Waters Flood Insurance Reform Act of 2012 (Biggert-Waters) increased NFIP insurance rates. The Homeowner Flood Insurance Affordability Act of 2014 (HFIAA) has delayed most of the planned rate increases.

In 2007, California enacted several reforms that increased the consideration given to flood risk when communities make land use decisions. Some of these considerations apply statewide, and in the Central Valley additional requirements were established. Some of these requirements are:

- Construction in urban areas with potentially deep flooding must be protected from the flood with an annual chance of 1-in-200 (i.e., twice the protection required by FEMA).
- 200-year flood risk maps are to be developed by DWR for areas protected by facilities of the State Plan of Flood Control.
- Flood risk notifications are sent annually by DWR to all property owners protected by facilities of the State Plan of Flood Control.
- Beginning in 2012 and every 5 years thereafter, DWR is to develop and the Central Valley Flood Protection Board is to approve, a Central Valley Flood Protection Plan (CVFPP).

The 2012 CVFPP states:

> "…to sustain agricultural communities and support the natural and beneficial functions of floodplains, FEMA should consider establishing a flood zone for agriculturally-based communities to allow replacement of reinvestment development in the floodplain for existing structures. The State will work with FEMA to consider a special, lower rate structure that reflects actual flood risks for agricultural buildings in rural-agricultural areas located in Special Flood Hazard Areas."

The 2012 CVFPP also encouraged local agencies to develop Regional Flood Management Plans (RFMPs) for consideration by the California Department of Water Resources (DWR) in developing the 2017 CVFPP. The RFMPs were completed in 2014 with grant funding from DWR.

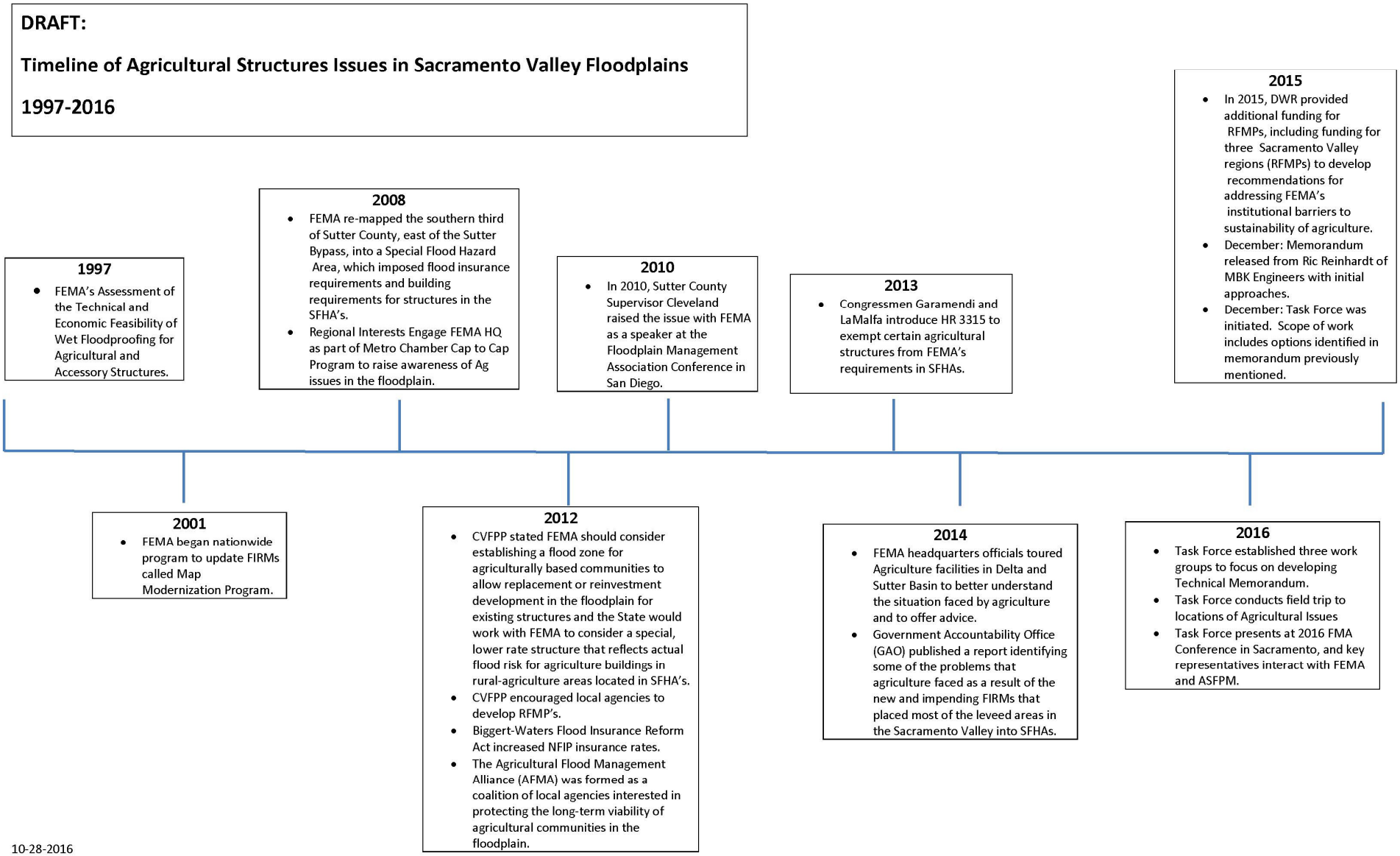
Also in 2014, FEMA headquarters officials toured agricultural facilities in the Delta and the Sutter Basin to better understand the situation faced by agriculture and to offer advice. The advice was that (1) recommendations for changes to wet floodproofing rules should by developed, (2) recommendations for considering levee relief cuts on the NFIP maps should be developed, (3) other recommendations should be developed that might be beneficial to agricultural sustainability, (4) FEMA would participate with local and state organizations in developing the recommendations, and (5) the recommendations should be administratively implementable by FEMA without requiring a change in law or regulation.

In 2014, the Government Accountability Office (GAO) published a report identifying some of the problems that agriculture faced as a result of the new and impending FIRMs that placed most of the leveed areas in the Sacramento Valley into SFHAs. This report recommended that FEMA update the wet floodproofing requirements in Technical Bulletin 7-93 (TB 7-93) in consideration of modern farming operations and deep, expansive floodplains being mapped into SFHAs.

In 2015, DWR provided additional funding for RFMPs, including funding for the three Sacramento Valley regions to develop recommendations for addressing FEMA's institutional barriers to sustainability of agriculture. DWR will consider including these recommendations developed through the RFMPs in the 2017 Central Valley Flood Protection Plan. The three Sacramento Valley regions have cooperated and funded a consultant team (HDR and MBK Engineers) to form and lead the Task Force that will make recommendations to FEMA about policy and practice changes that help sustain agriculture in SFHAs behind levees. Figure 1 is a timeline of activities relevant to the work of the Task Force.

The Task Force is composed of officials from FEMA, DWR, the Central Valley Flood Protection Board, reclamation districts, levee districts, flood control agencies, counties, engineers, farmers, and non-governmental organizations (including various farm bureaus, the Association of State Flood Plain Managers (ASFPM), the National Association of Flood and Stormwater Management Agencies, and American Rivers).

Figure 1. Timeline of Relevant Activities



3 Initial Approaches Considered

Initial approaches for the Task Force to consider were identified in scoping discussions as early as 2013 and are documented in a December 4, 2015 memorandum from Ric Reinhardt of MBK Engineers, Inc. stating "The scope for this effort proposes to explore three options that include:

1. Use of relief cuts to lower base flood elevations – This task would create an emergency response plan to excavate or remove portions of a levee in advance of, or immediately following, a flood that overwhelms levees, dams and/or other infrastructure of the protected basin. This plan would be coupled with (1) a floodplain mapping procedure, (2) flood zone designations, and (3) a floodplain management ordinance. The floodplain management ordinance is envisioned to limit residential development in the area that would be relieved of flooding by the levee relief cut.
2. Use of FEMA's existing Zone D – This task would explore the potential to use FEMA's existing FIRM Zone D designation and would involve drafting a model floodplain management ordinance that is envisioned to limit new residential development but allow for other structures that support agriculture and look at options to reduce the flood insurance rates for these areas.
3. Develop a wet floodproofing ordinance for agricultural structures – This task would include drafting recommendations for changes to FEMA's floodproofing requirements to accommodate the unique aspects of structures that support agriculture in the Sacramento Valley.

Other options that have been suggested include establishing a flood risk management model for rural areas that could allow for lower flood insurance rates or expanding the use of variances for agricultural structures. Such an approach would allow FEMA to develop a more actuarial rate based on assessing a series of risk factors, in contrast to FEMA's current approach which assumes that no levees exist to protect the rural basins. This approach may include the following actions:

1. Documentation of measures taken to eliminate or reduce non-agricultural development: conservation easements, zoning, agricultural easements, Williamson Act lands, agricultural mitigation fees, development impact fees, floodplain mapping, flood easements and other locally imposed floodplain management measures.
2. A written history of past levee performance with documentation of actions taken to address deficiencies. This will work best for basins that have not had a failure or ones that have had few failures with significant post-flood investment to correct the problems.
3. A basin emergency response (including flood warning and notification systems) and recovery plan.
4. A relief cut plan as described above.
5. A well-funded operation and maintenance plan with a record of maintaining the levee to a high standard.

6. An assessment of the levee system with:
    a. Risk-based investment to correct known deficiencies.
    b. A flood fight plan that identifies resources (personnel, equipment, supplies, funding) including regional coordination and mutual aid agreements. Annual documentation of flood fight training. Basin-wide, risk-based execution that includes prioritization of critical sites (item c. below), repair protocols (including design drawings) and advance measures.
    c. A reasonable estimate of the likely frequency of inundation of the basin (to demonstrate low risk to the NFIP). This includes refinement of existing DWR fragility curves for all rural basins in the 2012 CVFPP model with new information and improvements."

4 Task Force

The Task Force was initiated in December 2015, beginning with a December 18, 2015 kickoff meeting of the Executive Committee – at which time the name of the Task Force was selected. The Executive Committee is comprised of representatives from DWR and three Sacramento Valley regions funding the effort through DWR's RFMP2 grants. The Executive Committee had three meetings between December 2015 and August 2016.

Meetings of the full Task Force were as follows:

- February 22, 2016 – Kickoff meeting
- April 28, 2016 – Field trip to Montna Farms and Golden Gate Hop Ranch*
- August 25, 2016 – Discuss preliminary recommendations
- December 2, 2016 – Discuss draft technical memorandum

At the February 22, 2016 kickoff meeting, the Task Force decided that the scope of work should include the options identified in the December 4, 2015 memorandum discussed previously. One additional concept was identified for consideration – recognizing the flood protection provided by a non-accredited levee. This concept, and information obtained about flood insurance rates, led to further work and recommendations regarding flood insurance rates.

Three work groups were established in April 2016 and held a total of 15 meetings between May 12 and August 17. The work groups also met jointly on October 5 to discuss edits and comments on the working draft technical memorandum. The three work groups were comprised of volunteers from the Task Force, organized according to a recommendation made at the February 22, 2016 kickoff meeting. The work groups and actions considered were:

- Work Group 1 (Land Use and Structures)
    - Changes to FEMA's agricultural structures definition
    - Changes to wet floodproofing requirements for agricultural structures
    - Emergency plans for levee relief cuts and related changes for BFEs for agricultural structures through a special floodplain management ordinance
    - Use of Zone D instead of Zones A/AE with a special floodplain management ordinance
    - Use of Zone X (Shaded) instead of Zone D behind levee reaches meeting the requirements of 44 CFR 65.10
- Work Group 2 (FEMA Insurance)
    - Changes to FEMA's insurance rates for areas protected by non-accredited levees documented to provide specified levels of flood protection
    - Changes to Zone D insurance rates for areas protected by levees evaluated under FEMA's Operating Guidance 12-13
    - Development of FEMA insurance rates unique to agricultural structures

  - Recommendations for FEMA insurance rates for wet floodproofed structures
- Work Group 3 (Private Insurance, CRS, Risk Management, Others)
  - Recommendations that would enable use of non-NFIP flood risk insurance instruments
  - Recommendations related to CRS and risk management in leveed areas

Task Force membership was open and grew throughout the process. A membership list is shown in Appendix A. Work group members are also identified in Appendix A.

Selected Task Force related activities:

- On May 4, 2016 Ag Alert published an article on the April 28 field trip of agricultural structures in the Sutter Basin and the implications of flood rules on farmers.
- On September 7, 2016 a session on agricultural structures in floodplains was held at the annual Floodplain Management Association conference in Sacramento, with several Task Force members on the panel.
- On September 8 and October 27, 2016 Task Force representatives discussed preliminary recommendations with FEMA officials.

Figure 2. Photos from April 28, 2016 Field Trip near Yuba City, California

Meeting at Montna Farms

Wet Floodproofed Shop at Golden Gate Hop Ranch

*Photo on left shows Jon Munger of Montna Farms speaking to tour group with a solar panel array and rice storage silos below BFE. Photo on right shows a wet floodproofed shop inside of a larger wet floodproofed agricultural structure with: (1) a large opening to the shop without a door so as to provide for entry and exit of floodwaters, and (2) plywood above the shop to surround electrical components raised above the BFE.[1]

[1] *Important observations from the field trip and subsequent research include:

- If a new or substantially improved agricultural structure is in a deep floodplain, a few feet of depth reduction that might be achieved with a levee relief cut will not be very helpful in reducing the cost of constructing a wet floodproofed structure. But at the upstream end of the ponding area, a few feet of depth reduction would be very helpful.
- Solar panel arrays would not be cost-justified if they need to be elevated above the BFE in a deep floodplain. If not sufficiently elevated during a flood, solar panels would be damaged by submergence due to water entering at the electrical connection. The inverters could be elevated above the BFE at modest cost, and they comprise a large percentage of the solar array investment. Solar panels and inverters unattached to a structure do not fall under the definition of “structure” in FEMA’s regulations and a community therefore may choose whether or not to regulate them with respect to elevation.

5 Actions Considered and Recommendations

This section of the memorandum presents actions considered by the Task Force. As noted earlier, only actions that could be administered by FEMA without changing a law or regulation were considered. Some actions briefly considered by the Task Force that would require a change in law or regulation are identified in Appendix B.

The Task Force explored ideas for addressing both land use requirements (i.e., elevation and floodproofing of new and substantially improved structures) and insurance requirements. Some Task Force members wanted to remove requirements for elevation or floodproofing of new and substantially improved agricultural structures and to expand the types of structures that could be considered “agricultural.” Other Task Force members wanted to retain the existing requirements for elevation or floodproofing and to narrow the types of agricultural structures that qualify for a wet floodproofing variance.

The Task Force considered two aspects of flood insurance: (1) whether the mandatory purchase requirement should be eliminated for agricultural structures, and (2) whether insurance rates for agricultural structures should be reduced. Some members of the Task Force wanted to remove the mandatory purchase requirement for agricultural structures, while others wanted to retain it. The Task Force experienced full agreement on actions that would reduce the cost of flood insurance for agricultural structures.

The following is a presentation of the actions considered by the Task Force and the associated recommendation for each action, if any. However, the home organizations of Task Force members have not yet acted to support or oppose the recommendations, with the exception of ASFPM (recommendations 3, 4, 5, 7, and 8 are supported by ASFPM; recommendations 1, 2, and 6 are not supported by ASFPM; ASFPM is neutral on recommendation 9),

Some actions are focused on land use requirements; others are focused on insurance requirements; and some actions include both land use and insurance. The actions are grouped under the following three categories: (1) land use and insurance, (2) land use, and (3) insurance.

5.1 Land Use and Insurance Actions

In SFHAs, the NFIP couples land use restrictions with mandatory purchase of flood insurance. There is broad agreement that flood risk reduction must include some form of land use restriction and that flood losses should be borne by the beneficiary instead of the taxpayer. However, as noted in the Introduction, the current building restrictions and insurance rates cause challenges for agricultural activities.

Land use and insurance actions include actions that (1) relax requirements on construction of new and substantially improved agricultural structures or that affect the BFE or zone designation on the FIRM, and (2) relax or modify insurance requirements or reduce insurance rates.

5.1.1 Levee relief cuts with EOP and floodplain management ordinance

A relief cut is a pre-planned, engineered cut in a levee for the purpose of creating an improvised weir to return impounded floodwaters (usually from upstream levee overtopping or breaching) into a receiving floodway. This action of creating a lower elevation weir thereby reduces the elevation of impounded flood waters which would otherwise reach the elevation of the original levee crown before spilling into the receiving waters. Relief cuts, when properly pre-planned and effectively implemented, have the potential to lower the BFE, and the extent and duration of inundation caused by an upstream levee breach or overtopping (see Figure 3). Relief cuts are a historic and accepted method for reducing flood damages after failure of an upstream levee; a wide range of experience and documentation is available for formally incorporating this flood fight action into floodplain engineering and emergency planning practices.

The Task Force has identified an approach for using relief cuts to lower BFEs and shrink SFHAs for agricultural structures without reducing elevation/floodproofing requirements for non-agricultural structures in the area that would benefit from the levee relief cut. This approach includes an emergency response plan to excavate or remove portions of a levee immediately following a flood that overwhelms or breaches a levee system and enters the leveed area. This plan is coupled with (1) a floodplain mapping procedure, (2) flood zone designations, and (3) a special floodplain management ordinance.

The Task Force prepared a document, contained in Appendix E, entitled *Guide to Utilizing Levee Relief Cuts to Lower Base Flood Elevations,* which describes in detail, criteria for developing Preliminary Engineering Designs (PEDs) for pre-planned relief cuts, recommendations for conducting the hydraulic modeling, and standardized engineering criteria for determining the effects of a relief cut on the BFE. The PEDs contain analysis for determining appropriateness of a relief cut, implementation time and needs, and level of effectiveness for the actual flood circumstances.

To effectively plan and implement a relief cut, the agency with primary levee responsibility, the local levee maintaining agency, must have in place an Emergency Operation Plan – Basic Plan (EOP) and flood-specific Annex, which clearly identifies the trigger and decision points to be used to initiate execution of a relief cut. A sample EOP, compliant with requirements within FEMA's Comprehensive Preparedness Guide 101 (CPG101), is also included in Appendix E. The plan and identified agency responsibilities would need to provide strong assurance to FEMA and the community that the relief cut would occur as planned, such that it would be appropriate to use the lowered BFE for agricultural structures and, if the SFHA is mapped as Zone AE, to show the lowered BFE on the FIRM.

The Task Force developed a model floodplain management ordinance for regulating areas benefitting from relief cuts. The ordinance provides guidance for use of relief cuts in Zone A, Zone AE, Zone D Local Flood Hazard Area Due to a Relief Cut, and Zone X (Shaded) Local Flood Hazard Area Due to a Relief Cut:

- Zone A. To determine the lowered relief cut-based BFEs for agricultural structures in Zone A, the floodplain administrator would utilize hydraulic and engineering studies that evaluated the relief cut's effect in lowering the BFEs. This guidance is currently not contained in FEMA 265. Insurance premiums for all structures should be based on the lowered BFEs.

- Zone AE. Reductions in BFEs for Zone AE will have to be accomplished by revisions to the FIRM using the Letter of Map Revision (LOMR) process, recognizing that this temporary condition of making a relief cut during a flood is different from permanent conditions normally required for a LOMR. The hydraulic and engineering studies used to support the LOMR process will determine BFEs assuming the use of a relief cut, and also BFEs without a relief cut. The revised FIRM would show BFEs assuming the use of a relief cut, but new and substantially improved non-agricultural structures would need to conform to BFEs determined assuming no relief cut occurred – through application of a special floodplain management ordinance. Insurance premiums for all structures would be based on the lowered BFEs.
- Zone D Local Flood Hazard Area Due to a Relief Cut or Zone X (Shaded) Local Flood Hazard Area Due to a Relief Cut. Areas not identified as a SFHA on a FIRM, due to the fact that a planned relief cut reduces the extent of the inundation area and there is no other source of flooding during the Base Flood, would be designated as Zone D Local Flood Hazard Area Due to a Relief Cut or Zone X (Shaded Local Flood Hazard Area Due to a Relief Cut). In this Zone D Local Flood Hazard Area Due to a Relief Cut or Zone X (Shaded) Local Flood Hazard Area Due to a Relief Cut, new and substantially improved agricultural structures could be constructed at grade. But the community's special floodplain ordinance would prohibit construction of new and substantially improved non-agricultural structures below the BFE that would result without the relief cut. If designated as Zone X (Shaded) Local Flood Hazard Area Due to a Relief Cut and this area adjoins Zone X (Shaded), it would be challenging for the community to administer elevation/floodproofing requirements for non-agricultural structures in this area if it is not specifically delineated on the FIRM. For this reason, Zone D Local Flood Hazard Area Due to a Relief Cut is offered as a mapping option. Another way to solve this would be to provide a special pattern/shading and an accompanying note on the FIRM identifying the Zone X (Shaded) Local Flood Hazard Area Due to a Relief Cut as protected from flooding by a planned relief cut in the levee in the event of a catastrophic levee breach. **The NFIP's mandatory insurance purchase requirement would not apply in this Zone D Local Flood Hazard Area Due to a Relief Cut or Zone X (Shaded) Local Flood Hazard Area Due to a Relief Cut.**

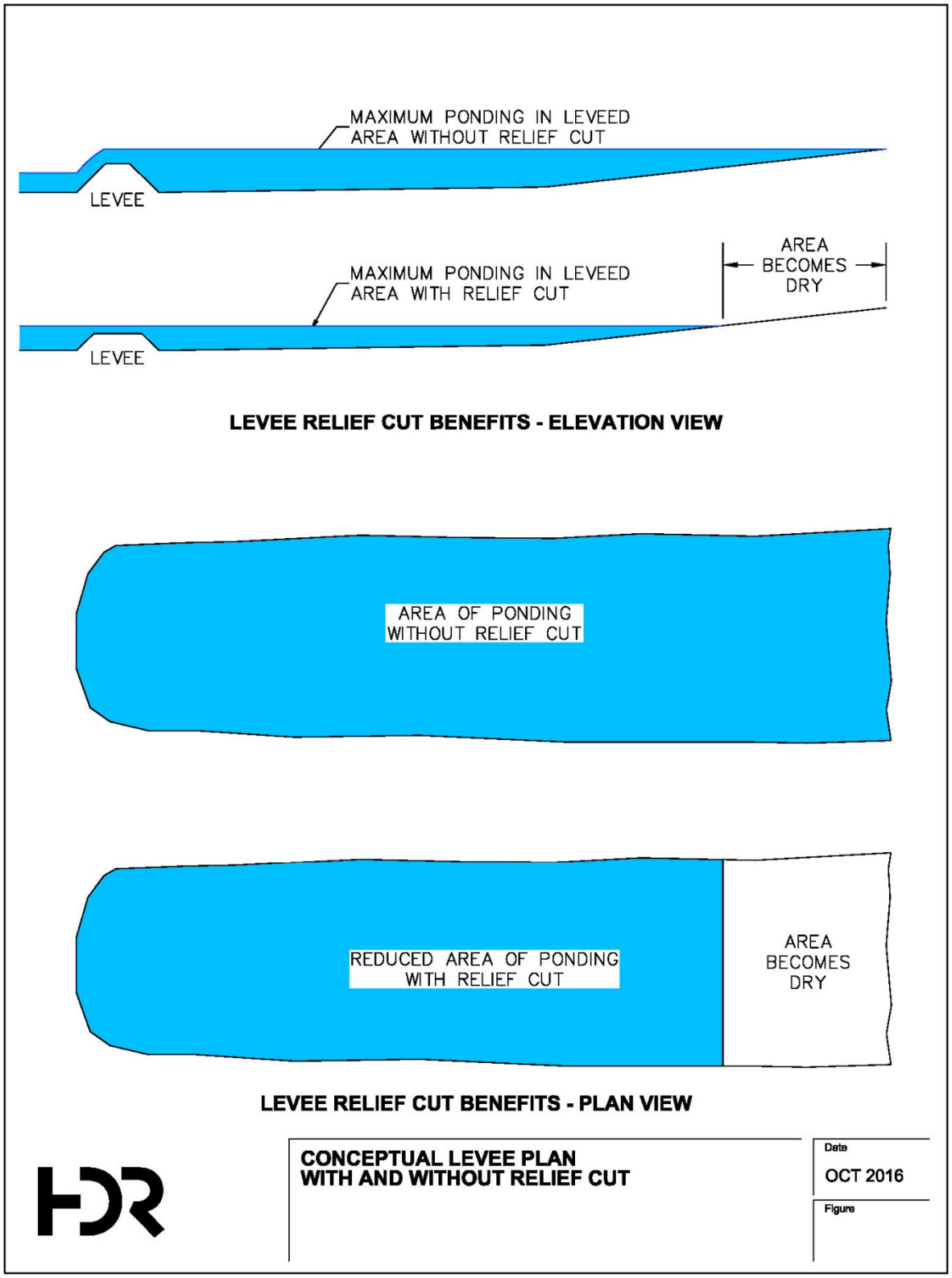


Figure 3. Levee Relief Cut Benefits

Recommendation 1

The Task Force recommends that FEMA recognize levee relief cuts that are properly planned and adopted by a community and:

- Update FEMA 265 to provide guidance on how a floodplain administrator should estimate the BFE in Zone A when considering a relief cut.
- In Zone A, FEMA should approve floodplain administrator use of lowered BFEs for relief cuts, coupled with a special floodplain management ordinance, for permitting new and substantially improved agricultural structures and for setting insurance premiums for all structures.
- Where a FIRM contains Zone AE that reflects ponding against a downstream levee, use the LOMR process to modify the Zone AE to reflect the lowered BFEs that result from a planned relief cut, provided that the community adopts a special floodplain management ordinance. The ordinance would require new and substantially improved non-agricultural structures in Zone AE to be elevated (or floodproofed) to or above the BFE that would result without the relief cut. Insurance premiums for all structures would be based on the lowered BFEs.
- Where a FIRM contains Zone AE that reflects ponding against a downstream levee, use the LOMR process to modify the Zone AE to reflect the reduced extent of ponding that results from a planned relief cut. If there is no other source of flooding for the area that is removed from the pond-created Zone AE, that area should be identified on the FIRM as Zone D or Zone X (Shaded), provided that the community adopts a special floodplain management ordinance. The ordinance would require new and substantially improved non-agricultural structures in this Zone D or Zone X (Shaded) to be elevated (or floodproofed) to or above the BFE that would result without the relief cut.

5.1.2 Zone D with floodplain management ordinance and flood insurance instrument

Under FEMA's current regulations, it is not possible within a SFHA to provide an exemption for agricultural structures to allow new and substantial improvements to be constructed below the BFE without floodproofing. But this goal could be achieved indirectly by changing the SFHA to Zone D, with additional requirements discussed below. A designation of Zone D identifies the flood risk as "possible but undetermined." As such, areas within Zone D are not considered to be within a SFHA and are not subject to elevation/floodproofing requirements or the mandatory insurance purchase requirement. The following action would provide for insurance and building restrictions that accommodate agricultural needs through a Zone D designation accompanied by:

- A special floodplain management ordinance that effectively maintains in the new Zone D the elevation and floodproofing requirements of a SFHA for all new and substantially improved structures, except for agricultural structures.
- A mechanism to monitor and report on compliance with the special floodplain management ordinance in the new Zone D.
- A levee risk management plan for the new Zone D.

- A mechanism to ensure that flood insurance coverage is maintained or increased in the new Zone D.

Unlike the requirements for Zone D in FEMA's Operating Guidance 12-13, under this action there would be no structural integrity or elevation requirements for the levee.

Many of the levees in the Sacramento Valley and other rural/agricultural areas across the United States lack the engineering data required for certification and accreditation or are not structurally sound for loading at the BFE and cannot be accredited without substantial investments in engineering evaluations, designs, and construction. In many rural/agricultural areas, such investments would not be economically justified or affordable. Consequently, these areas are mapped as SFHAs and currently there is no feasible method to change the flood zone to mitigate the impacts on agricultural sustainability – which is inconsistent with the premise that agriculture is one of the best uses of the floodplain.

Communities that participate in the NFIP need to adopt a floodplain management ordinance for SFHAs that meets or exceeds requirements contained in 44 CFR 60. However, a community is free to add requirements that go above and beyond the minimum requirements. This capability would enable a community to enact floodplain management rules for Zone D. Therefore, the portion of the community that is mapped as a SHFA behind a non-accredited levee could instead be mapped as Zone D, and the community could adopt a special floodplain management ordinance that requires elevation and floodproofing in Zone D as would be required in the SFHA. To support agricultural sustainability, the special floodplain management ordinance could exempt new and substantially improved agricultural structures from the elevation and floodproofing requirements.

The State of California has developed a model floodplain management ordinance that can be used by communities for developing their floodplain management ordinance. Appendix C contains *California Model Floodplain Management Ordinance for Noncoastal Communities, December 2006, Modified for Zone D Replacing an SFHA*. This modified model ordinance shows how a community could modify its floodplain management ordinance to require new and substantially improved non-agricultural structures in this special Zone D to be elevated (or floodproofed) to or above the BFE. The California model ordinance was selected for this example because each community has its own unique floodplain management ordinance that can vary somewhat from another community's ordinance.

Several issues were considered before advancing this recommendation:

- Mandatory purchase of flood insurance in the SFHA would be eliminated by remapping the SFHA as Zone D.
    - Although the intent of this proposal is to benefit agricultural without affecting non-agricultural structures, the mandatory flood insurance purchase requirement would be eliminated for all existing and new structures, not just agricultural structures.
    - Discussions with some lenders suggest that in some cases lenders may choose to require flood insurance in Zone D, but in most cases they would not. Considering that borrowers have many choices of lenders, the lenders who do

not require flood insurance would likely provide more of the loans than the lenders who do require flood insurance.

- Flood insurance penetration within Zone D would likely be low because purchase would be voluntary and the premiums would be relatively expensive, as compared to Zone X; penetration rates within Zone X are generally low.
- There is evidence that flood insurance penetration is already low in SFHAs, so the change in penetration may not be dramatic. But it was not possible to identify current penetration in rural SFHAs and in Zone D to make a comparison. Even if the current penetration is low in both rural SFHAs and Zone Ds, policies that lead to a greater percentage of buildings with flood insurance should be encouraged; the use of a Zone D works against that goal.
- Sustainability of agriculture and the community may be jeopardized when a catastrophic flood occurs and many, or most, of the damaged structures are not insured.
- The levee owner may face larger claims for uninsured structures (as compared to insured structures), should the levee fail and the levee owner is found liable for flood damages.
- The taxpayer may be on the hook for some of the uninsured flood damages through post-disaster financial assistance from FEMA's Disaster Relief Fund and through tax breaks for losses.

- There may be ways to mitigate loss of the mandatory purchase requirement. Two potential alternatives for California communities were identified:
  - In California, communities are given broad powers to regulate land uses. Establishing a requirement for purchase of flood insurance appears to fit within the community's police power regarding land use. The strongest case for such a requirement would apply for structures without a federally backed mortgage. Two concerns would be: (1) the lack of an enforcement mechanism, making it questionable as to how many structures would be insured when flood losses occur, and (2) uninsured structures damaged in a flood might qualify for federal post-disaster financial assistance and tax breaks.
  - In California, cities, counties and special districts have various mechanisms under which they have the power to levy assessments, fees and taxes. Propositions 13 and 218 set forth the property owner and electoral requirements precedent before the imposition of special taxes, assessments and property based fees. One of the requirements of Proposition 218 is that public entities imposing assessments must conduct a property owner ballot proceeding. Further Proposition 218 requires that property based fees must go through a property owner protest process. Proposition 13 set forth the requirement of a super majority vote for special taxes. Approved, assessments, property based fees or special taxes could be levied using the taxing authority of a public agency from properties for levee operations and maintenance, levee repairs and improvements, as well as flood insurance. If few of the property owners in Zone A/AE carry flood insurance due to poor enforcement of the mandatory purchase requirement, it may be difficult to obtain a majority of property owners to approve

a fee, tax, or assessment that includes insurance. This concern may be mitigated by providing property owners the ability to opt-out of the fee, tax, or assessment for insurance for any structure without a federally backed mortgage, and for residential detached structures. There may be a variety of options for insuring against flood losses through an assessment, fee, or special tax as discussed in Appendix D under Community Choice Flood Risk Financing. One option would be purchase of a group flood insurance policy from a private insurance carrier; a multi-year group policy would likely minimize the premium.

- New and substantially improved agricultural structures would be allowed to be constructed without consideration of the BFE. This would be beneficial for agriculture in the near-term, but may not be so beneficial in the long-term if these agricultural structures are damaged in a flood, especially if not insured. This could be partly mitigated by providing some modest elevation or floodproofing requirements for new and improved agricultural structures in the special floodplain management ordinance (e.g., elevate 2 feet above highest adjacent grade).
- FEMA would need to confirm that the FEMA regions are authorized to map a SFHA as Zone D without changing any laws or regulations. This runs counter to the goal of increasing the accuracy and detail of FIRMs.
- There is some potential for abuse of the agricultural structure exemption, resulting in some structures that may not strictly fall within the definition of an agricultural structure to be built without consideration of the BFE. This potential for abuse currently exists in the SFHA, but if abused, it would result in construction of a wet floodproofed structure rather than a structure without any floodproofing or elevation above grade.
- A community could rescind its special floodplain management ordinance, forcing FEMA to issue new maps with SFHAs – which can be a time consuming process. In the interim, the community could issue building permits for all types of construction in Zone D. But the likelihood of a community doing this and allowing construction of numerous non-agricultural structures below the BFE is judged to be very low.
- An enforcement mechanism would be needed to verify that new and substantially improved structures are constructed in accordance with the floodplain management ordinance. The conventional enforcement mechanism would not work in Zone D, because FEMA and the State would not monitor floodplain management ordinance compliance in Zone D. A community self-reporting program may address this concern.

Recommendation 2

The Task Force recommends that FEMA offer an option to remap SFHAs as Zone D in leveed areas that meet the following requirements:

- The community adopts a special floodplain ordinance that requires elevation (or floodproofing) to or above the BFE for new and substantially improved non-agricultural structures in the new Zone D.
- The community implements a self-reporting program that indicates compliance with the special floodplain management ordinance in the new Zone D.

- The community adopts a levee risk management plan for the new Zone D. The elements of a levee risk management plan are discussed in Section 5.3.5.
- The community mitigates the loss of the mandatory purchase requirement for the structures in the new Zone D. Exceptions may include structures without federally backed mortgages, residential detached structures, and low value structures. The goal would be to have more insurance coverage than currently exists in the SFHA. The Task Force has identified two potential mechanisms for achieving this: (1) an ordinance requiring flood insurance purchase, and (2) Community Choice Flood Risk Financing (e.g., purchase of a multi-year group flood insurance policy from a private insurance carrier).

5.1.3 Zone X (Shaded) for certified levee reaches

FEMA's Operating Guidance 12-13 provides for use of Zone D behind non-accredited levees that only partially satisfy requirements of 44 CFR 65.10. Zone D is defined as an area with possible but undetermined flood hazard; no flood hazard analysis has been conducted. Flood insurance rates are commensurate with the uncertainty of the flood risk. Zone X (Shaded) is used behind accredited levees that meet all requirements of 44 CFR 65.10. Zone X (Shaded) is defined as an area of 0.2-percent annual chance flood, or an area of 1-percent annual chance flood with average depth less than one foot or with a drainage area of less than one square mile.

Only accredited levee systems can utilize the Zone X (Shaded) behind the levee. Currently, even if a reach of levee is certified by an engineer as providing 1-percent annual chance flood protection to an area without relying on the remainder of the entire levee system, Zone D is the only permissible zone designation to be used behind the levee. Zone D has the drawback of having relatively high insurance rates, resulting in low participation, and the potential for lender-required flood insurance. Therefore, it is recommended that in locations where a reach of levee is certified by an engineer as meeting all requirements of 44 CFR 65.10, FEMA should modify its operating guidance to allow the certification and accreditation of the levee reach and to map the area protected from the Base Flood as Zone X (Shaded) instead of Zone D. This would be appropriate and helpful for agricultural areas that often cannot afford accredited levees, as well as for the owners of all types of structures, the community, FEMA, and the taxpayer because the Zone X (Shaded) rate is more reflective of the risk of a flood damage claim and will encourage voluntary purchase of insurance.

For illustrative purposes, consider two cases for a 30-mile reach of river and associated floodplain along the west bank of the river as shown in Figures 4 and 5.

Figure 4 shows a 20-mile long reach of levee at the upstream end of this floodplain that can be certified by an engineer as meeting all 44 CFR 65.10 requirements; the lower 10 miles of the river has no levee and consequently the lower and middle potions of the floodplain – say the lower 16 miles – would be flooded during the 1 percent annual chance flood. Because the 20 miles of certifiable levee constitutes the entire levee system, FEMA would allow certification and accreditation of the 20 miles of levee. The 14 miles of floodplain that would be protected from the 1 percent annual chance flood would be mapped as Zone X (Shaded) and the lower 16 miles of floodplain would be mapped as Zone A or AE.

Figure 5 also shows a 20-mile long reach of levee at the upstream end of this floodplain that can be certified by an engineer as meeting all 44 CFR 65.10 requirements; the lower 10 miles of the river also has a levee that cannot be certified and consequently the lower and middle portions of the floodplain – say the lower 16 miles – would be flooded during the 1 percent annual chance flood if the uncertified reach of levee breaches. Because the 20 miles of certifiable levee does not constitute the entire levee system, FEMA would not allow certification or accreditation of the 20 miles of levee. The 14 miles of floodplain that would be protected from the 1 percent annual chance flood would be mapped as Zone D and the lower 16 miles of floodplain would be mapped as Zone A or AE.

There is no difference in risk between these two cases for the structures and people in the upper 14 miles of the floodplain. However, the required use of Zone D in Figure 5 causes higher insurance premiums and creates the potential for lender-required insurance. FEMA's Operating Guidance 12-13 states, "Zone D designation is used for non-accredited systems instead of the Zone X (Shaded) designation used for accredited levee systems because the flood hazard potential is higher and more uncertain than with accredited levee system." In this particular situation where a levee reach can be certified as meeting all 44 CFR 65.10 requirements and protecting a distinct area within the floodplain from the Base Flood, FEMA's statement and usage of the Zone D designation is incorrect and should be changed.

It is noted that for a levee with a downstream end that terminates, such as in Figure 4, without excluding the 1 percent annual chance flood from the floodplain, at the end of the levee the certifying engineer would either need to: (1) provide armoring to prevent it from eroding and allowing additional flow into the floodplain, or (2) assume it erodes to a reasonable extent for the purpose of identifying the full potential extent of the floodplain. Likewise, for the lower end of the certified levee in Figure 5, the certifying engineer would need to evaluate the potential extent of erosion should the adjacent uncertified levee breach where they meet – for the purpose of identifying the full potential extent of the floodplain. These specific design considerations are already captured and reviewed as part of FEMA's levee accreditation process and covered in the MT-2 Forms and Operating Guidance 12-13.

Additionally, the uncertified reach of levee in Figure 5 has the potential to create a ponding area at the downstream end of the reach should there be a levee breach upstream of that location. Depending on the height of that levee and the slope and length of the floodplain, that ponding may increase the size of the area mapped as Zone A or AE. This would not be an issue for Figure 4, where the levee terminates before it could impound flood waters from an upstream levee breach. This is the biggest distinction between the two situations shown in the two figures, but is easily addressed through careful engineering analysis of the potential for ponding required by Operating Guidance 12-13 and reviewed as part of FEMA's levee accreditation process.

Although both Zone X (Shaded) and Zone D do not carry the requirement for mandatory purchase of flood insurance, the higher Zone D insurance rates discourage property owners from purchasing flood insurance – resulting in low participation and unnecessarily high uninsured flood risk. FEMA should implement zone designations that promote the purchase of optional flood insurance in locations where the levee is providing protection from the Base Flood.

It is worth noting that California has a 200-year flood protection standard for deep urbanized floodplains in the Central Valley. DWR has developed criteria for determining 200-year flood protection for levees (Urban Levee Design Criteria). DWR's criteria specifically provide that a levee reach can be identified as providing 200-year flood protection to a specific area, even if the remaining levee system does not provide 200-year flood protection. The following recommendation is consistent DWR's criteria.

Recommendation 3

The Task Force recommends that FEMA should revise its Operating Guidance 12-13 to map areas behind a certified reach of levee as Zone X (Shaded) instead of Zone D if the certified reach of levee is part of a larger levee system and it is providing protection from the Base Flood. If the levee reach does not meet freeboard requirements, FEMA should continue to implement Operating Guidance 12-13 as currently written and map the area behind it as Zone D.

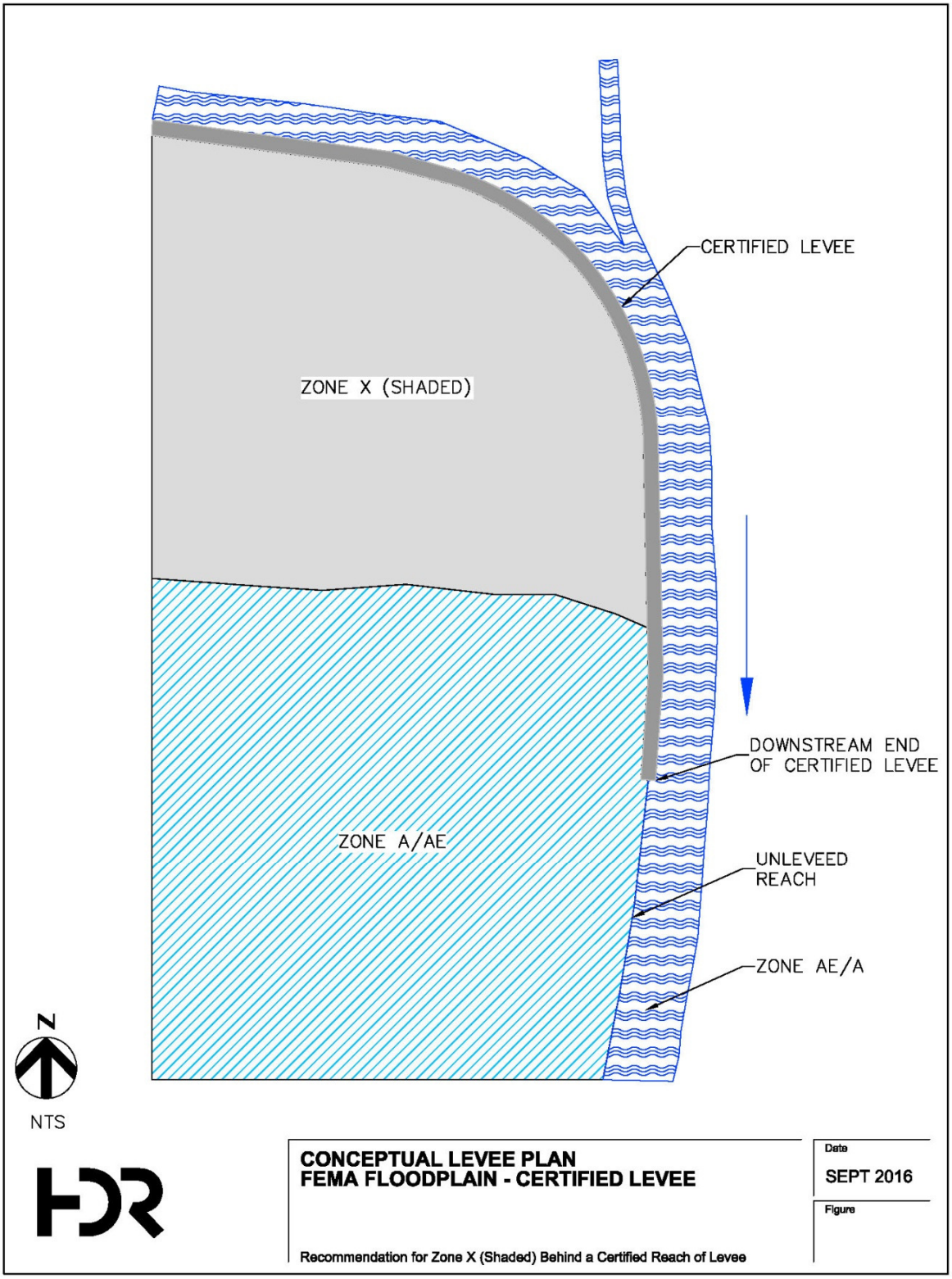


Figure 4. Conceptual Levee Plan FEMA Floodplain - Certified Levee

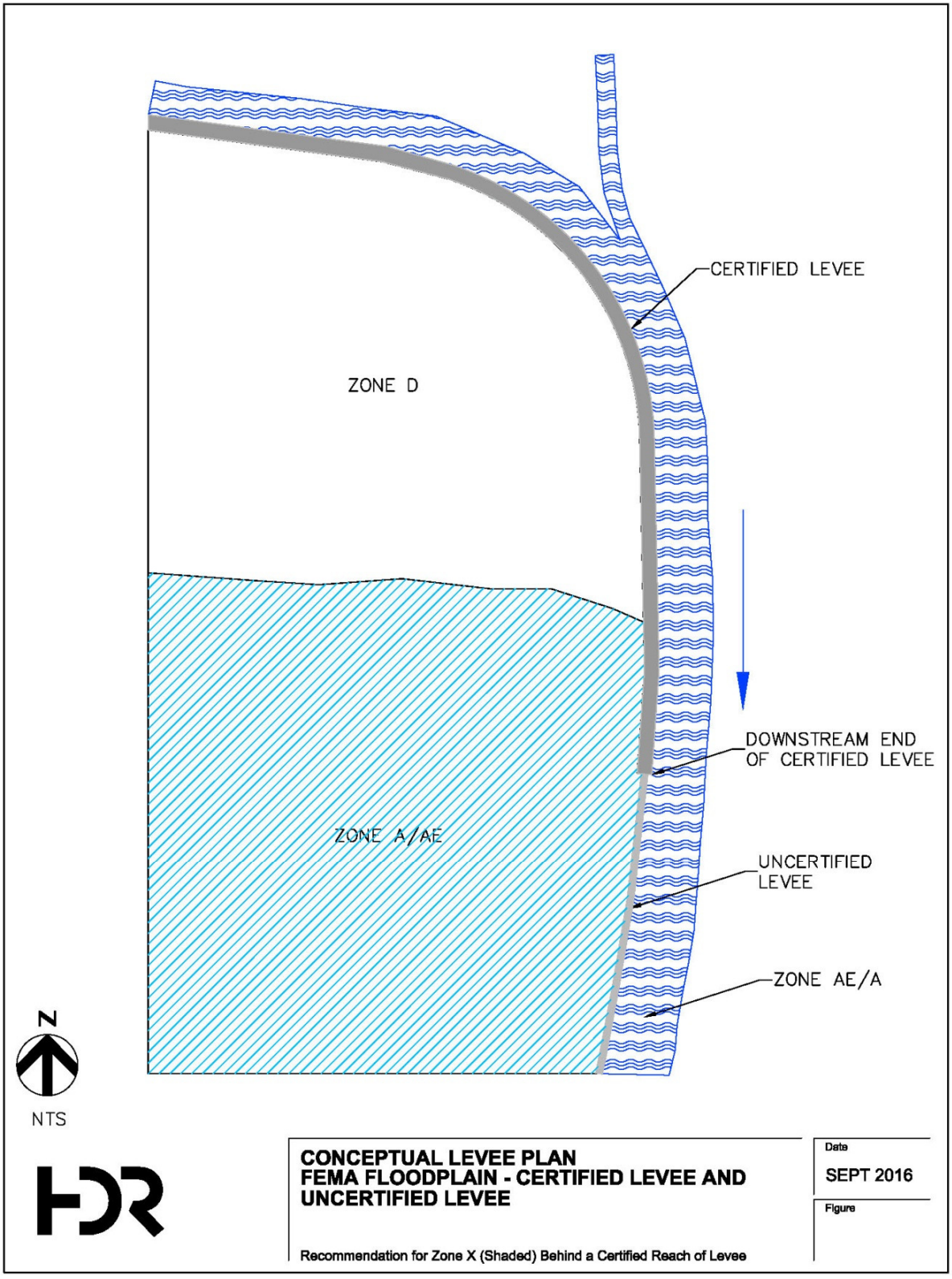


Figure 5. Conceptual Levee Plan FEMA Floodplain - Certified Levee and Uncertified Levee

5.2 Land Use Actions

Land use actions include actions that modify requirements for construction of new and substantially improved agricultural structures or that affect the BFE or zone designation on the FIRM.

5.2.1 Agricultural structure definition

The basic floodplain management requirement in FEMA's regulations (44 CFR 60) is that new and substantially improved (which includes substantially damaged) structures must be elevated or made watertight (i.e., dry floodproofed) at or above the BFE.

Some types of structures may be wet floodproofed as an alternative to elevating or dry floodprooofing. FEMA's Technical Bulletin 7-93 Wet Floodproofing Requirements (TB 7-93) recognizes that it may not be appropriate to require elevation or dry floodproofing of agricultural structures in expansive floodplains. Consequently, TB 7-93 allows for wet floodproofing of certain agricultural structures.

Agricultural structure is not a defined term in regulation or in TB 7-93. But TB 7-93 does identify the types of agricultural uses for structures that would qualify for wet floodproofing, if a variance is provided by the community. The variance requirement is contained in regulation (44 CFR 60.6). TB 7-93 states:

> "A variance may be issued only if the structure is used solely for agricultural purposes in which the use is exclusively in connection with the production, harvesting, storage, drying, or raising of agricultural commodities, including the raising of livestock."

TB 7-93 effectively provides a second, narrower "definition" for agricultural structure by continuing with the following:

> "Types of agricultural structures that may be wet floodproofed following the issuance of a variance are:
>
> - **Farm Storage Structures** used exclusively for the storage of farm machinery and equipment (e.g., pole and pre-fabricated metal frame structures with open or closed sides).
> - **Grain bins**
> - **Corn cribs**
> - **General purpose barns** for the temporary feeding of livestock, provided they remain open on at least one side."

The Task Force considered recommending some changes to this section of TB 7-93. Some Task Force members proposed recommending that the first definition is the only definition and that the second, narrower definition should be identified as a non-exclusive list of examples of agricultural structures that can be wet floodproofed. Some Task Force members proposed expanding the types of structures that could be included and others proposed narrowing the types of eligible structures so as to exclude dairies and feed lots.

ASCE 24-14, *Flood Resistant Design and Construction,* also establishes floodproofing requirements that are utilized in the 2015 International Building Code (IBC) and the 2016

California Building Code (CBC). These codes will become effective on January 1, 2017. Agricultural structures are not defined in ASCE 24-14; instead, the list of qualifying agricultural uses from TB 7-93 is cited. For an agricultural structure to qualify for wet floodproofing, it would need to qualify under both TB 7-93 and ASCE 24-14 and comply with requirements in both. Because the Task Force was unable to agree upon recommended changes to the agricultural structure definition in TB 7-93, there is also no recommended change to the list of qualifying agricultural structures for ACSE 24-14. If the TB7-93 list of agricultural structures is expanded in the update of TB 7-93, a similar update of ASCE 24-14 would be needed before any new types of agricultural structures could be eligible for wet floodproofing.

No Recommendation

The Task Force makes no recommendation for changes to the types of structures that should be eligible for wet floodproofing. Several other recommendations by the Task Force refer to “agricultural structures.” The intent is for those recommendations to use the same definition as provided in TB 7-93.

5.2.2 Wet floodproofing rules for agricultural structures

The wet floodproofing requirements in TB 7-93 for agricultural structures located in SFHAs provide for structures to experience minimal damage during the Base Flood. Some of the key requirements are for anchorage of the structure, use of flood-resistant materials below the BFE, automatic entry of flood waters, and mechanical and utility equipment elevated or floodproofed to the BFE. Automatic entry of flood waters is usually achieved by use of vents that provide one square inch of clear opening for every square foot of enclosed space.

Installation of vents (or an alternative design certified by a registered professional engineer) is required by 44 CFR 60.3 for allowing water to enter and exit enclosed space below the lowest floor of new and substantially improved structures in SFHAs. There is no specific regulation that applies to structures without enclosed space below the lowest floor, which is the situation for most agricultural structures.

TB 7-93 requires that the wet floodproofed structure “must be designed to allow for the automatic entry of flood waters.” In practice, the community usually requires vents to achieve this.

There are three major issues with vents:

- Structures that store agricultural commodities may be unable to use conventional vents and meet food safety requirements (e.g., preventing insect and rodent intrusion, preventing escape of fumigants, meeting “clean room” requirements, etc.).
- Vents can add significant cost to otherwise low-cost agricultural structures.
- Large vents typically installed for large agricultural structures provide easy access for vandals and thieves, which can be a major problem – especially in isolated, rural areas. Use of many more small vents or addition of security features would be required to address such threats, at additional cost.

One potential solution is to use vents that are closed except during a flood. But at this time such vents have not been demonstrated to meet food safety requirements for agriculture.[2]

Dry floodproofing requirements for non-residential structures in SFHAs are presented in FEMA's Technical Bulletin 3-93 (TB 3-93). TB 3-93 allows for human intervention to complete the required dry floodproofing actions shortly before, or during, the flood emergency. To a lesser degree, limited human intervention is also recognized in TB 7-93. It states that:

> "A Flood Emergency Operation Plan is an integral part of any structure's floodproofing design and is critical when the floodproofing requires human intervention such as adjustments to, or relocation of contents and utilities."

It is unclear whether TB 7-93 allows human intervention to provide "for the automatic entry of flood waters." Human intervention could provide for entry of flood waters by locking open large roll-up doors that are often used on agricultural structures. The door openings would need to provide equal or greater flow capacity than vents. A Flood Emergency Operation Plan would be required to identify the triggering event (e.g., a stream stage or an evacuation order) for locking the doors open prior to arrival of flood waters. In leveed areas, the possibility of a sudden catastrophic levee failure of any non-accredited levee reach, and the structure's proximity to such a breach, would need to be considered when deciding on the trigger, so that adequate warning time is provided. The Task Force understands that as a result of failure of many dry floodproofing systems during Hurricane Sandy, FEMA has recently required regular validation of Flood Emergency Operation Plans to ensure that planned human intervention will be carried out by the building owner/operator.

An Assessment of the Technical and Economic Feasibility of Wet Floodproofing for Agricultural and Accessory Structures Under the National Flood Insurance Program, prepared for FEMA in 1997*,* made some important recommendations to consider:

- Agricultural structures with large doors on at least two sides of the building should not require vents: "As long as the performance standard for human intervention can be met, structure owners should be allowed to ensure the entry of flood waters by opening the doors prior to the flood[3]."
- The factor of safety for venting is 5 due to life safety concerns. But these concerns are not applicable in agricultural structures and a factor of safety of 1.5 would be

[2] The Task Force is aware of vent systems that are recognized by FEMA as meeting NFIP venting requirements and are normally sealed in a closed position but open when submerged. But no such vent has been approved for meeting food safety requirements applicable to agriculture. Task Force members have been working with one vent manufacturer and agricultural food safety regulators to evaluate the potential for such vents to meet agricultural food safety and floodplain management requirements.

[3] The report also analyzed whether there would be adequate time for human intervention for structures near a levee that breached suddenly. The analysis concluded "…that depending on the height and of the levee and the size of the breach, the resulting flow depths and velocities may exceed those for which wet floodproofing is technically feasible. Another consideration is that there will be little or no warning time before a levee breach; therefore, wet floodproofing measures that depend on human intervention would be inappropriate in areas subject to flooding from failed levees. For these reasons, the appropriateness of wet floodproofing in such areas should be carefully evaluated." The Task Force expects that the possibility of a sudden catastrophic breach would be considered in the Flood Emergency Operation Plan for each wet floodproofed structure that relies on human intervention, and an adequate warning time for human intervention would be provided when the trigger is established. Therefore, for structures that are not distant from the unaccredited levee reach, instead of a trigger based on failure of the levee, the trigger would be based on other parameters – such as evacuation orders and/or exceeding a stream elevation at which the levee's reliability becomes uncertain.

more appropriate. This would greatly reduce the number of vents required. A table of venting requirements for agricultural structures was provided, but was limited to a maximum depth of 6 feet.

Additional community requirements might be:

- Posting of the door opening requirements and a description of the trigger event near the doors
- A signed acknowledgment of the property owner's responsibilities for executing the Flood Emergency Operation Plan
- Recording of the Flood Emergency Operation Plan and signed acknowledgment on the property deed so as to continue the responsibility with a new owner
- Additional requirements set by the floodplain administrator

As mentioned earlier, ASCE 24-14 *Flood Resistant Design and Construction* is a referenced standard in the 2015 IBC and 2016 CBC. After January 1, 2017, buildings and structures within the scope of the CBC proposed to be constructed in SFHAs must be designed in accordance with ASCE 24-14. ASCE 24-14 was prepared by the Flood Resistant Design and Construction Committee of the Codes and Standards Activities Division of the Structural Engineering Institute of the American Society of Civil Engineers. Like TB 7-93, ASCE 24-14 requires that enclosed structures are to have openings to "allow for the automatic entry and exit of floodwaters during design flood conditions." Section C2.7.2.1 *Non-Engineered Openings*, which is the accompanying comment section, says that "covers that must be removed and devices that must be manually opened do not satisfy the requirement for automatic entry and exit of floodwaters…" Therefore, to obtain relief from the vent requirement and allow use of doors and human intervention, this change must be reflected in an update to ASCE 24-14 as well as the update to TB 7-93.

Recommendation 4

The Task Force recommends allowing human intervention for providing entry of floodwaters into agricultural structures in situations when large doors on at least two sides of the building could be locked open. If human intervention is authorized, appropriate conditions should be established in a Flood Emergency Operation Plan approved by the community and/or community's floodplain administrator. The Task Force supports FEMA's efforts to ensure that human intervention identified in the Flood Emergency Operation Plan will be carried out by the building owner/operator. This recommendation should be implemented through updates to ASCE 24-14 and TB 7-93. The Task Force also recommends that a factor of safety of 1.5 or other appropriate, technically justified factor of safety should be used for venting of agricultural structures and that the update to TB 7-93 should provide guidance on the number and size of openings for agricultural structures, including in floodplains deeper than 6 feet.

5.3 Insurance Actions

Insurance actions include actions that would reduce insurance rates.

5.3.1 Insurance rates for non-accredited levees

FIRMs and NFIP Flood Insurance Manual insurance rate tables do not recognize the flood protection that a levee provides if the levee is not accredited for providing protection against the Base Flood[4]. This lack of recognition could be corrected by developing a procedure for recognizing the level of flood protection that the non-accredited levee provides and adjusting the FIRM and Flood Insurance Manual insurance rate tables accordingly. This can be done without any change to the zone designation on the FIRM; no changes to current land use requirements/restrictions or mandatory flood insurance purchase requirements are envisioned or recommended for areas protected by non-accredited levees. This action would simply recognize the flood protection provided by a non-accredited levee – to more justly base the flood insurance rate on risk instead of having a single rate for each zone designation behind a non-accredited levee. It could be applied within the following zones: A, AE, AH, AO, and D.

It appears that the premium savings could be substantial. Appendix F shows an example calculation of a premium from FEMA's *Technical Documentation of NFIP Actuarial Assumptions and Methods Supporting Rates Effective October 1, 2013*. That example is useful to show how the premium changes if a levee is recognized as providing protection from the smaller floods. For instance, the calculation shows that if the flood risk is removed for flood events with return periods of 28.5 years and less, the premium should be reduced by about 33 percent. Engineers should be able to document that many of the levees of the Sacramento Valley are capable of providing protection to this level and more.

This action is consistent with Recommendation No. 18 from the National Committee on Levee Safety (NCLS) regarding the mandatory purchase of flood insurance that employs risk-based premiums in leveed areas (*Draft Recommendations for a National Levee Safety Program*). This is also similar to the recommendations of the National Research Council (NRC) to use risk analysis to set insurance premiums for structures (*Levees and the National Flood Insurance Program: Improving policies and practices*; *Tying flood insurance to flood risk for low-lying structures in the floodplain*). The NRC proposes use of levee fragility (aka performance) curves instead of the deterministic method proposed herein. Use of risk analysis and levee fragility curves would be a preferable way of achieving the same goal. A deterministic method is proposed herein to expedite its application and avoid some of the challenges that FEMA may encounter in using risk-based analyses.

To implement this action, it is necessary to establish a methodology for quantifying the amount of flood protection provided by the non-accredited levee system. The methodology could be deterministic or probabilistic (i.e., risk analysis). Similar to current levee certification methodology used by most engineers, this recommendation uses a deterministic approach with specific criteria that an engineer would use to document the rated level of flood protection, for FEMA to approve and reflect on the FIRM. The methodology could apply for any level of flood protection, up to the 99-year flood, without changing the zone designation on the FIRM. For consistency, the following three flood protection ratings are proposed: 25-year, 50-year, and 75-year (4 percent, 2 percent, and

[4] There are two exceptions to this statement: Zone AR and Zone A99. To qualify for Zone AR or A99, among other requirements, the levee system must be in the process of being restored to provide protection against the Base Flood.

1.33 percent annual chance). In addition, for levees that do not meet the 25-year level of flood protection, 5-year and 10-year flood protection ratings are proposed consistent with the ratings and requirements of the United States Army Corps of Engineers' (USACE) Rehabilitation and Inspection Program (RIP) as contained in EP 500-1-1. The details of the methodology are presented in Appendix G.

The engineer's documentation for the flood protection rating would expire in 20 years, or less if so conditioned by the engineer (e.g., DWR's Urban Level of Flood Protection Criteria require 5-year periodic inspection reports for the 200-year flood protection rating to apply for up to 20 years). Without current documentation, the insurance rate tables for no levee will apply.

The Task Force recognizes that for implementation, it would be necessary to indicate on the FIRM the area that is protected by the levee to the specific level of flood protection. One way to achieve this may be use of a unique pattern on the map with an accompanying note that explains the pattern (e.g., 50-year rated level of flood protection provided by a non-accredited levee system).

In addition to providing better alignment between flood risk and insurance premiums in leveed areas, as recommended by the NCLS, having multiple levels of flood protection ratings for non-accredited levees would provide two additional benefits:

- It may motivate some communities within leveed areas to improve their levees and their operations and maintenance to move up to the next flood protection rating and further reduce their flood insurance premiums.
- It would serve as a good risk communication tool for educating communities on their level of flood protection and their options for reducing flood insurance premiums.

Recommendation 5

The Task Force recommends that FEMA use sound actuarial science to amend its insurance rates to reflect the flood protection provided by a non-accredited levee as documented by a civil engineer, following a specific methodology and meeting specific criteria as presented above. The methodology can be reexamined when a national levee safety standard is developed that addresses such situations.

5.3.2 Insurance rate for Zone D protected by a levee

FEMA's Operating Guidance 12-13 and FEMA's Analysis and Mapping Procedures for Non-Accredited Levee Systems (LAMP) expand the use of Zone D. Traditionally, the Zone D designation was utilized for areas with undetermined flood risk where no flood risk information was available. Accordingly, the rate for these Zone D areas is high and results in expensive flood insurance, sometimes comparable to rates in Zone A.

LAMP recognizes that there are two types of Zone D: the new Zone D landward of a levee system and the traditional Zone D. Under FEMA's operating guidance, the 'Zone D Protected by Levee' designation is used to map areas where the levee meets specific portions of 44 CFR 65.10 but cannot meet 44 CFR 65.10 in its entirety. For example, if a reach of levee meets all structural requirements of 44 CFR 65.10 and has a documented Operations and Maintenance plan, but lacks adequate freeboard, then engineering data

may be submitted by a registered professional engineer to map the area protected by this reach of levee as 'Zone D Protected by Levee'.

The flood hazard potential for areas designated as 'Zone D Protected by Levee' is higher than areas designated as Zone X (Shaded) (where the levee meets all requirements of 44 CFR 65.10) but lower than areas designated as Zone A or AE (where the levee does not meet the requirements of a Sound Reach in Operating Guidance 12-13). In addition, the area designated as 'Zone D Protected by Levee' is not consistent with the traditional 'unknown/undetermined' definition of Zone D because detailed flood risk information is available from the levee breach studies (and sometimes levee overtopping studies) that are required by Operating Guidance 12-13 to delineate Zone D and the adjacent SFHA.

Based on the fact that FEMA's current guidance already defines the graphical specifications for differentiating between these two types of Zone D on the FIRMs, and to the fact that the 'Zone D Protected by Levee' represents areas with a different flood risk hazard potential than the traditional Zone D, FEMA should incorporate a new separate rating table into the NFIP Flood Insurance Manual. The revised manual should include two separate rating tables – one for the traditional 'Zone D Undetermined/Unknown' areas, and a separate rating table for 'Zone D Protected by Levee'. The 'Zone D Protected by Levee' rating table should feature lower rates so that the flood insurance costs more appropriately reflect the true flood risk potential for the area (i.e., flood insurance costs for the 'Zone D Protected by a Levee' should be slightly higher than the costs for a Zone X (Shaded) policy, but lower than costs for a Zone A or AE policy).

The new zone D is already acknowledged in LAMP; the rates for structures in 'Zone D Protected by Levee' should be consistent with that acknowledgement. Implementing this recommendation will ultimately result in a more sound and logical NFIP where rates more appropriately match the true flood risk. Another major benefit is that it will likely result in higher penetration rates within these zones where flood insurance is not required, because it will be more affordable.

Recommendation 6

The Task Force recommends that FEMA amend its insurance rate tables to include two separate rating tables for Zone D. One rating table would be for areas identified on the FIRM as 'Zone D Undetermined/Unknown', and another (new) rating table would be for areas identified on the FIRM as 'Zone D Protected by Levee'.

5.3.3 Insurance rates for agricultural structures

The Task Force understands that NFIP insurance rates for agricultural structures are generally the same as for retail business and industrial structures (there are rate differences for structures with the lowest floor elevation below the BFE and rates that differ due to coverage differences) – and that in developing NFIP insurance rates for various categories of structures, FEMA lacked sufficient damage/claims data to develop rates specific to agricultural structures. On the whole, agricultural structures are likely to experience less damage for a given flood depth than retail business and industrial structures. Consequently, the rates for agricultural structures may be too high. Over the years there has been more experience with damages and claims associated with agricultural structures. Thus, there may now be sufficient data available for FEMA to

develop rates specific to agricultural structures. FEMA has recently contracted with CDM Smith to perform a study in response to the recommendations contained in the 2014 Government Accountability Office report, which will include looking at flood insurance. Furthermore, another opportunity may exist as FEMA researches a more specific rating method (called Risk Rating 2.0) which looks to provide a more specific rate to a structure than what is presently being provided. If sufficient data is unavailable, the California Department of Water Resources may be able to assist with structure inventories developed for the Central Valley Flood Protection Plan.

Recommendation 7

The Task Force recommends that FEMA develop insurance rates for agricultural structures separately from other types of structures and update the Flood Insurance Manual with the new rates. To expeditiously implement this recommendation, FEMA should consider using the CDM Smith study and/or developing these rates as part of the Risk Rating 2.0 approach to NFIP flood insurance ratings.

5.3.4 Insurance rates for wet floodproofed structures

FEMA's regulations (44 CFR 60) require that new and substantially improved structures have the first floor elevated to the BFE (or higher) or be floodproofed to the BFE (or higher). Only dry floodproofing is allowed, with some limited exceptions. One of the exceptions is for agricultural structures, which may be wet floodproofed by issuance of a variance.

The Flood Insurance Manual provides that structures in Zone A or AE certified for dry floodproofing to the BFE plus one foot may have the same rate as if elevated to the BFE. There is no similar provision for wet floodproofed structures.

44 CFR 60.6 provides for variances, including for wet floodproofing, and states:

> "The issuance of a variance is for flood plain management purposes only. Insurance program rates are determined by statute according to the actuarial risk and will not be modified by the granting of this variance."

Consequently, the premiums on wet floodproofed structures are identical to similar structures with no floodproofing. Yet, floodproofing prevents substantial damage to the structure for the Base Flood, virtually eliminating potential claims for the Base Flood and smaller floods. *An Assessment of the Technical and Economic Feasibility of Wet Floodproofing for Agricultural and Accessory Structures Under the National Flood Insurance Program,* prepared for FEMA*,* stated that FEMA "intends to use the results of this study to determine to what extent wet floodproofing criteria can be included in the National Flood Insurance Program (NFIP) floodplain management regulations and to develop appropriate flood insurance rates for these structures under the NFIP" (underline added).

Furthermore, the Task Force was unable to find a statute that requires a wet floodproofed structure to pay the same rate as a structure without floodproofing.

Like for dry floodproofing, agricultural structures that are wet floodproofed to the BFE plus one foot in compliance with FEMA's wet floodproofing requirements should be treated similar to structures that are elevated to the BFE.

Recommendation 8

The Task Force recommends that FEMA recognize wet floodproofing of agricultural structures in its insurance rates and address it similar to dry floodproofing, by updating the Flood Insurance Manual with the new rates. To expeditiously implement this recommendation, FEMA should consider using the CDM Smith study and/or developing these rates as part of the Risk Rating 2.0 approach to NFIP flood insurance ratings.

5.3.5 Add levee risk management activities to CRS

FEMA's Community Rating System (CRS) is a voluntary program that provides discounts on insurance rates for eligible structures in communities that participate in CRS. Communities that join CRS receive a 5 percent discount at level 9. Each 500 points increases the level by 1 and the discount by 5 percent. Level 1 communities receive a 45 percent discount on insurance premiums in SFHAs.

The Task Force identified several CRS activities that reward rural/agricultural communities for levee risk management:

- Open space preservation and low density zoning (up to 1450 and 600 points, respectively)
- Emergency action plans (up to 395 points)
- Levee relief cut plans (up to 30 points)
- Levee maintenance for non-federal[5] levees (up to 95 points)

The Task Force also identified several levee risk management activities that should be recognized for credit under CRS. Each of the following activities provides a risk reduction benefit:

- High ground evacuation locations. To qualify, a community would identify existing, and/or develop new areas of high ground that are available to locate equipment and people during a flood or a threat of flood. These high ground evacuation locations would not be on top of the levee or interfere with levee operations, maintenance, inspection, or flood fighting. They would reduce risk of loss of life and damage to personal property, as well as provide potential locations of emergency operations during a flood fight or recovery.
- Federal levees with System Wide Improvement Frameworks. To qualify, a community would have a federal levee that is eligible for federal post-flood rehabilitation assistance under Public Law 84-99 by virtue of having a System Wide Improvement Framework (SWIF) approved by USACE. Under a SWIF, the organization responsible for operations and maintenance of a federal levee commits to a long term program of risk based levee improvements that will gradually achieve full compliance with all federal operation and maintenance requirements. Progress is monitored by USACE and eligibility for PL 84-99 rehabilitation assistance is

[5] Federal levees may not be eligible for levee maintenance CRS points. A definition for federal levee or non-federal levee was not found in CRS materials reviewed. Specifically, the CRS Coordinator's Manual says "There are no LM credit points for a levee owned or operated by a federal agency" and "the credit points for LM are limited to non-accredited and nonfederal levees."

suspended if milestones are not met. Over time, implementation of a SWIF reduces the chance of a catastrophic levee failure.

- Risk-based levee system improvements. To qualify, a community would develop a program of risk-based improvements to the levee system, with identified funding sources. Repair of maintenance deficiencies would not be counted under this activity – only improvements would qualify. Improvements would enable the levee system to withstand loading at a stream stage that exceeds the levee system's design stage. This additional capacity and associated risk reduction would be documented by a civil engineer.
- Levee risk management plan. To qualify, a community would develop and adopt a plan of levee risk management. This plan would encompass many individual activities that could work together synergistically to reduce flood risk:
  - Land use management (e.g., low density zoning, HCP, conservation easements)
  - A written history of past levee performance with documentation of actions taken to address deficiencies. This will work best for basins that have not had a failure or ones that have had few failures with significant post-flood investment to correct the problems.
  - A basin emergency response (including flood warning and notification systems) and recovery plan.
  - A relief cut plan.
  - A well-funded operation and maintenance plan with a record of maintaining the levee to a high standard.
  - A flood fight plan that identifies resources (personnel, equipment, supplies, funding), agreements (including regional coordination and mutual aid), and important locations (evacuation routes, staging areas, helicopter landing pads, and potential levee overtopping and breach sites).
  - Annual documentation of flood fight training.
  - A risk assessment of the levee system with:
    - Identification of critically deficient levee reaches (critical sites).
    - A basin-wide, risk-based levee repair program that includes prioritization of critical sites, repair protocols (including design drawings) and advance measures.
    - A reasonable estimate of the likely frequency of inundation of the basin that demonstrates low risk.

For these CRS points to effectively benefit the leveed area within the community and not be dissipated by prorating the leveed area's credits throughout the community's SFHAs, the CRS program would need to be modified to recognize a subcommunity within a community. This would reduce insurance premiums within the leveed subcommunity according to the CRS points earned in the subcommunity.

Figure 6 shows the area of a community (assuming in this example the entire community is in SFHAs) and within it a subcommunity bounded by a levee system. The

subcommunity, if it were considered a unique CRS community within the larger CRS community, may qualify for numerous CRS credits beyond the credits that apply in the larger community. But if the subcommunity is not recognized separately from the community for its CRS credits, its CRS credits will be prorated and dissipated throughout the larger community. This would be of little benefit to the property owners in the subcommunity and would not motivate them to improve their CRS rating.

Recommendation 9

The Task Force recommends that the CRS program recognize a subcommunity within a community and offer CRS credits for the following activities:

- High ground evacuation locations
- Federal levees with System Wide Improvement Frameworks
- Risk-based levee system improvements
- Levee risk management plans

The Task Force also recommends that federal levees should be eligible for CRS points for levee maintenance, unless the levee is operated and maintained by the federal government. Most of the federal levees in the Sacramento Valley are not operated or maintained by the federal government.

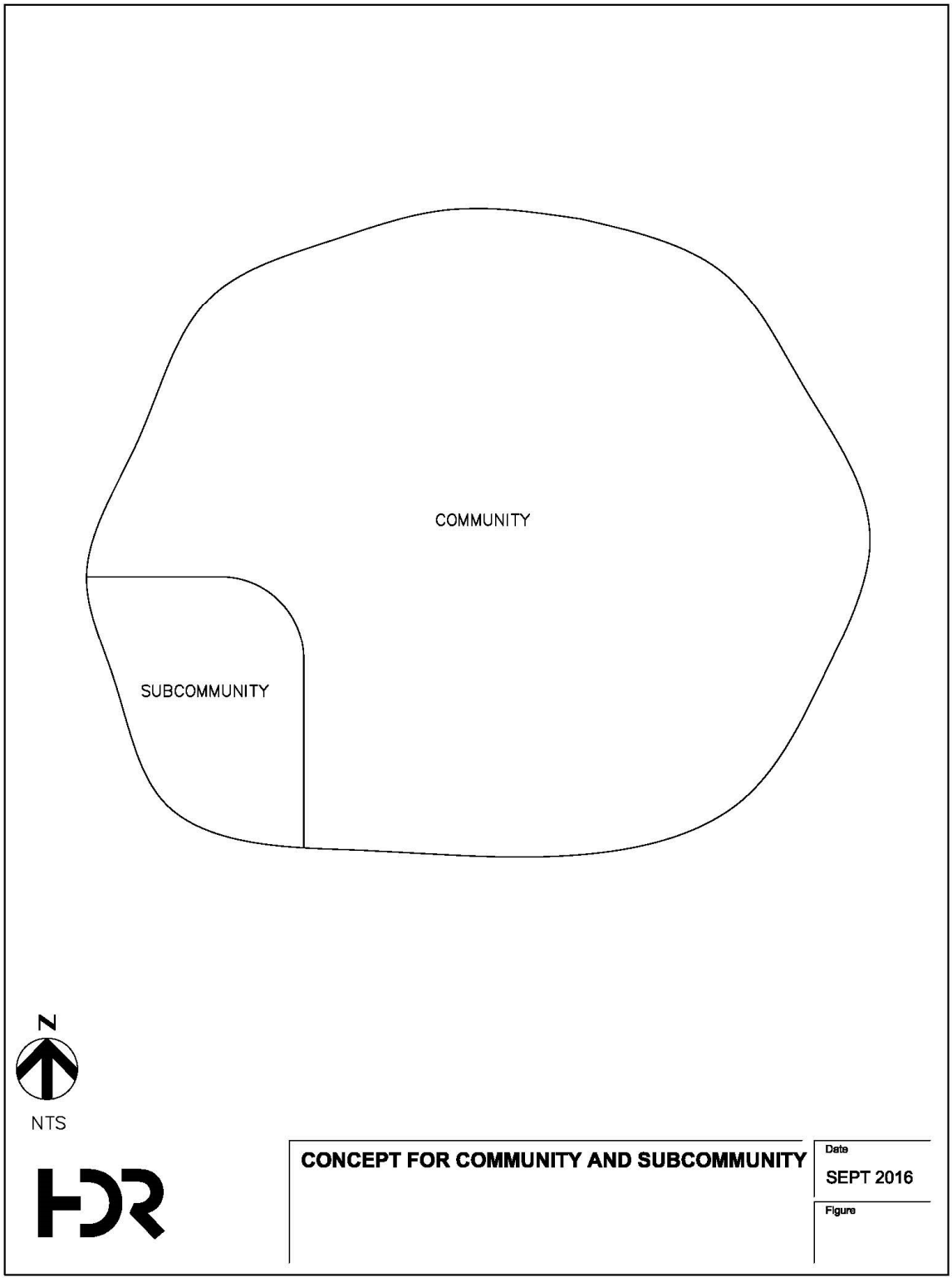


Figure 6. Concept for Community and Subcommunity

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2016 California Building Code

Note: Additional references are contained within appendices.

Appendix A. Task Force and Work Group Members

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Danelle Stylos	1
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Brian Walker	1
Seth Wurzel	3

Appendix B. Other Actions Considered

ACTIONS REQUIRING A CHANGE IN LAW OR REGULATION

The following actions were considered by the Task Force until it was determined that a law and/or regulation would need to be changed in order to implement the recommendation. The Task Force considered the action to have sufficient merit to document it in the event an opportunity arises to change law or regulation.

Modify Zone AR for agriculture

FIRMs and accompanying only recognize the insurance rate tables do not recognize the flood protection that a non-accredited levee provides if the levee qualifies for Zone AR. To qualify for Zone AR the levee system must be in the process of being restored to provide protection against the Base Flood and certified to provide protection against the flood that has a 3 percent annual chance of exceedance (i.e., the 33-year return period flood). This would be an achievable level of flood protection for many agricultural/rural levee systems. However, they could only qualify if being restored to provide protection from the Base Flood. The cost of evaluations and repairs required to restore protection from the Base Flood exceeds the financial capabilities of most rural/agricultural areas.

Insurance rates for structures in Zone AR are the same as in Zone X, which are significantly less costly than Zones A, AE, or D. Zone AR requires elevation of new and substantially improved/damaged structures above the BFE. In developed areas the elevation requirement is the lower of 3 feet above highest adjacent grade or the BFE. In undeveloped areas, (which would apply in most rural areas) the elevation requirement is 3 feet above highest adjacent grade where the BFE flood depth is 5 feet or less (or to the BFE if that is lower); if the BFE flood depth exceeds 5 feet the elevation requirement is to the BFE.

Zone AR rules could be modified to include levees protecting agricultural/rural areas without requiring levee restoration. This would reduce insurance rates to Zone X rates and provide some relief to building elevation requirements. However, this could only be achieved with changes in law and regulations. Therefore, this recommendation is not being advanced at this time.

It should be noted that a similar proposal has been made in various forums: create an Agriculture Zone. This would achieve a similar goal, but unlike modifying Zone AR, the specific level of flood protection required, the insurance rate, and land use requirements for an Agriculture Zone have not been specified.

Surcharge relief for multiple structures on a parcel

Farms typically have numerous agricultural structures, far more than other structure categories like residential, industrial, and retail business. These agricultural structures are required for efficient operations. FEMA requires each NFIP-insured structure to have its own insurance policy. According to the Flood Insurance Manual, a $250 annual surcharge is placed on every policy – with the exception of a primary residence (which has a $25 annual surcharge). The Flood Insurance Manual notes that the surcharge is

from the Homeowner Flood Insurance Affordability Act. This surcharge is unnecessarily burdensome for agriculture and should be waived after the first $250 surcharge is paid when multiple agricultural structures are insured on the same parcel. However, this could only be achieved with a change in law. Therefore, this recommendation is not being advanced at this time.

Exempt low value agricultural structures

Farms often contain detached structures, or outbuildings, of low value – such as old barns and sheds. The Homeowner Flood Insurance Affordability Act provided an exemption from the mandatory purchase requirement for detached structures on residential properties. Accordingly, FEMA modified the rules for lenders with the July 21, 2015 Final Rule for Lenders in SFHAs. The modified rules exempted detached structures for residential properties from the mandatory purchase requirement, but specifically excluded detached structures that are used primarily for agricultural purposes. The stated reason for excluding agricultural structures from this exemption is:

> "The Agencies believe detached structures used for commercial, agricultural, or other business purposes should be protected adequately by flood insurance as collateral given their value to the borrower and lender, and should not be covered by the detached structures exemption."

The problem with this statement is that there is no recognition of the fact that some of these detached structures may have little value to the borrower and lender. Like residential detached structures, low value agricultural structures should be exempted from the mandatory purchase requirement. However, this could only be achieved with changes in law and regulations. Therefore, this recommendation is not being advanced at this time.

FACILITATE USE OF PRIVATE FLOOD INSURANCE

Many hope that private insurance can become a viable, less expensive alternative to the NFIP in satisfying the mandatory insurance purchase requirement in SFHAs.

The Task Force supports use of private flood insurance to meet the insurance needs of agricultural properties, while recognizing that the financial integrity of the NFIP needs to be protected. The Task Force also expects that private insurers would price their policies with considerations of:

- A non-accredited levee's ability to provide protection from flooding
- Flood fighting capabilities
- The protection provided by wet floodproofing
- A levee risk management program adopted by a levee maintaining agency of community with dedicated funding.

The NFIP was created to provide flood insurance at a time when flood insurance from the marketplace was generally unavailable and/or unaffordable. Private insurance

companies lacked the risk information to appropriately price policies. That is no longer the case in many locations. The following information and tools available to private insurance companies enable them to price policies at rates that may be competitive with NFIP rates, especially NFIP rates for post-FIRM structures:

- FIRMs
- Floodplain maps developed by state and local agencies
- Hydrologic data from USGS
- Hydraulic models developed by USACE and private companies
- Risk and Uncertainty analysis using Monte Carlo methods

HFIAA provided for private insurance to take a larger role and be recognized as meeting the mandatory purchase requirement. However, many lenders are reluctant to recognize private as fulfilling the mandatory purchase requirement. HR 2901 has been passed by the House of Representatives and is before the Senate. The Association of State Flood Plain Managers (ASFPM) has expressed concerns with HR 2901 and recommended that the issues being addressed in HR 2901 be deliberated and addressed in the 2017 NFIP reauthorization. ASFPM concerns include:

- NFIP policies include fees for floodplain mapping and Increased Cost of Compliance (ICC) for structures experiencing repeated flood damage. Private policies should include an equivalent fee to fund these important NFIP programs.
- Private insurers can “cherry pick” the structures that would be most profitable, leaving the remaining high risk structures for the NFIP, resulting in increased NFIP premiums and compromising the financial integrity of the NFIP.
- A large flood, like the flooding in Hurricanes Sandy and Katrina, could exceed the capability of private insurers to cover the losses.

An additional concern associated with private flood insurance is that the insurance company may choose to sue the levee owner and/or levee maintainer after a levee breach to recover payouts on insured properties. FEMA also has this capability, but has chosen not to exercise it. This is a distinct advantage for the levee owner and levee maintainer when structures are insured through the NFIP.

Appendix C. Model Floodplain Management Ordinance for Use with Zone D

Note that this document in Appendix C is meant to be used as stand-alone document and therefore the pages are not numbered as being in Appendix C.

CALIFORNIA

MODEL

FLOODPLAIN MANAGEMENT

ORDINANCE

FOR
NONCOASTAL COMMUNITIES

December 2006

Modified for Zone D Replacing an SFHA*

DRAFT

This California Model Floodplain Management Ordinance has been developed as a tool to help communities meet the minimum requirements of the National Flood Insurance Program (NFIP). Communities choosing not to use this model ordinance must ensure their ordinance meets the minimum requirements of the NFIP.

Department of Water Resources
The Resources Agency, State of California

*Modifications are shown in blue text with strikeout and underline

TABLE OF CONTENTS

Instructions for Creating Your Community's Ordinance

1) PROVIDE COMMUNITY SPECIFIC INFORMATION AS REQUESTED IN BRACKETS.
This model ordinance contains {brackets} that must be replaced with community specific information such as your community's name, address, or name of the responsible party.

2) ACCESSORY STRUCTURES.
This model ordinance contains the definition for accessory structures and construction requirements in Section 5.1.C.5 to allow for the permitting of an **"Accessory structure"** within special flood hazard areas **without a variance**.

3) UPDATE CROSS REFERENCES.
Cross references and bracketed items throughout this document are underlined in red and bolded only to facilitate locating to ensure changes are made and to match actual numbering used by your community and not intended to reflect a suggested final format.

4) DETERMINE IF YOUR COMMUNITY WANTS TO ADOPT HIGHER STANDARDS RECOMMENDED BY THE STATE OF CALIFORNIA.
This model ordinance meets the minimum standards required to participate in the National Flood Insurance Program. Community adoption of higher standards can be applied towards credit under the Community Rating System (CRS) program and result in reduced premiums for the entire community. The State of California recommends:

- **Freeboard.** See Appendix 2.0.A, page 2~~2~~7.
- **Determining BFE's in Unnumbered A Zones.** See Appendix 2.0.B, page 2~~2~~7.
- **Determining Market Value of Existing Structures.** See Appendix 2.0.C, page 2~~2~~7.
- **Increased Cost of Compliance (ICC) Coverage—Repetitive Loss Provisions.** See Appendix 2.0.D, page 2~~3~~7.
- **Non-conversion of Enclosed Areas Below the Lowest Floor.** See Appendix 2.0.E, page 2~~3~~8.

5) DETERMINE IF YOUR COMMUNITY HAS SPECIAL REQUIREMENTS

- **Alluvial Fan Advisory.**

  See Appendix 1.0, page 2~~1~~5.
- **Crawlspace Construction.**

  See Appendix 3.0.A, page 2~~4~~9.
- **Mudslide (i.e., mudflow) Prone Areas.** (Zone M)
  See Appendix 3.0.B, page ~~25~~30.
- **Erosion Prone Areas.** (Zone E)
  See Appendix 3.0.C, page ~~26~~31.

6) PRIOR TO ADOPTION, SUBMIT DRAFT TO:

- Other community departments, including Attorney's office.
- Department of Water Resources or FEMA Region IX for review and approval.

7) AFTER ADOPTION, SEND A COPY OF THE ADOPTED ORDINANCE CERTIFIED BY THE CITY/COUNTY CLERK TO FEMA REGION IX AND A COPY TO DWR.

SECTION 1.0
STATUTORY AUTHORIZATION, FINDINGS OF FACT, PURPOSE AND METHODS

1.1 STATUTORY AUTHORIZATION.

The Legislature of the State of California has in Government Code Sections 65302, 65560, and 65800 conferred upon local governments the authority to adopt regulations designed to promote the public health, safety, and general welfare of its citizenry. Therefore, the {community governing body} of {name of county or municipality} does hereby adopt the following floodplain management regulations.

1.2 FINDINGS OF FACT.

A. The flood hazard areas of {name of county or municipality} are subject to periodic inundation which results in loss of life and property, health and safety hazards, disruption of commerce and governmental services, extraordinary public expenditures for flood protection and relief, and impairment of the tax base, all of which adversely affect the public health, safety, and general welfare.

B. These flood losses are caused by uses that are inadequately elevated, floodproofed, or protected from flood damage. The cumulative effect of obstructions in areas of special flood hazards which increase flood heights and velocities also contributes to flood losses.

1.3 STATEMENT OF PURPOSE.

It is the purpose of this ordinance to promote the public health, safety, and general welfare, and to minimize public and private losses due to flood conditions in specific areas by legally enforceable regulations applied uniformly throughout the community to all publicly and privately owned land within flood prone, mudslide [i.e. mudflow] or flood related erosion areas. These regulations are designed to:

A. Protect human life and health;

B. Minimize expenditure of public money for costly flood control projects;

C. Minimize the need for rescue and relief efforts associated with flooding and generally undertaken at the expense of the general public;

D. Minimize prolonged business interruptions;

E. Minimize damage to public facilities and utilities such as water and gas mains; electric, telephone and sewer lines; and streets and bridges located in areas of special flood hazard;

F. Help maintain a stable tax base by providing for the sound use and development of areas of special flood hazard so as to minimize future blighted areas caused by flood damage;

G. Ensure that potential buyers are notified that property is in an area of special flood hazard; and

H. Ensure that those who occupy the areas of special flood hazard assume responsibility for their actions.

1.4 METHODS OF REDUCING FLOOD LOSSES.

In order to accomplish its purposes, this ordinance includes regulations to:

A. Restrict or prohibit uses which are dangerous to health, safety, and property due to water or erosion hazards, or which result in damaging increases in erosion or flood heights or velocities;

B. Require that uses vulnerable to floods, including facilities which serve such uses, be protected against, flood damage at the time of initial construction;

C. Control the alteration of natural floodplains, stream channels, and natural protective barriers, which help accommodate or channel floodwaters;

D. Control filling, grading, dredging, and other development which may increase flood damage;

E. Prevent or regulate the construction of flood barriers which will unnaturally divert floodwaters or which may increase flood hazards in other areas; and

SECTION 2.0
DEFINITIONS

Unless specifically defined below, words or phrases used in this ordinance shall be interpreted so as to give them the meaning they have in common usage and to give this ordinance its most reasonable application.

"A zone" - see **"Special flood hazard area"**.

"Accessory structure" means a structure that is either:

1. Solely for the parking of no more than 2 cars; or

2. A small, low cost shed for limited storage, less than 150 square feet and $1,500 in value.

"Accessory use" means a use which is incidental and subordinate to the principal use of the parcel of land on which it is located.

"Agricultural structure" means a structure used solely for agricultural purposes in which the use is exclusively in connection with the production, harvesting, storage, drying, or raising, of agricultural commodities, including the raising of livestock.

"Alluvial fan" means a geomorphologic feature characterized by a cone or fan-shaped deposit of boulders, gravel, and fine sediments that have been eroded from mountain slopes, transported by flood flows, and then deposited on the valley floors, and which is subject to flash flooding, high velocity flows, debris flows, erosion, sediment movement and deposition, and channel migration.

"Apex" means a point on an alluvial fan or similar landform below which the flow path of the major stream that formed the fan becomes unpredictable and alluvial fan flooding can occur.

"Appeal" means a request for a review of the Floodplain Administrator's interpretation of any provision of this ordinance.

"Area of shallow flooding" means a designated AO or AH Zone on the Flood Insurance Rate Map (FIRM). The base flood depths range from one to three feet; a clearly defined channel does not exist; the path of flooding is unpredictable and indeterminate; and velocity flow may be evident. Such flooding is characterized by ponding or sheet flow.

"Area of special flood hazard" - See "Special flood hazard area."

"Base flood" means a flood which has a one percent chance of being equaled or exceeded in any given year (also called the "100-year flood"). Base flood is the term used throughout this ordinance.

"Base flood elevation" (BFE) means the elevation shown on the Flood Insurance Rate Map for Zones AE, AH, A1-30, VE and V1-V30 that indicates the water surface elevation resulting from a flood that has a 1-percent or greater chance of being equaled or exceeded in any given year.

"Basement" means any area of the building having its floor subgrade - i.e., below ground level - on all sides.

"Building" - see **"Structure"**.

"Development" means any man-made change to improved or unimproved real estate, including but not limited to buildings or other structures, mining, dredging, filling, grading, paving, excavation or drilling operations or storage of equipment or materials.
"Encroachment" means the advance or infringement of uses, plant growth, fill, excavation, buildings, permanent structures or development into a floodplain which may impede or alter the flow capacity of a floodplain.

"Existing manufactured home park or subdivision" means a manufactured home park or subdivision for which the construction of facilities for servicing the lots on which the manufactured homes are to be affixed (including, at a minimum, the installation of utilities, the construction of streets, and either final site grading or the pouring of concrete pads) is completed before **{insert date your first floodplain management ordinance was adopted}**.

"Expansion to an existing manufactured home park or subdivision" means the preparation of additional sites by the construction of facilities for servicing the lots on which the manufactured homes are to be affixed (including the installation of utilities, the construction of streets, and either final site grading or the pouring of concrete pads).

"Flood, flooding, or flood water" means:

1. A general and temporary condition of partial or complete inundation of normally dry land areas from the overflow of inland or tidal waters; the unusual and rapid accumulation or runoff of surface waters from any source; and/or mudslides (i.e., mudflows); and

2. The condition resulting from flood-related erosion.

"Flood Boundary and Floodway Map (FBFM)" means the official map on which the Federal Emergency Management Agency or Federal Insurance Administration has delineated both the areas of special flood hazards and the floodway.

"Flood Insurance Rate Map (FIRM)" means the official map on which the Federal Emergency Management Agency or Federal Insurance Administration has delineated both the areas of special flood hazards and the risk premium zones applicable to the community.

"Flood Insurance Study" means the official report provided by the Federal Insurance Administration that includes flood profiles, the Flood Insurance Rate Map, the Flood Boundary and Floodway Map, and the water surface elevation of the base flood.

"Floodplain or flood-prone area" means any land area susceptible to being inundated by water from any source - see **"Flooding."**

"Floodplain Administrator" is the community official designated by title to administer and enforce the floodplain management regulations.

"Floodplain management" means the operation of an overall program of corrective and preventive measures for reducing flood damage and preserving and enhancing, where possible, natural resources in the floodplain, including but not limited to emergency preparedness plans, flood control works, floodplain management regulations, and open space plans.

"Floodplain management regulations" means this ordinance and other zoning ordinances, subdivision regulations, building codes, health regulations, special purpose ordinances (such as grading and erosion control) and other application of police power which control development in flood-prone areas. This term describes federal, state or local regulations in any combination thereof which provide standards for preventing and reducing flood loss and damage.

"Floodproofing" means any combination of structural and nonstructural additions, changes, or adjustments to structures which reduce or eliminate flood damage to real estate or improved real property, water and sanitary facilities, structures, and their contents. For guidelines on dry and wet floodproofing, see FEMA Technical Bulletins TB 1-93, TB 3-93, and TB 7-93.
"Floodway" means the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than one foot. Also referred to as "Regulatory Floodway."

"Floodway fringe" is that area of the floodplain on either side of the "Regulatory Floodway" where encroachment may be permitted.

"**Fraud and victimization"** as related to **Section 6.0** of this ordinance, means that the variance granted must not cause fraud on or victimization of the public. In examining this requirement, the **{community governing body}** will consider the fact that every newly constructed building adds to government responsibilities and remains a part of the community for fifty to one-hundred years. Buildings that are permitted to be constructed below the base flood elevation are subject during all those years to increased risk of damage from floods, while future owners of the property and the community as a whole are subject to all the costs, inconvenience, danger, and suffering that those increased flood damages bring. In addition, future owners may purchase the property, unaware that it is subject to potential flood damage, and can be insured only at very high flood insurance rates.

"Functionally dependent use" means a use which cannot perform its intended purpose unless it is located or carried out in close proximity to water. The term includes only docking facilities, port facilities that are necessary for the loading and unloading of cargo or passengers, and ship building and ship repair facilities, and does not include long-term storage or related manufacturing facilities.

"Governing body" is the local governing unit, i.e. county or municipality, that is empowered to adopt and implement regulations to provide for the public health, safety and general welfare of its citizenry.

"Hardship" as related to **Section 6** of this ordinance means the exceptional hardship that would result from a failure to grant the requested variance. The **{community governing body}** requires that the variance be exceptional, unusual, and peculiar to the property involved. Mere economic or financial hardship alone is not exceptional. Inconvenience, aesthetic considerations, physical handicaps, personal preferences, or the disapproval of one's neighbors likewise cannot, as a rule, qualify as an exceptional hardship. All of these problems can be resolved through other means without granting a variance, even if the alternative is more expensive, or requires the property owner to build elsewhere or put the parcel to a different use than originally intended.

"Highest adjacent grade" means the highest natural elevation of the ground surface prior to construction next to the proposed walls of a structure.

"**Historic structure"** means any structure that is:

1. Listed individually in the National Register of Historic Places (a listing maintained by the Department of Interior) or preliminarily determined by the Secretary of the Interior as meeting the requirements for individual listing on the National Register;

2. Certified or preliminarily determined by the Secretary of the Interior as contributing to the historical significance of a registered historic district or a district preliminarily determined by the Secretary to qualify as a registered historic district;

3. Individually listed on a state inventory of historic places in states with historic preservation programs which have been approved by the Secretary of Interior; or

4. Individually listed on a local inventory of historic places in communities with historic preservation programs that have been certified either by an approved state program as determined by the Secretary of the Interior or directly by the Secretary of the Interior in states without approved programs.

"Levee" means a man-made structure, usually an earthen embankment, designed and constructed in accordance with sound engineering practices to contain, control or divert the flow of water so as to provide protection from temporary flooding.

"Levee system" means a flood protection system which consists of a levee, or levees, and associated structures, such as closure and drainage devices, which are constructed and operated in accord with sound engineering practices.

"Lowest floor" means the lowest floor of the lowest enclosed area, including basement (see **"Basement"** definition).

1. An unfinished or flood resistant enclosure below the lowest floor that is usable solely for parking of vehicles, building access or storage in an area other than a basement area, is not considered a building's lowest floor provided it conforms to applicable non-elevation design requirements, including, but not limited to:

   a. The flood openings standard in **Section 5.1.C.3**;

   b. The anchoring standards in **Section 5.1.A**;

   c. The construction materials and methods standards in **Section 5.1.B**; and

   d. The standards for utilities in **Section 5.2**.

2. For residential structures, all subgrade enclosed areas are prohibited as they are considered to be basements (see **"Basement"** definition). This prohibition includes below-grade garages and storage areas.

"Manufactured home" means a structure, transportable in one or more sections, which is built on a permanent chassis and is designed for use with or without a permanent foundation when attached to the required utilities. The term "manufactured home" does not include a "recreational vehicle".

"Manufactured home park or subdivision" means a parcel (or contiguous parcels) of land divided into two or more manufactured home lots for rent or sale.

"Market value" is defined in the **{name of county or municipality}** substantial damage/improvement procedures. See **Section 4.2.B.1**.

"Mean sea level" means, for purposes of the National Flood Insurance Program, the National Geodetic Vertical Datum (NGVD) of 1929, North American Vertical Datum (NAVD) of 1988, or other datum, to which base flood elevations shown on a community's Flood Insurance Rate Map are referenced.

"New construction", for floodplain management purposes, means structures for which the "start of construction" commenced on or after **{insert date your first floodplain management ordinance was adopted}**, and includes any subsequent improvements to such structures.

"New manufactured home park or subdivision" means a manufactured home park or subdivision for which the construction of facilities for servicing the lots on which the manufactured homes are to

be affixed (including at a minimum, the installation of utilities, the construction of streets, and either final site grading or the pouring of concrete pads) is completed on or after **{insert date your first floodplain management ordinance was adopted}**.

"Non-agricultural structure" means a structure that is not an agricultural structure.

"Obstruction" includes, but is not limited to, any dam, wall, wharf, embankment, levee, dike, pile, abutment, protection, excavation, channelization, bridge, conduit, culvert, building, wire, fence, rock, gravel, refuse, fill, structure, vegetation or other material in, along, across or projecting into any watercourse which may alter, impede, retard or change the direction and/or velocity of the flow of water, or due to its location, its propensity to snare or collect debris carried by the flow of water, or its likelihood of being carried downstream.

"One-hundred-year flood" or "100-year flood" - see **"Base flood."**

"**Program deficiency"** means a defect in a community's floodplain management regulations or administrative procedures that impairs effective implementation of those floodplain management regulations.

"Public safety and nuisance" as related to Section 6 of this ordinance, means that the granting of a variance must not result in anything which is injurious to safety or health of an entire community or neighborhood, or any considerable number of persons, or unlawfully obstructs the free passage or use, in the customary manner, of any navigable lake, or river, bay, stream, canal, or basin.

"Recreational vehicle" means a vehicle which is:

1. Built on a single chassis;

2. 400 square feet or less when measured at the largest horizontal projection;

3. Designed to be self-propelled or permanently towable by a light-duty truck; and

4. Designed primarily not for use as a permanent dwelling but as temporary living quarters for recreational, camping, travel, or seasonal use.

"Regulatory floodway" means the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than one foot.

"Remedy a violation" means to bring the structure or other development into compliance with State or local floodplain management regulations, or if this is not possible, to reduce the impacts of its noncompliance. Ways that impacts may be reduced include protecting the structure or other affected development from flood damages, implementing the enforcement provisions of the ordinance or otherwise deterring future similar violations, or reducing State or Federal financial exposure with regard to the structure or other development.

"Riverine" means relating to, formed by, or resembling a river (including tributaries), stream, brook, etc. **"Sheet flow area"** - see **"Area of shallow flooding."**

"Special flood hazard area (SFHA)" means an area in the floodplain subject to a 1 percent or greater chance of flooding in any given year. It is shown on an FHBM or FIRM as Zone A, AO, A1-A30, AE, A99, or, AH.

"Start of construction" includes substantial improvement and other proposed new development and means the date the building permit was issued, provided the actual start of construction, repair,

reconstruction, rehabilitation, addition, placement, or other improvement was within 180 days from the date of the permit. The actual start means either the first placement of permanent construction of a structure on a site, such as the pouring of slab or footings, the installation of piles, the construction of columns, or any work beyond the stage of excavation; or the placement of a manufacture home on a foundation. Permanent construction does not include land preparation, such as clearing, grading, and filling; nor does it include the installation of streets and/or walkways; nor does it include excavation for a basement, footings, piers, or foundations or the erection of temporary forms; nor does it include the installation on the property of accessory buildings, such as garages or sheds not occupied as dwelling units or not part of the main structure. For a substantial improvement, the actual start of construction means the first alteration of any wall, ceiling, floor, or other structural part of a building, whether or not that alteration affects the external dimensions of the building.

"Structure" means a walled and roofed building that is principally above ground; this includes a gas or liquid storage tank or a manufactured home.

"Substantial damage" means damage of any origin sustained by a structure whereby the cost of restoring the structure to its before damaged condition would equal or exceed 50 percent of the market value of the structure before the damage occurred.

"Substantial improvement" means any reconstruction, rehabilitation, addition, or other improvement of a structure, the cost of which equals or exceeds 50 percent of the market value of the structure before the "start of construction" of the improvement. This term includes structures which have incurred "substantial damage", regardless of the actual repair work performed. The term does not, however, include either:

1. Any project for improvement of a structure to correct existing violations or state or local health, sanitary, or safety code specifications which have been identified by the local code enforcement official and which are the minimum necessary to assure safe living conditions; or

2. Any alteration of a "historic structure," provided that the alteration will not preclude the structure's continued designation as a "historic structure."

"Variance" means a grant of relief from the requirements of this ordinance which permits construction in a manner that would otherwise be prohibited by this ordinance.

"Violation" means the failure of a structure or other development to be fully compliant with this ordinance. A structure or other development without the elevation certificate, other certifications, or other evidence of compliance required in this ordinance is presumed to be in violation until such time as that documentation is provided.

"Water surface elevation" means the height, in relation to the National Geodetic Vertical Datum (NGVD) of 1929, North American Vertical Datum (NAVD) of 1988, or other datum, of floods of various magnitudes and frequencies in the floodplains of coastal or riverine areas.

"Watercourse" means a lake, river, creek, stream, wash, arroyo, channel or other topographic feature on or over which waters flow at least periodically. Watercourse includes specifically designated areas in which substantial flood damage may occur.

"Zone D Local Flood Hazard Area" means a federally defined Zone D area of undetermined flood risk behind a levee system that is not accredited as providing protection from the base flood and that is administered similar to a special flood hazard area through floodplain management regulations. A Zone D local flood hazard area is not identified as a special flood hazard area on the FIRM because the floodplain management regulations for the Zone D local flood hazard area are similar to the

regulations for a special flood hazard area, with the exception of regulations for agricultural structures.

SECTION 3.0
GENERAL PROVISIONS

3.1 LANDS TO WHICH THIS ORDINANCE APPLIES.

This ordinance shall apply to all areas of special flood hazards and local flood hazards within the jurisdiction of **{name of county or municipality}**.

3.2 BASIS FOR ESTABLISHING THE AREAS OF SPECIAL FLOOD HAZARD.

The areas of special flood hazard identified by the Federal Emergency Management Agency (FEMA) in the "Flood Insurance Study (FIS) for **{name of county or municipality (exact title of study)}**" dated **{date}**, with accompanying Flood Insurance Rate Maps (FIRM's) and Flood Boundary and Floodway Maps (FBFM's), dated **{date}**, and all subsequent amendments and/or revisions, are hereby adopted by reference and declared to be a part of this ordinance. This FIS and attendant mapping is the minimum area of applicability of this ordinance and may be supplemented by studies for other areas which allow implementation of this ordinance and which are recommended to the **{community governing body}** by the Floodplain Administrator. The study, FIRM's and FBFM's are on file at **{department, address}**. Zone D local flood hazard areas are identified as Zone D on a FIRM and on maps on file in the Office of the Floodplain Administrator.

3.3 COMPLIANCE.

No structure or land shall hereafter be constructed, located, extended, converted, or altered without full compliance with the terms of this ordinance and other applicable regulations. Violation of the requirements (including violations of conditions and safeguards) shall constitute a misdemeanor. Nothing herein shall prevent the **{community governing body}** from taking such lawful action as is necessary to prevent or remedy any violation.

3.4 ABROGATION AND GREATER RESTRICTIONS.

This ordinance is not intended to repeal, abrogate, or impair any existing easements, covenants, or deed restrictions. However, where this ordinance and another ordinance, easement, covenant, or deed restriction conflict or overlap, whichever imposes the more stringent restrictions shall prevail.

3.5 INTERPRETATION.

In the interpretation and application of this ordinance, all provisions shall be:

A. Considered as minimum requirements;

B. Liberally construed in favor of the governing body; and

C. Deemed neither to limit nor repeal any other powers granted under state statutes.

3.6 WARNING AND DISCLAIMER OF LIABILITY.

The degree of flood protection required by this ordinance is considered reasonable for regulatory purposes and is based on scientific and engineering considerations. Larger floods can and will occur on rare occasions. Flood heights may be increased by man-made or natural causes. This ordinance does not imply that land outside the areas of special flood hazards and local flood hazards or uses permitted within such areas will be free from flooding or flood damages. This ordinance shall not create liability on the part of **{community**

governing body}, any officer or employee thereof, the State of California, or the Federal Emergency Management Agency, for any flood damages that result from reliance on this ordinance or any administrative decision lawfully made hereunder.

3.7 SEVERABILITY.

This ordinance and the various parts thereof are hereby declared to be severable. Should any section of this ordinance be declared by the courts to be unconstitutional or invalid, such decision shall not affect the validity of the ordinance as a whole, or any portion thereof other than the section so declared to be unconstitutional or invalid.

SECTION 4.0 ADMINISTRATION

4.1 DESIGNATION OF THE FLOODPLAIN ADMINISTRATOR.

The **{e.g., City Manager, Director of Planning, Public Works, or Building Official, etc.}** is hereby appointed to administer, implement, and enforce this ordinance by granting or denying development permits in accord with its provisions.

4.2 DUTIES AND RESPONSIBILITIES OF THE FLOODPLAIN ADMINISTRATOR.

The duties and responsibilities of the Floodplain Administrator shall include, but not be limited to the following:

A. Permit Review.

Review all development permits to determine:

1. Permit requirements of this ordinance have been satisfied, including determination of substantial improvement and substantial damage of existing structures;

2. All other required state and federal permits have been obtained;

3. The site is reasonably safe from flooding;

4. The proposed development does not adversely affect the carrying capacity of areas where base flood elevations have been determined but a floodway has not been designated. This means that the cumulative effect of the proposed development when combined with all other existing and anticipated development will not increase the water surface elevation of the base flood more than 1 foot at any point within the **{name of county or municipality}**; and

5. All Letters of Map Revision (LOMR's) for flood control projects are approved prior to the issuance of building permits. Building Permits must not be issued based on Conditional Letters of Map Revision (CLOMR's). Approved CLOMR's allow construction of the proposed flood control project and land preparation as specified in the "start of construction" definition.

B. Development of Substantial Improvement and Substantial Damage Procedures.

1. Using FEMA publication FEMA 213, "Answers to Questions About Substantially Damaged Buildings," develop detailed procedures for identifying and administering requirements for substantial improvement and substantial damage, to include defining "Market Value."

2. Assure procedures are coordinated with other departments/divisions and implemented by community staff.

C. Review, Use and Development of Other Base Flood Data.

When base flood elevation data has not been provided in accordance with **Section 3.2**, the Floodplain Administrator shall obtain, review, and reasonably utilize any base flood elevation and floodway data available from a federal or state agency, or other source, in order to administer **Section 5**. For Zone D local flood hazard areas

identified as Zone D on the FIRM, the Floodplain Administrator shall reasonably utilize any base flood elevation and floodway data from the most recent Flood Insurance Study and FIRM that previously showed the Zone D area as a special flood hazard area.

NOTE: A base flood elevation may be obtained using one of two methods from the FEMA publication, FEMA 265, "Managing Floodplain Development in Approximate Zone A Areas – A Guide for Obtaining and Developing Base (100-year) Flood Elevations" dated July 1995.

D. Notification of Other Agencies.

1. Alteration or relocation of a watercourse:

   a. Notify adjacent communities and the California Department of Water Resources prior to alteration or relocation;

   b. Submit evidence of such notification to the Federal Emergency Management Agency; and

   c. Assure that the flood carrying capacity within the altered or relocated portion of said watercourse is maintained.

2. Base Flood Elevation changes due to physical alterations:

   a. Within 6 months of information becoming available or project completion, whichever comes first, the floodplain administrator shall submit or assure that the permit applicant submits technical or scientific data to FEMA for a Letter of Map Revision (LOMR).

   b. All LOMR's for flood control projects are approved prior to the issuance of building permits. Building Permits must not be issued based on Conditional Letters of Map Revision (CLOMR's). Approved CLOMR's allow construction of the proposed flood control project and land preparation as specified in the "start of construction" definition.

Such submissions are necessary so that upon confirmation of those physical changes affecting flooding conditions, risk premium rates and floodplain management requirements are based on current data.

3. Changes in corporate boundaries:

   Notify FEMA in writing whenever the corporate boundaries have been modified by annexation or other means and include a copy of a map of the community clearly delineating the new corporate limits.

E. Documentation of Floodplain Development.

Obtain and maintain for public inspection and make available as needed the following:

1. Certification required by **Section 5.1.C.1 and Section 5.4** (lowest floor elevations);

2. Certification required by **Section 5.1.C.2** (elevation or floodproofing of nonresidential structures);

3. Certification required by **Sections 5.1.C.3** (wet floodproofing standard);

4. Certification of elevation required by **Section 5.3.A.3** (subdivisions and other proposed development standards);

5. Certification required by **Section 5.6.B** (floodway encroachments); and

6. Maintain a record of all variance actions, including justification for their issuance, and report such variances issued in its biennial report submitted to the Federal Emergency Management Agency.

F. Map Determination.
Make interpretations where needed, as to the exact location of the boundaries of the areas of special flood hazard, where there appears to be a conflict between a mapped boundary and actual field conditions. The person contesting the location of the boundary shall be given a reasonable opportunity to appeal the interpretation as provided in **Section 4.4**.

F. Remedial Action.
Take action to remedy violations of this ordinance as specified in **Section 3.3**.

G. Biennial Report.
Complete and submit Biennial Report to FEMA.

H. Planning.
Assure community's General Plan is consistent with floodplain management objectives herein.

4.3 DEVELOPMENT PERMIT.

A development permit shall be obtained before any construction or other development, including manufactured homes, within any area of special flood hazard or Zone D local flood hazard established in **Section 3.2**. Application for a development permit shall be made on forms furnished by the **{name of community}**. The applicant shall provide the following minimum information:

A. Plans in duplicate, drawn to scale, showing:

1. Location, dimensions, and elevation of the area in question, existing or proposed structures, storage of materials and equipment and their location;

2. Proposed locations of water supply, sanitary sewer, and other utilities;

3. Grading information showing existing and proposed contours, any proposed fill, and drainage facilities;

4. Location of the regulatory floodway when applicable;

5. Base flood elevation information as specified in Section 3.2 or Section 4.2.C;

6. Proposed elevation in relation to mean sea level, of the lowest floor (including basement) of all structures; and

7. Proposed elevation in relation to mean sea level to which any nonresidential structure will be floodproofed, as required in Section 5.1.C.2 of this ordinance and detailed in FEMA Technical Bulletin TB 3-93.

B. Certification from a registered civil engineer or architect that the nonresidential floodproofed building meets the floodproofing criteria in Section 5.1.C.2.

C. For a crawl-space foundation, location and total net area of foundation openings as required in Section 5.1.C.3 of this ordinance and detailed in FEMA Technical Bulletins 1-93 and 7-93.

D. Description of the extent to which any watercourse will be altered or relocated as a result of proposed development.

E. All appropriate certifications listed in Section 4.2.E of this ordinance.

4.4 APPEALS.

The **{community governing body}** of **{name of county or municipality}** shall hear and decide appeals when it is alleged there is an error in any requirement, decision, or determination made by the Floodplain Administrator in the enforcement or administration of this ordinance.

SECTION 5.0
PROVISIONS FOR FLOOD HAZARD REDUCTION

5.1 STANDARDS OF CONSTRUCTION.

In all areas of special flood hazards the following standards are required:

A. Anchoring.

All new construction and substantial improvements of structures, including manufactured homes and including non-agricultural structures in Zone D local flood hazard areas, shall be adequately anchored to prevent flotation, collapse or lateral movement of the structure resulting from hydrodynamic and hydrostatic loads, including the effects of buoyancy.

B. Construction Materials and Methods.

All new construction and substantial improvements of structures, including manufactured homes and including non-agricultural structures in Zone D local flood hazard areas, shall be constructed:

1. With flood resistant materials, and utility equipment resistant to flood damage for areas below the base flood elevation;

2. Using methods and practices that minimize flood damage;

3. With electrical, heating, ventilation, plumbing and air conditioning equipment and other service facilities that are designed and/or located so as to prevent water from entering or accumulating within the components during conditions of flooding; and

4. Within Zones AH or AO, so that there are adequate drainage paths around structures on slopes to guide flood waters around and away from proposed structures.

C. Elevation and Floodproofing.

1. **Residential construction.**

All new construction or substantial improvements of residential structures shall have the lowest floor, including basement:

a. In AE, AH, A1-30 Zones, elevated to or above the base flood elevation.

b. In an AO zone, elevated above the highest adjacent grade to a height equal to or exceeding the depth number specified in feet on the FIRM, or elevated at least 2 feet above the highest adjacent grade if no depth number is specified.

c. In an A zone, without BFE's specified on the FIRM [unnumbered A zone], elevated to or above the base flood elevation; as determined under **Section 4.2.C**.
Upon the completion of the structure, the elevation of the lowest floor, including basement, shall be certified by a registered civil engineer or

licensed land surveyor, and verified by the community building inspector to be properly elevated. Such certification and verification shall be provided to the Floodplain Administrator.

2. **Nonresidential construction.**

All new construction or substantial improvements of nonresidential structures, including non-agricultural structures in Zone D local flood hazard areas, shall either be elevated to conform with **Section 5.1.C.1** or:

a. Be floodproofed, together with attendant utility and sanitary facilities, below the elevation recommended under **Section 5.1.C.1**, so that the structure is watertight with walls substantially impermeable to the passage of water;

b. Have structural components capable of resisting hydrostatic and hydrodynamic loads and effects of buoyancy; and

c. Be certified by a registered civil engineer or architect that the standards of **Section 5.1 C.2.a & b** are satisfied. Such certification shall be provided to the Floodplain Administrator.

3. **Flood openings.**

All new construction and substantial improvements of structures with fully enclosed areas below the lowest floor (excluding basements and excluding agricultural structures in Zone D local flood hazard areas) that are usable solely for parking of vehicles, building access or storage, and which are subject to flooding, shall be designed to automatically equalize hydrostatic flood forces on exterior walls by allowing for the entry and exit of floodwater. Designs for meeting this requirement must meet the following minimum criteria:

a. For non-engineered openings:

1. Have a minimum of two openings on different sides having a total net area of not less than one square inch for every square foot of enclosed area subject to flooding;

2. The bottom of all openings shall be no higher than one foot above grade;

3. Openings may be equipped with screens, louvers, valves or other coverings or devices provided that they permit the automatic entry and exit of floodwater; and

4. Buildings with more than one enclosed area must have openings on exterior walls for each area to allow flood water to directly enter; or

b. Be certified by a registered civil engineer or architect.

4. **Manufactured homes.**

a. See **Section 5.4**.

5. **Garages and low cost accessory structures.**

a. Attached garages.

1. A garage attached to a residential structure, constructed with the garage floor slab below the BFE, must be designed to allow for the automatic entry of flood waters. See **Section 5.1.C.3**. Areas of the garage below the BFE must be constructed with flood resistant materials. See **Section 5.1.B**.

2. A garage attached to a nonresidential structure must meet the above requirements or be dry floodproofed. For guidance on below grade parking areas, see FEMA Technical Bulletin TB-6.

b. Detached garages and accessory structures.

1. "Accessory structures" used solely for parking (2 car detached garages or smaller) or limited storage (small, low-cost sheds), as defined in **Section 2**, may be constructed such that its floor is below the base flood elevation (BFE), provided the structure is designed and constructed in accordance with the following requirements:

a) Use of the accessory structure must be limited to parking or limited storage;

b) The portions of the accessory structure located below the BFE must be built using flood-resistant materials;

c) The accessory structure must be adequately anchored to prevent flotation, collapse and lateral movement;

d) Any mechanical and utility equipment in the accessory structure must be elevated or floodproofed to or above the BFE;

e) The accessory structure must comply with floodplain encroachment provisions in **Section 5.6**; and

f) The accessory structure must be designed to allow for the automatic entry of flood waters in accordance with **Section 5.1.C.3**.

2. Detached garages and accessory structures not meeting the above standards must be constructed in accordance with all applicable standards in **Section 5.1**.

5.2 STANDARDS FOR UTILITIES.

A. All new and replacement water supply and sanitary sewage systems shall be designed to minimize or eliminate:

1. Infiltration of flood waters into the systems; and

2. Discharge from the systems into flood waters.

B. On-site waste disposal systems shall be located to avoid impairment to them, or contamination from them during flooding.

5.3 STANDARDS FOR SUBDIVISIONS AND OTHER PROPOSED DEVELOPMENT.

A. All new subdivisions proposals and other proposed development, including proposals for manufactured home parks and subdivisions, greater than 50 lots or 5 acres, whichever is the lesser, shall:

1. Identify the Special Flood Hazard Areas (SFHA), the Zone D local flood hazard areas, and Base Flood Elevations (BFE).

2. Identify the elevations of lowest floors of all proposed structures and pads on the final plans.

3. If the site is filled above the base flood elevation, the following as-built information for each structure shall be certified by a registered civil engineer or licensed land surveyor and provided as part of an application for a Letter of Map Revision based on Fill (LOMR-F) to the Floodplain Administrator:

   a. Lowest floor elevation.

   b. Pad elevation.

   c. Lowest adjacent grade.

B. All subdivision proposals and other proposed development shall be consistent with the need to minimize flood damage.

C. All subdivision proposals and other proposed development shall have public utilities and facilities such as sewer, gas, electrical and water systems located and constructed to minimize flood damage.

D. All subdivisions and other proposed development shall provide adequate drainage to reduce exposure to flood hazards.

5.4 STANDARDS FOR MANUFACTURED HOMES.

A. All manufactured homes that are placed or substantially improved, on sites located: (1) outside of a manufactured home park or subdivision; (2) in a new manufactured home park or subdivision; (3) in an expansion to an existing manufactured home park or subdivision; or (4) in an existing manufactured home park or subdivision upon which a manufactured home has incurred "substantial damage" as the result of a flood, shall:

1. Within Zones A1-30, AH, ~~and~~ AE, and Zone D local flood hazard areas on the community's Flood Insurance Rate Map, be elevated on a permanent foundation such that the lowest floor of the manufactured home is elevated to or above the base flood elevation and be securely fastened to an adequately anchored foundation system to resist flotation, collapse, and lateral movement.

B. All manufactured homes to be placed or substantially improved on sites in an existing manufactured home park or subdivision within Zones A1-30, AH, ~~and~~ AE, and Zone D local flood hazard areas on the community's Flood Insurance Rate Map that are not subject to the provisions of **Section 5.4.A** will be securely fastened to an adequately anchored foundation system to resist flotation, collapse, and lateral movement, and be elevated so that either the:

1. Lowest floor of the manufactured home is at or above the base flood elevation; or

2. Manufactured home chassis is supported by reinforced piers or other foundation elements of at least equivalent strength that are no less than 36 inches in height above grade.

Upon the completion of the structure, the elevation of the lowest floor including basement shall be certified by a registered civil engineer or licensed land surveyor, and verified by the community building inspector to be properly elevated. Such certification and verification shall be provided to the Floodplain Administrator.

5.5 STANDARDS FOR RECREATIONAL VEHICLES.

A. All recreational vehicles placed in Zones A1-30, AH, ~~and~~ AE, and Zone D local flood hazard areas will either:

1. Be on the site for fewer than 180 consecutive days; or

2. Be fully licensed and ready for highway use. A recreational vehicle is ready for highway use if it is on its wheels or jacking system, is attached to the site only by quick disconnect type utilities and security devices, and has no permanently attached additions; or

3. Meet the permit requirements of **Section 4.3** of this ordinance and the elevation and anchoring requirements for manufactured homes in **Section 5.4.A**.

5.6 FLOODWAYS.

Since floodways are an extremely hazardous area due to the velocity of flood waters which carry debris, potential projectiles, and erosion potential, the following provisions apply:

A. Until a regulatory floodway is adopted, no new construction, substantial development, or other development (including fill) shall be permitted within Zones A1-30 and AE, unless it is demonstrated that the cumulative effect of the proposed development, when combined with all other development, will not increase the water surface elevation of the base flood more than 1 foot at any point within the **{name of county or municipality}**.

B. Within an adopted regulatory floodway, the **{name of county or municipality}** shall prohibit encroachments, including fill, new construction, substantial improvements, and other development, unless certification by a registered civil engineer is provided demonstrating that the proposed encroachment shall not result in any increase in flood levels during the occurrence of the base flood discharge.

C. If **Sections 5.6.A & B** are satisfied, all new construction, substantial improvement, and other proposed new development shall comply with all other applicable flood hazard reduction provisions of **Section 5**.

SECTION 6.0
VARIANCE PROCEDURE

6.1 NATURE OF VARIANCES.

The issuance of a variance is for floodplain management purposes only. Insurance premium rates are determined by statute according to actuarial risk and will not be modified by the granting of a variance.

The variance criteria set forth in this section of the ordinance are based on the general principle of zoning law that variances pertain to a piece of property and are not personal in nature. A variance may be granted for a parcel of property with physical characteristics so unusual that complying with the requirements of this ordinance would create an exceptional hardship to the applicant or the surrounding property owners. The characteristics must be unique to the property and not be shared by adjacent parcels. The unique characteristic must pertain to the land itself, not to the structure, its inhabitants, or the property owners.

It is the duty of the **{community governing body}** to help protect its citizens from flooding. This need is so compelling and the implications of the cost of insuring a structure built below flood level are so serious that variances from the flood elevation or from other requirements in the flood ordinance are quite rare. The long term goal of preventing and reducing flood loss and damage can only be met if variances are strictly limited. Therefore, the variance guidelines provided in this ordinance are more detailed and contain multiple provisions that must be met before a variance can be properly granted. The criteria are designed to screen out those situations in which alternatives other than a variance are more appropriate.

6.2 CONDITIONS FOR VARIANCES.

A. Generally, variances may be issued for new construction, substantial improvement, and other proposed new development to be erected on a lot of one-half acre or less in size contiguous to and surrounded by lots with existing structures constructed below the base flood level, providing that the procedures of **Sections 4 and 5** of this ordinance have been fully considered. As the lot size increases beyond one-half acre, the technical justification required for issuing the variance increases.

B. Variances may be issued for the repair or rehabilitation of **"historic structures"** (as defined in **Section 2** of this ordinance) upon a determination that the proposed repair or rehabilitation will not preclude the structure's continued designation as an historic structure and the variance is the minimum necessary to preserve the historic character and design of the structure.

C. Variances shall not be issued within any mapped regulatory floodway if any increase in flood levels during the base flood discharge would result.

D. Variances shall only be issued upon a determination that the variance is the "minimum necessary" considering the flood hazard, to afford relief. "Minimum necessary" means to afford relief with a minimum of deviation from the requirements of this ordinance. For example, in the case of variances to an elevation requirement, this means the **{community governing body}** need not grant permission for the applicant to build at grade, or even to whatever elevation the applicant proposes, but only to that elevation which the **{community governing body}** believes will both provide relief and preserve the integrity of the local ordinance.

E. Any applicant to whom a variance is granted shall be given written notice over the signature of a community official that:

1. The issuance of a variance to construct a structure below the base flood level will result in increased premium rates for flood insurance up to amounts as high as $25 for $100 of insurance coverage, and

2. Such construction below the base flood level increases risks to life and property. It is recommended that a copy of the notice shall be recorded by the Floodplain Administrator in the Office of the **{name of county}** Recorder and shall be recorded in a manner so that it appears in the chain of title of the affected parcel of land.

F. The Floodplain Administrator will maintain a record of all variance actions, including justification for their issuance, and report such variances issued in its biennial report submitted to the Federal Emergency Management Agency.

6.3 APPEAL BOARD.

A. In passing upon requests for variances, the **{community governing body}** shall consider all technical evaluations, all relevant factors, standards specified in other sections of this ordinance, and the:

1. Danger that materials may be swept onto other lands to the injury of others;

2. Danger of life and property due to flooding or erosion damage;

3. Susceptibility of the proposed facility and its contents to flood damage and the effect of such damage on the existing individual owner and future owners of the property;

4. Importance of the services provided by the proposed facility to the community;

5. Necessity to the facility of a waterfront location, where applicable;

6. Availability of alternative locations for the proposed use which are not subject to flooding or erosion damage;

7. Compatibility of the proposed use with existing and anticipated development;

8. Relationship of the proposed use to the comprehensive plan and floodplain management program for that area;

9. Safety of access to the property in time of flood for ordinary and emergency vehicles;

10. Expected heights, velocity, duration, rate of rise, and sediment transport of the flood waters expected at the site; and

11. Costs of providing governmental services during and after flood conditions, including maintenance and repair of public utilities and facilities such as sewer, gas, electrical, and water system, and streets and bridges.

B. Variances shall only be issued upon a:

1. Showing of good and sufficient cause;

2. Determination that failure to grant the variance would result in exceptional "hardship" to the applicant; and

3. Determination that the granting of a variance will not result in increased flood heights, additional threats to public safety, or extraordinary public expense, create a nuisance (see **"Public safety and nuisance"),** cause **"fraud and victimization"** of the public, or conflict with existing local laws or ordinances.

C. Variances may be issued for new construction, substantial improvement, and other proposed new development necessary for the conduct of a functionally dependent use provided that the provisions of **Sections 6.3.A through 6.3.D** are satisfied and that the structure or other development is protected by methods that minimize flood damages during the base flood and does not result in additional threats to public safety and does not create a public nuisance.

D. Upon consideration of the factors of **Section 6.2.A** and the purposes of this ordinance, the **{community governing body}** may attach such conditions to the granting of variances as it deems necessary to further the purposes of this ordinance

APPENDIX

Appendices

1.0 ALLUVIAL FAN ADVISORY

Hazards of Alluvial Fan Development

Alluvial fans present a unique flood hazard environment where the combination of sediment, slope, and topography create an ultra hazardous condition for which elevation on fill will not provide reliable protection. Active alluvial fan flooding is characterized by flow path uncertainty combined with abrupt deposition and erosion. As a result, any area of an alluvial fan may be subject to intense flood hazards.

The technology of mathematically modeling the hydrodynamics of water and debris flows for alluvial fans is still in the early development stage. The Federal Emergency Management Agency (FEMA) has formulated a mapping procedure for the purpose of defining the likelihood of flood hazards on inundated alluvial fan zones to be used for flood insurance purposes and general floodplain regulation, referred to as the FEMA alluvial fan methodology.

An active alluvial fan flooding hazard is indicated by three related criteria:

a. Flow path uncertainty below the hydrographic apex;

b. Abrupt deposition and ensuing erosion of sediment as a stream or debris flow loses its competence to carry material eroded from a steeper, upstream source area; and

c. An environment where the combination of sediment availability, slope, and topography creates an ultra hazardous condition for which elevation on fill will not reliably mitigate the risk.

Inactive alluvial fan flooding is similar to traditional riverine flood hazards, but occurs only on alluvial fans. It is characterized by flow paths with a higher degree of certainty in realistic assessments of flood risk or in the reliable mitigation of the hazard. Counter to active alluvial fan flooding hazards, an inactive alluvial fan flooding hazard is characterized by relatively stable flow paths. However, areas of inactive alluvial fan flooding, as with active alluvial fan flooding, may be subject to sediment deposition and erosion, but to a degree that does not cause flow path instability and uncertainty.

An alluvial fan may exhibit both active alluvial fan flooding and inactive alluvial fan flooding hazards. The hazards may vary spatially or vary at the same location, contingent on the level of flow discharge. Spatially, for example, upstream inactive portions of the alluvial fan may distribute flood flow to active areas at the distal part of the alluvial fan. Hazards may vary at the same location, for example, with a flow path that may be stable for lower flows, but become unstable at higher flows.

More detailed information can be found at FEMA's website: "Guidelines for Determining Flood Hazards on Alluvial Fans" at http://www.fema.gov/fhm/ft_afgd2.shtm#1.

Alluvial Fans and LOMR's

The NFIP does not allow for the removal of land from the floodplain based on the placement of fill (LOMR-F) in alluvial fan flood hazard areas. The NFIP will credit a major structural flood control project, through the LOMR process, that will effectively eliminate alluvial fan flood hazards from the protected area. Details about map revisions for alluvial fan areas can be found in the Code of Federal Regulations at Title 44, Part 65.13.

Alluvial Fan Task Force

As stated in AB 2141 (Longville, Chapter 878, Statutes of 2004), the State of California Department of Water Resources will convene an Alluvial Fan Task Force (AFTF). The AFTF will produce an alluvial fan model ordinance for local communities and a recommendations report to the legislature. As of March 2006, the model ordinance and report are projected to be completed by 2007.

2.0 HIGHER STANDARDS RECOMMENDED BY THE STATE OF CALIFORNIA

This model ordinance meets the minimum standards required to participate in the National Flood Insurance Program. Community adoption of higher standards can be applied towards credit under the Community Rating System (CRS) program and result in reduced premiums for all flood insurance policy holders within the entire community. The State of California recommends:

A. Freeboard.

- To elevate at least 2 feet above the minimum required base flood elevation, make the following changes:

  1. Modify Sections 5.1.C.1.a, 5.1.C.1.c, and 5.4.A.1 by replacing "elevated to or above" with "elevated 2 feet above."

  2. Modify Section 5.4.B.1 by replacing "at or above" with "at least 2 feet above."

  3. Replace Section 5.1.C.1.b with:
     In an AO zone, elevated above the highest adjacent grade to a height 2 feet above the depth number specified in feet on the FIRM, or elevated at least 4 feet above the highest adjacent grade if no depth number is specified.

B. Determining BFE's in Unnumbered A Zones.

- Replace "may" with "shall" in the second paragraph of Section 4.2.C to read:

  "NOTE: A base flood elevation shall…."

C. Determining Market Value of Existing Structures.

- Replace the "Market value" definition in Section 2 with:

  "Market value" shall be determined by estimating the cost to replace the structure in new condition and adjusting that cost figure by the amount of depreciation which has accrued since the structure was constructed.

  1. The cost of replacement of the structure shall be based on a square foot cost factor determined by reference to a building cost estimating guide recognized by the building construction industry.

  2. The amount of depreciation shall be determined by taking into account the age and physical deterioration of the structure and functional obsolescence as approved by the floodplain administrator, but shall not include economic or other forms of external obsolescence.

  Use of replacement costs or accrued depreciation factors different from those contained in recognized building cost estimating guides may be considered only if such factors are included in a report prepared by an independent professional appraiser and supported by a written explanation of the differences

D. Increased Cost of Compliance (ICC) Coverage—Repetitive Loss Provisions.

This provision allows communities the opportunity for flood insurance policy holders to have ICC coverage made available in repetitive loss situations.

- Modify the definition of "Substantial damage" as follows:

  "Substantial damage" means:

1. Damage of any origin sustained by a structure whereby the cost of restoring the structure to its before damaged condition would equal or exceed 50 percent of the market value of the structure before the damage occurred; or

2. Flood-related damages sustained by a structure on two separate occasions during a 10- year period for which the cost of repairs at the time of each such event, on the average, equals or exceeds 25 percent of the market value of the structure before the damage occurred. This is also known as "repetitive loss."

E. <u>Non-conversion of Enclosed Areas Below the Lowest Floor</u>.

- Insert/add the following section as Section 4.2.J.

A. <u>Non-conversion of Enclosed Areas Below the Lowest Floor</u>.

To ensure that the areas below the BFE shall be used solely for parking vehicles, limited storage, or access to the building and not be finished for use as human habitation without first becoming fully compliant with the floodplain management ordinance in effect at the time of conversion, the Floodplain Administrator shall:

1. Determine which applicants for new construction and/or substantial improvements have fully enclosed areas below the lowest floor that are 5 feet or higher;

2. Enter into a "NON-CONVERSION AGREEMENT FOR CONSTRUCTION WITHIN FLOOD HAZARD AREAS" or equivalent with the {name of county or municipality}. The agreement shall be recorded with the {name of county} County Recorder as a deed restriction. The non-conversion agreement shall be in a form acceptable to the Floodplain Administrator and County Counsel; and

3. Have the authority to inspect any area of a structure below the base flood elevation to ensure compliance upon prior notice of at least 72 hours.

3.0 SPECIAL REQUIREMENTS

A. Crawlspace Construction.

Communities with construction practices that result in crawl spaces with interior floors up to 2 feet below grade have historically been in violation of the NFIP requirements. FEMA Technical Bulletin 11- 01 now provides accommodation for these practices.

- Remove the following from "Lowest floor" definition in Section 2:

  2. For residential structures, all subgrade enclosed areas are prohibited as they are considered to be basements (see "Basement" definition). This prohibition includes below-grade garages and storage areas.

- Add the following section into your ordinance at Section 5.1.C:

5.1.C {X} Crawlspace Construction.

This sub-section applies to buildings with crawl spaces up to 2 feet below grade. Below- grade crawl space construction in accordance with the requirements listed below will not be considered basements.

a. The building must be designed and adequately anchored to resist flotation, collapse, and lateral movement of the structure resulting from hydrodynamic and hydrostatic loads, including the effects of buoyancy. Crawl space construction is not allowed in areas with flood velocities greater than 5 feet per second unless the design is reviewed by a qualified design professional, such as a registered architect or professional engineer;

b. The crawl space is an enclosed area below the BFE and, as such, must have openings that equalize hydrostatic pressures by allowing for the automatic entry and exit of floodwaters. For guidance on flood openings, see FEMA Technical Bulletin 1- 93;

c. Crawl space construction is not permitted in V zones. Open pile or column foundations that withstand storm surge and wave forces are required in V zones;

d. Portions of the building below the BFE must be constructed with materials resistant to flood damage. This includes not only the foundation walls of the crawl space used to elevate the building, but also any joists, insulation, or other materials that extend below the BFE; and

e. Any building utility systems within the crawl space must be elevated above BFE or designed so that floodwaters cannot enter or accumulate within the system components during flood conditions.

f. Requirements for all below-grade crawl space construction, in addition to the above requirements, to include the following:

1. The interior grade of a crawl space below the BFE must not be more than 2 feet below the lowest adjacent exterior grade (LAG), shown as D in figure 3 of Technical Bulletin 11-01;

2. The height of the below-grade crawl space, measured from the interior grade of the crawl space to the top of the crawl space foundation wall must not exceed 4 feet (shown as L in figure 3 of Technical Bulletin 11-01) at any point;

3. There must be an adequate drainage system that removes floodwaters from the interior area of the crawl space within a reasonable period of time after a flood event, not to exceed 72 hours; and

4. The velocity of floodwaters at the site should not exceed 5 feet per second for any crawl space. For velocities in excess of 5 feet per second, other foundation types should be used.

B. <u>Mudslide (i.e., Mudflow) Prone Areas</u>. (Zone M)

- Communities with mudslide prone areas shall insert the following:

1. Definitions to Section 2:

"Area of special mudslide (i.e., mudflow) hazard" is the area subject to severe mudslides (i.e., mudflows). The area is designated as Zone M on the Flood Insurance Rate Map (FIRM).

"Mudslide" describes a condition where there is a river, flow or inundation of liquid mud down a hillside, usually as a result of a dual condition of loss of brush cover and the subsequent accumulation of water on the ground, preceded by a period of unusually heavy or sustained rain.

"Mudslide (i.e., mudflow) **prone area"** means an area with land surfaces and slopes of unconsolidated material where the history, geology, and climate indicate a potential for mudflow.

2. Section "**5.**{X} **<u>Mudslide (i.e., Mudflow) Prone Areas</u>**":

5.{X} **<u>Mudslide (i.e., Mudflow) Prone Areas</u>.**

A. The Floodplain Administrator shall review permits for proposed construction of other development to determine if it is proposed within a mudslide area.

B. Permits shall be reviewed to determine that the proposed site and improvement will be reasonably safe from mudslide hazards. Factors to be considered in making this determination include, but are not limited to:

1. The type and quality of soils;

2. Evidence of ground water or surface water problems;

3. Depth and quality of any fill;

4. Overall slope of the site; and

5. Weight that any proposed development will impose on the slope.

C. Within areas which may have mudslide hazards, the Floodplain Administrator shall require:

1. A site investigation and further review by persons qualified in geology and soils engineering;

2. The proposed grading, excavation, new construction, and substantial improvement be adequately designed and protected against mudslide damages;

3. The proposed grading, excavations, new construction, and substantial improvement not aggravate the existing hazard by creating either on-site or off- site disturbances; and

4. Drainage, planting, watering, and maintenance not endanger slope stability.

C. **Erosion-prone areas**. (Zone E)

- Communities with erosion prone areas shall insert the following:

1. Definitions into Section 2:

"Area of special flood-related erosion hazard" is the land within a community which is most likely to be subject to severe flood-related erosion losses. The area may be designated as Zone E on the Flood Insurance Rate Map (FIRM).

"Flood-related erosion" means the collapse or subsidence of land along the shore of a lake or other body of water as a result of undermining caused by waves or currents of water exceeding anticipated cyclical level or suddenly caused by an unusually high water level in a natural body of water, accompanied by a severe storm, or by an unanticipated force of nature, such as a flash flood or an abnormal tidal surge, or by some similarly unusually and unforeseeable event which results in flooding.

"Flood-related erosion area" or **"Flood-related erosion prone area"** means a land area adjoining the shore of a lake or other body of water, which due to the composition of the shoreline or bank and high water levels or wind-driven currents, is likely to suffer flood-related erosion damage.

"Flood-related erosion area management" means the operation of an overall program of corrective and preventive measures for reducing flood-related erosion damage, including but not limited to emergency preparedness plans, flood-related erosion control works, and floodplain management regulations.

2. Section "**5.{X} FLOOD-RELATED EROSION-PRONE AREA**" into Section 5:

5.**{X}** **FLOOD-RELATED EROSION-PRONE AREA**

A. The Floodplain Administrator shall require permits for proposed construction and other development within all flood-related erosion-prone areas known to the community.

B. Permit applications shall be reviewed to determine whether the proposed site alterations and improvements will be reasonably safe from flood-related erosion, and will not cause flood-related erosion hazards or otherwise aggravate the existing hazard.

C. If a proposed improvement is found to be in the path of flood-related erosion or would increase the erosion hazard, such improvement shall be relocated or adequate protective measures shall be taken to avoid aggravating the existing erosion hazard.

D. Within Zone E on the Flood Insurance Rate Map, a setback is required for all new development from the ocean, lake, bay, riverfront or other body of water to create a safety buffer consisting of a natural vegetative or contour strip. This buffer shall be designated according to the flood-related erosion hazard and erosion rate, in relation to the anticipated ″useful life″ of structures, and depending upon the geologic, hydrologic, topographic, and climatic characteristics of the land. The buffer may be used for suitable open space purposes, such as for agricultural, forestry, outdoor recreation and wildlife habitat areas, and for other activities using temporary and portable structures only.

Appendix D. Community Choice Flood Risk Financing

OVERVIEW

Community Choice Flood Risk Financing (CCFRF) would provide residents and businesses with an alternative to NFIP flood insurance. A local CCFRF District might be a municipal or quasi-public entity that would purchase or arrange for the flood risk financing on the open market. In order to address the obligation to acquire insurance, costs might be distributed via direct charge on a property tax bill that could have the added benefit of being exempt from income taxes.

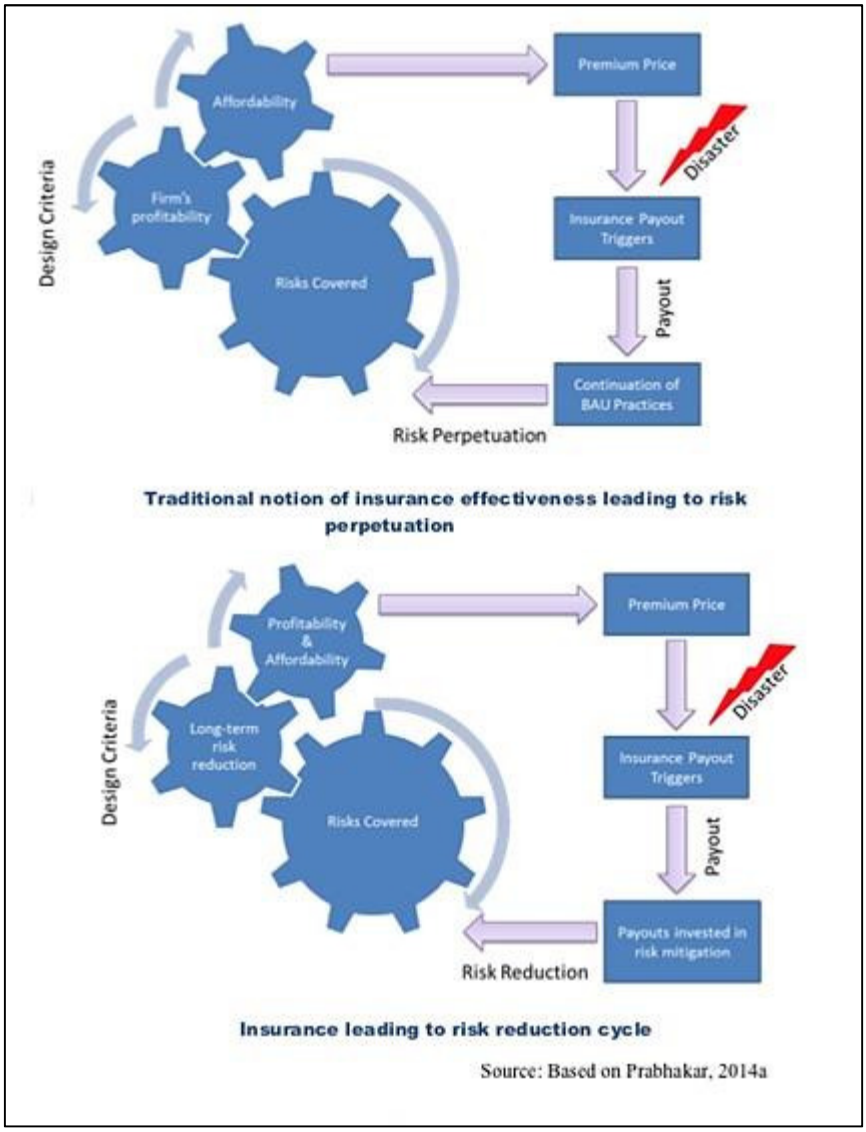

Figure D-1.

A CCFRF would have the opportunity to lower insurance costs through mitigation measures, pooling of risk, and other measures. The individual flood insurance savings could be reinvested in buying down the risk or passed along to the property owner. Figure D-1, extracted from *Effectiveness of Insurance for Disaster Risk Reduction and Climate Change Adaption: Challenges and Opportunities*[1] depicts how the existing insurance models (both NFIP and private insurance) might be changed through a CCFRF to provide long term risk-reduction.

Key to implementing a CCFRF is the agreement by FEMA to change the existing FIRM from a SFHA to a Zone D. The change is critical because in Zone D the mandatory purchase requirement, with its provisions that narrowly define an acceptable insurance instrument, no longer applies. Before FEMA would agree to change an existing SHFA to a Zone D, the CCFRF

[1] Prabhakar, S.V.R.K., J.J. Pereira, J.M. Pulhin, G.S. Rao, H. Scheyvens and J. Cummins (Eds). 2015. Effectiveness of Insurance for Disaster Risk Reduction and Climate Change Adaption: Challenges and Opportunities. IGES Research Report No 2014-04. Hayama, Japan: Institute for Global Environmental Strategies.

would most likely have to demonstrate that building elevation/floodproofing requirements would continue to be enforced, that there would be a high level of participation in the insurance instrument, and that the insurance instrument would be adequate to cover flood losses.

While the community could choose to purchase the community's insurance from a private firm, other options such as a State level or regional level insurance pool might be considered. Municipal pools are cooperative, nonprofit insurance entities owned and controlled by local, regional, or State governments. Expanding existing municipal pool arrangements to community flood insurance would have the benefit of being member owned and operated, which would increase interest in adopting hazard mitigation measures to lower claims and premiums. One challenge would involve diversification of risk at the state level.

A CCFRF could have an advantage to levee owners and levee maintainers over individually purchased private flood insurance. While private insurance companies may successfully sue the levee owner and levee maintainer to recover payouts on losses after a levee failure, a CCFRF may establish a legally binding arrangement with the levee owner and levee maintainer regarding such lawsuits.

Flood Risk Financing Instruments

In order describe the insurance options that might be implemented through a CCFRF program, it is useful to establish a frame through which potential risk bearers and risk management options might be investigated. Much of this information presented in this section is extracted from the NFIP report, *Report to Congress on Reinsuring NFIP Insurance Risk and Options for Privatizing the NFIP*.[2]

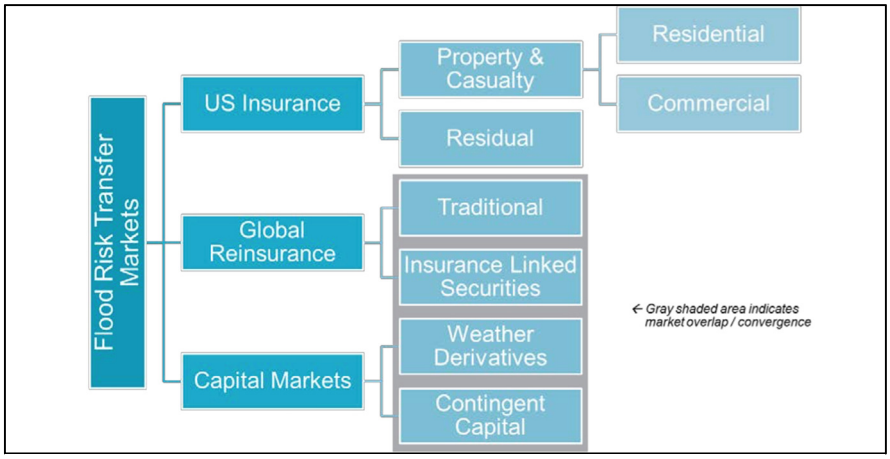

Figure D-2. Flood Risk Transfer Markets

Figure D-2 outlines the framework used within this Appendix. Generally, the main insurance options are: (1) private insurance, (2) reinsurance, and (3) capital markets.

Property and Casualty – Private Insurance

Private residential flood insurance is offered by a number of companies, although at this time it is generally limited to high value homes. In response to the HIFIAA mandated rate increases a number of these private firms have announced their intention to launch private insurance alternatives. The most notable program is offered by WNC First[3]. WNC is a Private Flood

[2] Department of Homeland Security, August 13, 2015. Report to Congress on Reinsuring NFIP Insurance Risk and Options for Privatizing the NFIP.

Insurance Program operating in California. It has the same limits as the NFIP but includes the following additional benefits:

- Includes $1,000 temporary dwelling residence (can be up to $5,000)
- 15-day waiting period
- Option to purchase waiver of coinsurance requirement
- Includes loss assessment coverage due to Increased Cost of Compliance
- Rates are advertised to be 10% to 50% lower than NFIP rates.

Other private insurance companies that offer insurance to high value homes include ACE Private Risk Service, Chubb, Fireman's Fund, and Privilege Underwriters Reciprocal Exchange (PURE). A number of other subsidiaries of Lloyd's of London offer primary residential flood coverage via a separate Difference in Conditions (DIC) policy which typically provides coverage for perils excluded from standard homeowner's policies.

The NFIP principally covers residential structures, only 5% of the NFIP's business is non-residential in nature.[3] Guy Carpenter,[4] in their report to congress, noted that the commercial market for primary and excess commercial flood coverage in the United States is fairly significant in overall size -- in part, because many commercial policies are written on an "all risks" basis. It is common practice to sublimit the peril of flood insurance to some amount lower than the full value of the insured property and the usual incidence of substantial Self-Insured Retentions (SIRs) held net by insureds on large commercial accounts.

In order to accurately price risk, insurance companies rely on good hydraulic and hydrologic modeling data. The large insurance companies use loss estimates developed from either in-house catastrophe modeling companies or commercial catastrophe modeling firms. A CCFRF might choose to levy a fee to all homeowners to pay for the collection and development of hydrologic and hydraulic data under the assumption that better data would reduce uncertainty and thus reduce insurance premiums.

Under a private insurance option, the community might provide the data and let each homeowner shop for the best bargain, or the community might develop a list of recommended insurance providers. In areas that are outside of the CCFRF, private insurance may be a viable alternative to the NFIP.

Property and Casualty – Residual Market

Admitted vs. Non-Admitted. Catastrophe insurance is written by United States insurers through a variety of different policies and by different means. There are admitted carriers and non-admitted carriers (a.k.a., excess and surplus (E&S) or surplus). Admitted carriers are licensed by and required to file rates and form with state regulators for approval. Their policies are backed by state guarantee funds in the event of insurer insolvency and licensed insurers pay certain fees and taxes for this privilege. Non-admitted carriers on the other hand, though approved by state insurance regulators, are not subject to the same oversight and have freedom of rate and

[3] http://www.fema.gov/flood-insurance-statistics-current-month/policies-force-occupancy-type as of Nov 2013; 292,000 of 5.5 million total NFIP policies are classified as non-residential.

[4] The Guy Carpenter Study is part of the *Report to Congress on Reinsuring NFIP Insurance Risk and Opportunities for Privatizing the NFIP* referenced previously.

form. Catastrophic risks often fall into the E&S market where freedom of rate and form may be an important consideration.

Residual Market. Residual market insurers (a.k.a,, shared or involuntary insurance programs) are established by State governments to provide mostly high-risk policy holders with access to insurance coverage which may not be readily available on the open market. Generally residual markets are intended to be run in the same fashion as professional insurers, though some unique characteristics of residual markets include:

- Rates are risk-based and higher than those charged in the open market.
- Scope of coverage is sometimes constricted.
- Private market insurers active in each State are required to share in the annual deficit or surplus of the State's residual market depending on loss experience or in some notable states (e.g., NC, FL, LA, TX) to support the residual market if it's accumulated surplus funds have run dry.

When the claims-paying capacity of a residual market is exhausted in a particular year an assortment of mechanisms may be used to cover losses:

- **Levy of assessments**: Assessments may be levied on participating insurers.
- **Issuance of revenue bonds**: Plans may issue pre-event or post-event bonds.
- **Reinsurance and capital markets**: Plans may buy reinsurance or they may access capital markets to provide an additional layer of catastrophic coverage. This is often done so that there is an increased ability to fund losses and it may serve to delay or avoid potential assessments[5].

These plans, primarily developed to provide wind coverage and coastline coverage for Florida and Louisiana residents, may provide a model for California flood insurance. These two states were able to streamline their residual markets to achieve two necessary objectives:

- They achieved federal income tax-exempt status which allows them to accrue a surplus more quickly without having to deal with corporate income taxes, which enhances their claims-paying capacity for a catastrophic event.

They reformed the way deficits are handled post-loss in order to create revenue streams from the grouping of regular and emergency taxations, which the corporation can use to back the issuance of pre- and post-event bonds to improve the liquidity of the residual market.

Reinsurance

Reinsurance is essentially "insurance for insurance companies". Figure D-3 presents a graphic of the (re)insurance risk transfer value chain. The global reinsurance industry controls a significant amount of capital, in 2013 it was estimated to be $322 billion worldwide.

. [5] Insurance Information Institute, RESIDUAL MARKET PROPERTY PLANS: FROM MARKETS OF LAST RESORT TO MARKETS OFFIRST CHOICE; AUGUST 2013.

There is a recognized convergence between reinsurance and capital markets. Reinsurers are using their capital to manage their risk more efficiently through collateralized reinsurance and Insurance Linked Securities (ILS) purchases. This is thought to be a fundamental shift in the reinsurance market that will benefit reinsurance purchasers.

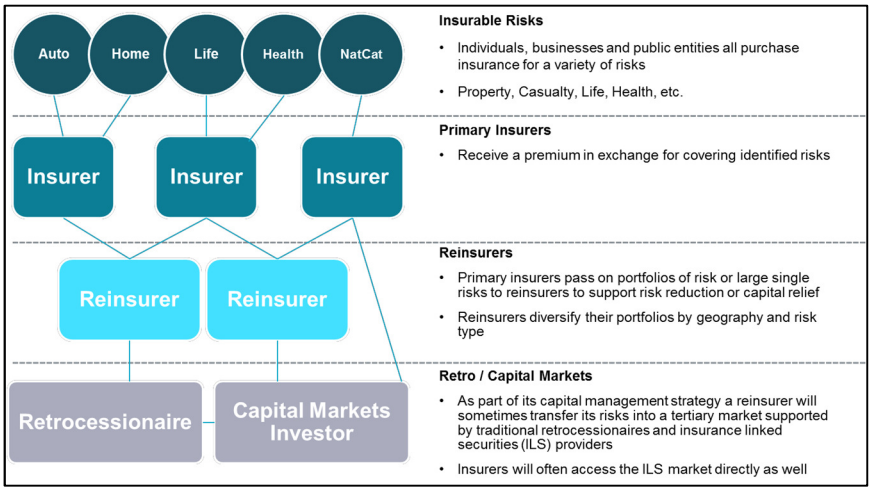

Figure D-3. Global (Re) Insurance Value Chain

Another form of reinsurance is an Insurance Linked Security (ILS). ILS products are distinguishable from traditional reinsurance products in many ways -- though one key difference is the way in which they are structured. Whereas traditional reinsurance products tend to be backed by the overall financial strength of the reinsurer counterparty, ILS products tend to be fully funded or collateralized by ILS investors. Structurally this usually entails the establishment of a Letter of Credit (LOC) with a bank (for collateralized reinsurance) or a “bankruptcy remote” Special Purpose Vehicle (SPV) to hold the collateral (for catastrophe bonds) until the counterparty obligation established by the risk transfer agreement has expired or the collateral funds have been exhausted by losses. An ILS may be an attractive vehicle for a portion of the CCFRF risk in that it would not have to be drawn upon until the event.

An ILS trigger could be structured in a variety of ways as shown in Table D-1 below. These types of triggers are used in insuring earthquake and hurricane risk.

Table D-1. ILS Trigger

Trigger Type:	Indemnity		PCS/PERILS Index		Modeled-Loss	Parametric
Notable Example:	Traditional Third Party Modeled or Sponsor Modeled Excess of Loss	Dual Trigger Indemnity and Industry Loss	CWIL – County / CRESTA Level Resolution*	Weighted State / Country / Line of Business Structure	Based on Cedant's portfolio	Payout exclusively based on specifically calibrated formula
Description:	Bond payout based on actual losses where initial modeling is determined by third party for insurer transactions or sponsor for reinsurer transactions	Bond payout based on the joint occurrence of (i) indemnity losses in excess of a threshold amount and (ii) minimum industry losses (i.e. PCS or LAZR trigger) or event parameters being met	Payouts based on county / CRESTA-level PCS/PERILS industry loss based on modeling firm's estimation of losses within a region's loss; Provides further increased hedging resolution	Predecessor to LAZR structure that weights each state/country's PCS/PERILS loss by line of business; Provides increased hedging resolution over "unweighted" PCS/PERILS structures	Notional portfolio exposure based on cedant's exposure portfolio	Formulaic payout based on observed event parameters such as earthquake moment magnitude at specified measurement locations or hurricane windspeed and storm track
Pros/Cons and Typical Uses:	Can be more challenging (including lower available capacity and increased pricing) for commercial lines business (or reinsurance business); accepted for personal lines business	Pricing may be based on the likelihood of the first trigger (industry loss or event parameter) rather than the expected loss of the indemnity layer; best suited for per occurrence structures	Reduces basis risk with little or no impact on capacity or pricing relative to other PCS/PERILS triggers	Potential for basis risk if underlying exposures are not uniform within each state/country and/or line of business	Customized trigger allows for basis risk reduction without specific disclosure of underlying exposure data	Subject to basis risk, best suited for identifiable key exposures

Natural disaster risk assessment relies on probabilistic catastrophe models and historical data. In order to underwrite extreme risk, the reinsurance industry is dependent upon a robust understanding of each covered peril as grounded in sound analytical practices. In this regard probabilistic models have a special role as they serve to provide sufficiently robust risk assessment capability for reinsurers and ILS investors to put their capital at risk. Catastrophe models were originally developed to quantify portfolio-level loss profiles for risk transfer, they are now widely used by product managers, pricing actuaries, and underwriters.

Table D-2 describes the differences between the three main types of model and the importance of probabilistic perspectives.

Table D-2. Model Types

Model Type	Description	Conclusions on Severity	Conclusions on Frequency
Deterministic Models	Modeling the impact of a single discrete historic or simulated event	YES	NO
Zonation/Rating Models	Modeling the probability of event incidence and identify vulnerability to a given peril	NO	YES
Probabilistic Models	Modeling a series of simulated events accounting for their occurrence probability over time	YES	YES

Capital Markets

Weather derivatives, a fairly new phenomenon, function effectively the same way as parametric (re)insurance transactions – an objective parameter is correlated with a financial consequence, sensitivities are tested and triggers are structured accordingly. The main differences between the weather derivative marketplace and the parametric (re)insurance market are the perils covered and the market structure.

A weather derivative would be exchanged on Chicago Mercantile Exchange (CME), the main marketplace for weather trading. The primary benefit of buying an exchange-traded or OTC cleared product is the management of credit risk. Futures and options contracts traded through an exchange are generally cleared, settled and guaranteed – the same holds true for any cleared OTC products. The guarantee function of an exchange is important since it effectively removes credit risk from transactions. Buyers of derivatives thus do not need to evaluate the credit of each potential counterparty or limit themselves to a selected set of counterparties.

As a corollary to the weather derivative markets a fledgling market for index-based weather insurance has begun to form in the United States, building on many examples of such schemes from throughout the developing world. The most prominent example of an index insurance provider in the United States is the Climate Corporation -- an organization which recently sold to Monsanto for nearly $1 billion. In addition to offering Federal crop insurance coverage, Climate Corporation has developed a state-of-the-art, technology-driven weather index insurance platform. Its flagship product is called Total Weather Insurance (TWI) which by the company's own description "is the only full-season insurance program that enables [farmers] to protect potential profits by insuring against adverse weather events that can cause yield shortfalls, even when [farmers] fully utilize Federal crop insurance."

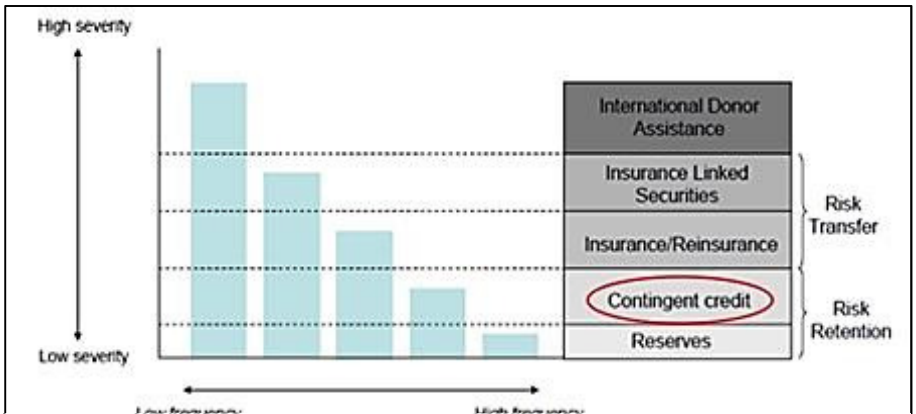

Figure D-4. Risk Layering and Disaster Financing Strategy for International Sovereign Entities

Given the Central Valley's predominant agricultural base, one could envision a scenario where products such as the TWI were also linked to potential flood risk.

A contingent credit arrangement is a form of ex ante financing which is advocated by the World Bank in the context of sovereign disaster risk management. Contingent credit agreements act like any other line of credit where the terms of said credit facility, including the interest rate, maturity, and usage criteria are all pre-agreed -- though access to the credit limit is governed by the occurrence of an external event, usually a natural catastrophe. For the World Bank's catastrophe contingent credit products, front-end and renewal fees are charged to keep the line open. The specific triggers used to unlock credit access can either be financial metrics (e.g., value of loss incurred) or a soft trigger, such as the declaration of a state of emergency by the relevant government.

Figure D-4 indicates the role of contingent credit in sovereign disaster risk management.

Parametric Insurance

The CCFRF could choose to manage the risk though a parametric insurance type arrangement instead of a traditional insurance product[6]. Parametric insurance is increasingly being used by insurance providers as a way to provide affordable coverage for catastrophe risks. With a parametric policy, claims are based on the occurrence of a predefined triggering event, as well as some basic evidence of loss. The triggering event might be a measured water level at a gage or other reading device. Different gage heights would trigger different payment amounts. This precludes the need for an assessor to visit each property but it introduces "basis risk," the risk that the payment could be lower or higher than the actual damages.

The premium paid for the policy is determined by modeling the expected loss when an event occurs and the payout this would trigger, weighted by the likelihood of its occurrence. Key to this design is the fact that it only minimally increases the administrative burden on local agencies.

Properties covered by parametric insurance would receive predefined claims payments when a qualifying flood event occurs. The payouts would only be for floods that register on gages that affect more than a few properties. Kousky and Shabman, suggest that since buildings and contents vary enormously in value and hence damages incurred, this payment might be a percentage of the property's appraised value and would be capped as a maximum dollar amount per property per flood event.

The issue of how much to pay out, at what triggering point is a key component of a successful implementation. It could take a variety of forms based on the specific needs and building construction of the community. Paying a set amount regardless of property value might entice homeowners to implement additional flood mitigation measures. For example, a property owner may choose to install tile and stucco as opposed to carpet and drywall. Farmers may choose to sell their stored harvest before a certain date or they may choose to implement other floodproofing measures.

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[6] The majority of the following discussion is extracted from Kousky, C., L. Shabman, *A Proposed Design for Community Based Flood Insurance,* 2015, Washington, D.C.: Resources for the Future accessed from www.rff.org.

An analysis of residential claims paid by the NFIP[7] found that excluding 2005 (Hurricane Katrina) the median claim between 2000 and 2009 was $12,600. This suggests that a majority of the damaging flood events can be covered under a parametric policy, but that catastrophic damage would not be fully covered.

Under this scenario, claims paid by the community policy would be capped. Individual property owners who wished to receive more coverage would purchase "wraparound" coverage, which would start paying where the community policy stopped or would pay when the community policy was not triggered.

Standard hydrologic and hydraulic models can predict flood depths in the community for various flood stages on the gage. The CCFRF district would be divided into zones chosen to minimize heterogeneity in flood depths within each area. As shown in Figure D-5, extracted from Kousky and Shabman, modeling might show, at one foot above the baseline, Area A is predicted to flood. At two feet above, Areas A and B flood, with the flooding in area A now being deeper. At three feet or more, Areas A, B and C are all predicted to flood, with A having the deepest flooding and C the shallowest. The areas would be chosen to minimized heterogeneity in flood depths with in each area. The predicted average depth of flooding in each area for each point on the gage is then linked to depth-damage curves to estimate the amount of damage to a property of a given elevation at each flood depth.

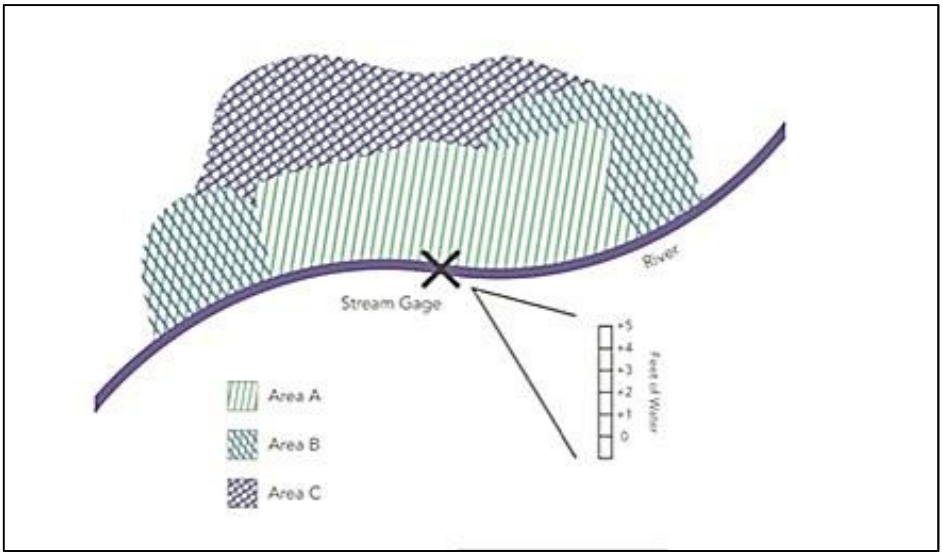

Figure D-5. Community Areas Expected to Flood

The estimates of property damage (for the modeled flood depth and median elevation) are then used to determine payments for each covered property. Different areas receive different payouts up to a cap. This model is set up for unleveed riverine flooding using stream gages to predict the extent of flooding. For leveed areas, the model would also need to consider levee performance to evaluate the likelihood of occurrence of flooding and the appropriate triggering event.

Research from the social sciences related to flood insurance purchase habits and risk perception provide a number of recommendations for implementation and insight to community acceptance for such a program:

[7] Kousky, C., and E. Michel-Kerjan. 2015. Examining flood insurance claims in the United States. *Journal of Risk and Insurance.*

- The insurance or flood risk financing plan should be tied to the land and not with the owner as is the current practice with the NFIP.
- The flood financing arrangement should be for a period of five to ten years. It should be long enough to see the benefits of pooling the risk, but not so long as to incur a new set of risks.
- All customers should be automatically enrolled in the CCFRF but given the opportunity to opt-out or go back to NFIP.

Consumers are generally willing to pay more for an insurance instrument that provides certainty. Thus, the certainty in both premium and claims payout is likely to be attractive to consumers.

California's Return on Insurance Premiums

One of the first considerations of a non-NFIP flood risk program is whether or not the program could compete with the perceived "subsidized" rates offered by the NFIP. To test the potential viability of a CCFRF program it is useful to consider the following:

- In 2016, residents and businesses from the 14 Central Valley counties spent almost $57.7 million dollars to purchase 109,365 NFIP policies. The insured value totaled over $32 billion. The average annual premium was $559 with an average cost per thousand of $1.79. The Central Valley represents about one third of the total number of NFIP policies issued for the state of California. The statewide average annual premium is $388 and the average cost per thousand is $2.58[8]. The NFIP policy data is shown in Table 1 below.
- Attachment 8F of the 2012 Central Valley Flood Protection Plan computed the expected annual damages for the Central Valley Flood Protection Plan. The Plan estimated that there were 340,527 residential and business structures located in the 500-year floodplain of the Central Valley.
- Since 1978 California has experienced a number of major storms. During the period from 1978 to 2016, there have been a total of 6,577 NFIP claims paid. The total amount of the claims paid is almost $69.2 million[9]. The average claim is approximately $14,000. Note, these numbers were obtained from the FEMA website and are not indexed for inflation. Further, the CVFPP is 2012 data and the NFIP information is from 2016. Thus, some caution should be used in drawing conclusions; however, a number of interesting observations come out of examining this data.
    - For example, assuming that the state promoted CCFRFs based on a parametric or an index based product, as explained below, the payout would be based not on the actual estimated damages, but on a triggering event. Assuming that the average payout was set at $30,000--twice the historical average payout -- and an annual premium of $300 per structure was charged for every structure in the 500-

[8] https://bsa.nfipstat.fema.gov/reports/1011.htm accessed June 2016.

[9] https://bsa.nfipstat.fema.gov/reports/1040.htm accessed October 2016.

year flood plain (almost $250 less than the current annual premium), the aggregate payments would generate $102 million per year.

    - Assuming that we have a triggering event that results in a payout in one year to 7,000 properties – more claims than the NFIP has paid for the entire period between 1978 and 2016 -- would result in a payout of $210 million, a large amount but one that represents only two years of payments!

- A report by Deloitte noted that "from 1978 until September 2013, just six states – Louisiana, Texas, New Jersey, New York, Florida, and Mississippi—accounted for nearly 78% (in dollar value) of all flood claims paid (see Exhibit 6). In terms of premiums collected, however, from September 2012 to September 2013, these six states accounted for only 61% of premiums paid across all states."[11]
- An analysis of claims data completed by the UC Davis Watershed Sciences Center has shown that since 1994 the residents in Central Valley counties have paid almost $1 billion more NFIP premiums than they have received claims payments.
- The actuaries for the NFIP have acknowledged that they do not have adequate loss history to effectively rate agricultural structures. At the same time, under HFIAA, the rates for pre-firm structures are allowed to increase 25% until the full actuarial rate is reached. For homes and businesses in leveed areas of the Central Valley, this would result in flood insurance payments that do not recognize the significant investments made by the State in reducing flood risk.
- The "leaking" of Central Valley flood insurance dollars to the NFIP may reduce the available funds for levee maintenance, ultimately making the Central Valley more flood prone.
- NFIP policies do not cover the cost of temporary housing or debris removal.

Governance and Implementation

If California residents were to implement CCFRFs at a municipal local level, there are a number of structures that could be used as models for the governance and implementation of a CCFRF.

- State levee and reclamation districts currently take an active role in managing the levee systems and their role could be expanded to include the procurement and administration of a CCFRF. With a CCFRF, the role that levee and reclamation districts play in mitigating flood risk would be recognized and enhanced.
- Community Choice electric public nonprofits, formed to provide more green energy alternatives, could be used as a model for establishing and implementing a CCFRF.
- The California Earthquake Authority, which provides earthquake insurance to homeowners, could also serve as a model for establishing and delivering a CCFRF.
- Various pooled risk management joint powers authorities exist throughout California to deliver risk management services such as property, workers compensation, errors and omissions, and employment practices liability insurance. This joint powers authority model could be used for implementing, delivering, and administering a CCFRF.

- Geologic Hazard Abatement Districts (GHAD), which are entities of the State formed to manage landslide and geologic caused risks, could be formed to implement and administer a CCFRF. A discussion and examples of how GHADs can be used in the context of flood risk management are presented in Appendix A.

Finally, the Resources for the Future report: *A Proposed Design for Community Flood Insurance*, (Carolyn Kousky and Leonard Shabman) could guide the design for a CCFRF.

Implementation Issues and Other Considerations

There are a number of implementation issues that would need to be considered before moving to a CCFRF.

- Detailed modeling and average first floor elevation information would be needed to set the appropriate triggering event and pay out amounts. While catastrophic modeling uses many of the same types of data as the traditional engineering modeling, there are significant differences. Catastrophic modeling generally consists of three modules, the science module, the engineering module and the insurance module. Collaboration with a catastrophe modeling company is likely to be needed convert the existing modeling information into a catastrophe model suitable for pricing risk.
- In California, appropriate models for how to generate funding at a local level, given the constraints of Propositions 218 and 13, need to be evaluated. Furthermore, the issues associated with the relative benefit of the insurance afforded and the relative assessment, fee or special tax would need to be addressed. Finally, the property owner or voter approval threshold associated with the appropriate funding mechanism would need to be considered as well.
- Community resources would be needed to set up and administer the CCFRF, particularly during the initiation stages. If there is interest, perhaps state level resources might be applied to the initial set up phase of the CCFRF.
- There would need to be consideration of a provision on how to subsidize or assist low-income homeowners.
- Deciding how much risk to retain and how much risk to finance is a decision that would need careful consideration.

Other considerations might include:

- With the advent of climate change, a CCFRF could provide more flexibility in managing for changing conditions.
- A CCFRF might provide opportunities for public-private partnerships that extend into the area of implementing mitigation measures.
- The NFIP does not cover debris removal, alternative housing expenses, or business interruption costs. A CCFRF might consider options that include coverage for these items.
- The CCFRF boundaries would need to be carefully considered.

Analysis of Central Valley NFIP Performance

2016 Annual Policy Data Accessed June 2016 from https://bsa.nfipstat.fema.gov/reports/1011.htm								Total Claims Paid Since 1978 Accessed October 2016 from https://bsa.nfipstat.fema.gov/reports/1040.htm*				
Basin	County	Community Name	In-force	In-force whole $	Premium In-force	Average Policy Cost	Average cost per thousand insured	Total Losses	Closed Losses	Total Payments	2016 Premium vs. Claims Paid Since 1978	Average Claim
Sac	BUTTE	BIGGS, CITY OF	17	$4,424,000	$5,600	$329	$1.27	1	1	$6,481.97	-$881.97	$6,481.97
Sac	BUTTE	BUTTE COUNTY *	2,006	$478,246,200	$1,560,703	$778	$3.26	227	177	$3,334,585.45	-$1,773,882.45	$18,839.47
Sac	BUTTE	CHICO, CITY OF	990	$256,873,700	$597,255	$603	$2.33	12	9	$237,812.17	$359,442.83	$26,423.57
Sac	BUTTE	GRIDLEY, CITY OF	50	$16,819,000	$23,108	$462	$1.37	0	0	$0.00	$23,108.00	
Sac	BUTTE	OROVILLE, CITY OF	62	$16,433,300	$50,648	$817	$3.08	25	21	$494,395.16	-$443,747.16	$23,542.63
Sac	BUTTE	PARADISE, TOWN OF	27	$7,907,000	$10,671	$395	$1.35	3	1	$14,957.23	-$4,286.23	$14,957.23
Sac	COLUSA	COLUSA COUNTY *	518	$124,566,800	$396,526	$765	$3.18	116	97	$2,239,211.90	-$1,842,685.90	$23,084.66
Sac	COLUSA	COLUSA, CITY OF	152	$49,510,000	$57,599	$379	$1.16	14	12	$104,769.83	-$47,170.83	$8,730.82
Sac	COLUSA	WILLIAMS, CITY OF	25	$10,981,000	$15,756	$630	$1.43	12	10	$63,751.57	-$47,995.57	$6,375.16
Sac	GLENN	GLENN COUNTY *	436	$92,672,600	$312,768	$717	$3.37	91	69	$1,055,132.50	-$742,364.50	$15,291.78
Sac	GLENN	ORLAND, CITY OF	20	$5,402,000	$6,708	$335	$1.24	0	0	$0.00	$6,708.00	
Sac	GLENN	WILLOWS, CITY OF	231	$44,236,300	$174,944	$757	$3.95	89	69	$602,479.85	-$427,535.85	$8,731.59
Sac	PLUMAS	PLUMAS COUNTY *	236	$49,369,400	$254,050	$1,076	$5.15	45	34	$680,554.05	-$426,504.05	$20,016.30
Sac	PLUMAS	PORTOLA, CITY OF	5	$1,320,000	$4,098	$820	$3.10	4	3	$37,720.02	-$33,622.02	$12,573.34
Sac	SACRAMENTO	CITRUS HEIGHTS, CITY OF	461	$127,467,900	$176,439	$383	$1.38	1	0	$0.00	$176,439.00	
Sac	SACRAMENTO	ELK GROVE, CITY OF	1,473	$475,186,000	$547,486	$372	$1.15	0	0	$0.00	$547,486.00	
Sac	SACRAMENTO	FOLSOM, CITY OF	302	$97,565,400	$121,857	$404	$1.25	23	14	$403,345.45	-$281,488.45	$28,810.39
Sac	SACRAMENTO	GALT, CITY OF	109	$33,874,600	$55,068	$505	$1.63	3	2	$69,338.31	-$14,270.31	$34,669.16
Sac	SACRAMENTO	ISLETON,CITY OF	123	$23,400,800	$220,678	$1,794	$9.43	19	13	$457,108.20	-$236,430.20	$35,162.17
Sac	SACRAMENTO	RANCHO CORDOVA, CITY OF	320	$95,266,000	$122,077	$381	$1.28	0	0	$0.00	$122,077.00	
Sac	SACRAMENTO	SACRAMENTO COUNTY *	10,486	$2,951,850,900	$5,498,861	$524	$1.86	1594	1194	$22,393,861.25	-$16,895,000.25	$18,755.33
Sac	SACRAMENTO	SACRAMENTO, CITY OF	44,073	$14,405,215,000	$20,267,474	$460	$1.41	1808	968	$9,906,771.19	$10,360,702.81	$10,234.27
Sac	SUTTER	LIVE OAK, CITY OF	69	$21,986,000	$45,699	$662	$2.08	11	7	$66,659.79	-$20,960.79	$9,522.83
Sac	SUTTER	SUTTER COUNTY*	4,514	$1,423,299,200	$2,180,474	$483	$1.53	118	89	$2,328,569.89	-$148,095.89	$26,163.71
Sac	SUTTER	YUBA CITY, CITY OF	1,662	$535,113,600	$790,034	$475	$1.48	20	4	$15,570.82	$774,463.18	$3,892.71
Sac	TEHAMA	CORNING, CITY OF	77	$22,341,200	$95,507	$1,240	$4.27	21	17	$92,233.51	$3,273.49	$5,425.50
Sac	TEHAMA	RED BLUFF, CITY OF	183	$42,615,900	$235,230	$1,285	$5.52	62	44	$376,567.91	-$141,337.91	$8,558.36
Sac	TEHAMA	TEHAMA COUNTY*	1,048	$241,196,200	$793,588	$757	$3.29	263	197	$3,005,873.23	-$2,212,285.23	$15,258.24
Sac	TEHAMA	TEHAMA, CITY OF	97	$16,767,600	$70,594	$728	$4.21	43	32	$386,813.08	-$316,219.08	$12,087.91
Sac	YOLO	DAVIS, CITY OF	554	$173,723,500	$282,169	$509	$1.62	16	14	$268,764.67	$13,404.33	$19,197.48
Sac	YOLO	WEST SACRAMENTO, CITY OF	2,882	$906,064,600	$1,234,552	$428	$1.36	39	13	$35,827.76	$1,198,724.24	$2,755.98
Sac	YOLO	WINTERS, CITY OF	47	$13,642,600	$32,545	$692	$2.39	5	3	$8,844.29	$23,700.71	$2,948.10
Sac	YOLO	WOODLAND, CITY OF	749	$228,838,800	$723,210	$966	$3.16	16	12	$182,378.54	$540,831.46	$15,198.21
Sac	YOLO	YOLO COUNTY*	1,280	$336,922,700	$959,796	$750	$2.85	255	221	$2,870,276.55	-$1,910,480.55	$12,987.68
Sac	YUBA	MARYSVILLE, CITY OF	610	$201,798,400	$330,379	$542	$1.64	37	26	$450,587.01	-$120,208.01	$17,330.27
Sac	YUBA	WHEATLAND, CITY OF	216	$68,919,000	$86,780	$402	$1.26	2	0	$0.00	$86,780.00	
Sac	YUBA	YUBA COUNTY *	2,540	$746,281,900	$1,170,064	$461	$1.57	262	190	$7,868,067.90	-$6,698,003.90	$41,410.88
		Total or Average	**78,650**	**24,348,099,100**	**39,510,995**	**502**	**$1.62**	**5257**		**$52,191,243.15**		**$16,303.80**

Analysis of Central Valley NFIP Performance

2016 Annual Policy Data Accessed June 2016 from https://bsa.nfipstat.fema.gov/reports/1011.htm								Total Claims Paid Since 1978 Accessed October 2016 from https://bsa.nfipstat.fema.gov/reports/1040.htm*				
Basin	County	Community Name	In-force	In-force whole $	Premium In-force	Average Poli	Average cost	Total Los	Closed Los	Total Payments		
SJ	FRESNO	CLOVIS, CITY OF	196	$58,462,100	$77,807	$397	$1.33	22	13	$118,652.32	-$40,845.32	$9,127.10
SJ	FRESNO	COALINGA, CITY OF	66	$14,154,100	$42,979	$651	$3.04	0	0	$0.00	$42,979.00	
SJ	FRESNO	FIREBAUGH, CITY OF	173	$34,479,600	$140,468	$812	$4.07	4	0	$0.00	$140,468.00	
SJ	FRESNO	FOWLER, CITY OF	29	$7,833,400	$38,942	$1,343	$4.97	2	1	$3,197.94	$35,744.06	$3,197.94
SJ	FRESNO	FRESNO COUNTY *	1,570	$396,321,400	$900,295	$573	$2.27	67	39	$537,282.62	$363,012.38	$13,776.48
SJ	FRESNO	FRESNO, CITY OF	632	$174,806,400	$329,347	$521	$1.88	134	81	$765,183.27	-$435,836.27	$9,446.71
SJ	FRESNO	HURON, CITY OF	10	$4,670,000	$5,741	$574	$1.23	0	0	$0.00	$5,741.00	
SJ	FRESNO	KINGSBURG, CITY OF	27	$8,610,000	$9,699	$359	$1.13	1	0	$0.00	$9,699.00	
SJ	FRESNO	MENDOTA, CITY OF	23	$5,631,800	$20,205	$878	$3.59	4	3	$2,572.00	$17,633.00	$857.33
SJ	FRESNO	ORANGE COVE, CITY OF	103	$24,605,400	$76,475	$742	$3.11	9	6	$78,052.28	-$1,577.28	$13,008.71
SJ	FRESNO	PARLIER, CITY OF	10	$2,087,700	$18,032	$1,803	$8.64	0	0	$0.00	$18,032.00	
SJ	FRESNO	REEDLEY, CITY OF	12	$3,640,000	$7,404	$617	$2.03	1	0	$0.00	$7,404.00	
SJ	FRESNO	SAN JOAQUIN, CITY OF	4	$1,265,000	$5,157	$1,289	$4.08	8	3	$10,720.38	-$5,563.38	$3,573.46
SJ	FRESNO	SANGER, CITY OF	78	$18,426,800	$72,485	$929	$3.93	9	4	$16,288.44	$56,196.56	$4,072.11
SJ	KINGS	CORCORAN, CITY OF	16	$5,138,000	$5,633	$352	$1.10	0	0	$0.00	$5,633.00	
SJ	KINGS	HANFORD,CITY OF	86	$26,613,000	$39,876	$464	$1.50	1	1	$2,246.38	$37,629.62	$2,246.38
SJ	KINGS	KINGS COUNTY *	326	$76,079,900	$242,858	$745	$3.19	6	4	$16,699.81	$226,158.19	$4,174.95
SJ	KINGS	LEMOORE,CITY OF	35	$9,271,200	$11,747	$336	$1.27			$0.00	$11,747.00	
SJ	MADERA	MADERA COUNTY*	1,045	$208,736,000	$847,002	$811	$4.06	40	20	$189,951.78	$657,050.22	$9,497.59
SJ	MADERA	MADERA,CITY OF	86	$24,553,000	$51,343	$597	$2.09	9	8	$88,293.47	-$36,950.47	$11,036.68
SJ	MERCED	ATWATER, CITY OF	40	$9,116,000	$14,475	$362	$1.59	1	1	$1,739.90	$12,735.10	$1,739.90
SJ	MERCED	DOS PALOS, CITY OF	8	$2,240,000	$2,739	$342	$1.22			$0.00	$2,739.00	
SJ	MERCED	LIVINGSTON, CITY OF	7	$1,430,000	$2,598	$371	$1.82			$0.00	$2,598.00	
SJ	MERCED	LOS BANOS, CITY OF	53	$15,934,000	$19,588	$370	$1.23			$0.00	$19,588.00	
SJ	MERCED	MERCED COUNTY *	1,861	$365,012,700	$1,236,849	$665	$3.39	111	83	$1,898,917.69	-$662,068.69	$22,878.53
SJ	MERCED	MERCED, CITY OF	4,045	$869,903,200	$2,011,596	$497	$2.31	146	86	$2,347,703.47	-$336,107.47	$27,298.88
SJ	SAN JOUAQUI	ESCALON, CITY OF	9	$2,205,000	$2,940	$327	$1.33			$0.00	$2,940.00	
SJ	SAN JOUAQUI	LATHROP, CITY OF	305	$96,927,900	$126,713	$415	$1.31	1	1	$7,060.69	$119,652.31	$7,060.69
SJ	SAN JOUAQUI	LODI,CITY OF	431	$139,539,800	$181,274	$421	$1.30	14	6	$16,832.87	$164,441.13	$2,805.48
SJ	SAN JOUAQUI	MANTECA, CITY OF	280	$89,139,700	$107,493	$384	$1.21	11	7	$504,950.93	-$397,457.93	$72,135.85
SJ	SAN JOUAQUI	RIPON, CITY OF	51	$16,611,000	$18,123	$355	$1.09			$0.00	$18,123.00	
SJ	SAN JOUAQUI	SAN JOAQUIN COUNTY*	4,261	$1,124,043,300	$2,810,563	$660	$2.50	225	164	$4,860,239.75	-$2,049,676.75	$29,635.61
SJ	SAN JOUAQUI	STOCKTON, CITY OF	4,067	$1,348,956,700	$1,993,175	$490	$1.48	46	22	$242,940.35	$1,750,234.65	$11,042.74
SJ	SAN JOUAQUI	TRACY, CITY OF	174	$58,710,900	$92,992	$534	$1.58	11	7	$18,652.12	$74,339.88	$2,664.59
SJ	TULARE	DINUBA, CITY OF	523	$105,583,000	$289,013	$553	$2.74	13	5	$13,980.91	$275,032.09	$2,796.18
SJ	TULARE	EXETER, CITY OF	23	$6,865,000	$8,725	$379	$1.27	3	3	$23,409.65	-$14,684.65	$7,803.22
SJ	TULARE	FARMERSVILLE, CITY OF	345	$57,096,700	$211,461	$613	$3.70	5	2	$5,496.09	$205,964.91	$2,748.05
SJ	TULARE	LINDSAY, CITY OF	374	$65,368,900	$285,325	$763	$4.36	10	3	$2,292.31	$283,032.69	$764.10
SJ	TULARE	PORTERVILLE, CITY OF	353	$71,967,100	$252,124	$714	$3.50	22	11	$31,718.97	$220,405.03	$2,883.54
SJ	TULARE	TULARE COUNTY*	2,416	$586,845,900	$1,809,178	$749	$3.08	122	77	$839,688.49	$969,489.51	$10,905.05
SJ	TULARE	TULARE, CITY OF	83	$24,389,000	$30,098	$363	$1.23	1	0	$0.00	$30,098.00	
SJ	TULARE	VISALIA, CITY OF	4,837	$1,375,970,700	$2,590,794	$536	$1.88	51	19	$102,678.73	$2,488,115.27	$5,404.14
SJ	TULARE	WOODLAKE, CITY OF	117	$20,842,500	$79,641	$681	$3.82	3	2	$18,283.39	$61,357.61	$9,141.70
SJ	STANISLAUS	CERES, CITY OF	22	$6,960,000	$9,046	$411	$1.30			$0.00	$9,046.00	
SJ	STANISLAUS	MODESTO, CITY OF	371	$96,378,500	$217,671	$587	$2.26	46	40	$1,647,432.03	-$1,429,761.03	$41,185.80
SJ	STANISLAUS	NEWMAN, CITY OF	199	$46,682,100	$130,089	$654	$2.79	27	23	$329,075.02	-$198,986.02	$14,307.61
SJ	STANISLAUS	OAKDALE, CITY OF	52	$15,316,000	$17,707	$341	$1.16			$0.00	$17,707.00	
SJ	STANISLAUS	PATTERSON, CITY OF	260	$55,857,600	$181,304	$697	$3.25	30	25	$258,545.84	-$77,241.84	$10,341.83
SJ	STANISLAUS	RIVERBANK, CITY OF	36	$11,315,000	$14,733	$409	$1.30			$0.00	$14,733.00	
SJ	STANISLAUS	STANISLAUS COUNTY *	492	$102,906,200	$455,391	$926	$4.43	89	72	$2,010,053.46	-$1,554,662.46	$27,917.41
SJ	STANISLAUS	TURLOCK, CITY OF	78	$21,055,000	$26,474	$339	$1.26	14	12	$45,172.64	-$18,698.64	$3,764.39
SJ	STANISLAUS	WATERFORD, CITY OF	15	$4,795,000	$5,380	$359	$1.12	1	0	$0.00	$5,380.00	
SJ		**Total or Average**	**30715**	**$7,921,349,200**	**$18,178,767**	**592**	**$2.29**	**1320**	**854**	**$17,056,005.99**		**$11,801.20**
		Central Valley Total	**109,365**	**$32,269,448,300**	**57,689,762**	**$559**	**$1.79**	**6,577**	**854**	**$69,247,249.14**	-$11,557,487.14	
		California Total	**300,872**	**$84,372,575,600**	**$217,353,554**	**$388**	**$2.58**	**45,847**	**30,927**	**$520,596,037.90**	-$303,242,483.90	
		Average Claim Paid										**$13,948.59**

Appendix A

GEOLOGIC HAZARD ABATEMENT DISTRICTS FOR FLOOD CONTROL APPLICATIONS

Introduction

Geologic Hazard Abatement Districts (GHADs) are state-level public agencies formed by local communities to provide prevention, rapid response, and funding to address hazardous geologic conditions. Although formed by a local agency, a GHAD is a political subdivision of the state and is not an agent or instrument of a local agency. They were established by the California Legislature to allow local communities to develop a self-funding mechanism to mitigate the damaging effects of large-scale hazards such as landslides, earth movement, erosion and other similar hazards.

GHADs were created in California in 1979 by the Beverly Act to enable local residents to collectively mitigate geological hazards which pose a threat to their properties and their associated improvements. Statutes pertaining to GHADs are presented in California Public Resources Code Division 17. GHADs are designed to handle long-term abatement and maintenance of real property potentially threatened by geologic hazards.

When established, a GHAD is an independent political subdivision of the State governed by a locally elected Board. However, it is not an agency or instrument of a local agency, and therefore is not subjected to control by a local agency. It is granted similar authority as other local agencies, including:

- Taxing ability
- Bonding ability
- Certain legal immunity
- Can sue and/or be sued
- May exercise eminent domain

A GHAD is intended to address the prevention, mitigation, abatement, and control of geologic hazards on designated land within its boundaries. For the purposes of a GHAD, a “geologic hazard” as defined in California resources Code § 26507, “means an actual or threatened landslide, land subsidence, soil erosion, earthquake, fault movement, or natural or unnatural movement of earth.” Further, as a prudent landowner, a GHAD is able to acquire, construct, operate, manage, or maintain improvements on any land it specifically owns. There are no limits or requirements pertaining to size, number of units, or contiguous boundaries (i.e., a GHAD may contain numerous non-contiguous parcels).

Implementation

Application to Flood Control

Because of the broad definition of “geologic hazard,” GHADs have been effectively applied to erosion- induced land movement, including the maintenance of stormwater quality and detention facilities, and are increasingly being formed for flood protection. It is important to note that, unlike many other areas of the country, few California levees have failed from overtopping; instead, they have primarily failed due to internal erosion resulting from neglect or degradation, which can

be foreseeably minimized or prevented with a proactive maintenance and ongoing improvement program. These levees have a finite design life that can be extended in perpetuity provided that an appropriate maintenance/rehabilitation program is implemented.

A GHAD provides a superior alternative for the maintenance of flood control structures due to its focus on the prevention of damage, proactive monitoring of potential hazards, and the ability to swiftly undertake improvements. GHADs have a multi-decade track record of successfully responding to both routine and unforeseen large-scale events quickly and efficiently with technical and financial resources. GHADs also provide an attractive means for future renovations or improvements to flood control structures by providing a revenue stream to fund ongoing capital improvements, rehabilitation, or expansion of flood control structures. Additionally, a reserve may be accumulated for damage recovery from an unpreventable large-scale event or applied towards the purchase of a community-wide flood insurance policy.

Advantages of a GHAD

GHADs are effective means for providing rapid emergency response. When applied to flood control, they provide an ideal structure to fund and implement flood fighting measures during critical high-water times, including emergency levee repair, sandbagging, soil/rock facing, temporary dam or cutoff wall erection. These measures can be effectively applied as flood levels rise or evidence of distress to protective measures progress. Ongoing revenue can be used for advanced flood planning and to stock emergency supplies for when they are needed to implement these measures. Additionally, the governing documents of the GHAD can be tailored to develop emergency contingency plans, as well as mechanisms to ensure their enforcement.

From a fiscal standpoint, GHADs offers several distinct advantages over other private or public financial and regulatory mechanisms used for flood insurance issues. First, assessments are commonly collected with property tax bills and enjoy the same rights of collection and redress as property taxes (i.e., liens may be applied to delinquent properties). Assessment-related debt incurred by a property owner is senior to even mortgage-related debt. Because GHADs are state agencies with these collection powers, they can borrow and issue bonds with attractive interest rates, similar to those issued by other governmental bodies. Assessments are also tax deductible to the parcel owner. Because they are applied and collected with property taxes, the revenue stream runs with the land and continues to be applied and collected even after a loss has been realized on a particular parcel. The assessment cannot lapse or be cancelled on the anniversary of its establishment like an insurance policy. Table 1 below compares attributes of GHADs with several other potential maintenance/financing entities.

TABLE 1 – Entity Comparison Matrix

Type of Governance Entity	Geologic Hazard Abatement District (GHAD)	Reclamation District (RD)	Local Agency Joint Powers Authority (JPA)	County/Municipal Flood Control Agency	Community Facilities District (CFD)	Homeowners Association (HOA)
Government Hierarchy	State	Local	Case Specific	Local	Special District	Private
Eminent Domain Powers	Yes	Yes	Case Specific	Yes	No	No
LAFCO Exemption	Yes	Yes	No	Yes	No	Yes
Subject to Prop 218	Yes	Yes	Yes	Yes	Yes	No
Ability to Issue Bonds	Yes	Yes	Case Specific	Yes	Yes	No
Deductibility of Assessment	Yes	Yes	Yes	Yes	Partial	No
Contract Negotiation Powers	Yes	No	No	No	No	Yes

GHADs are locally controlled and operated and, as a result, are often far less bureaucratic than state or federal entities. The "flat," efficient organizational model greatly reduces overhead and the need to divert assessment resources for administration, reducing the potential assessments to parcel owners within a district. Further, because the governing GHAD documents are written under the grant of broad powers with little outside interference, these documents can be written with great latitude. As an example, potential flood losses may be capped as written into the GHAD Plan of Control or Engineer's Report. Additionally, explicit inclusions and exclusions of coverage as well as expenditure priorities may be prepared within these documents.

With respect to organizational structure, the governing board of a GHAD can take two forms: 1) five board members can be elected from among the property owners within the district, or 2) the individual members of the legislative body that forms the GHAD (i.e. City Council or County Board of Supervisors members) will serve as the GHAD board. Under the second board structure, the individuals that are responsible for making land use planning decisions are the same individuals that are responsible for addressing the resulting flood protection issues associated with land use decisions, as they may pertain to the separate agency boundaries. Often the two functions of land use and flood protection are vested in separate agencies that fail to evaluate the consequences that result from a lack of coordination between the two

issues. The formation of a flood protection focused GHAD can unify flood protection decisions with land use decisions.

External Insurance Opportunity

In many ways, GHADs currently operate as “de facto” insurance policy providers for parcel owners within a district. However, a GHAD is not a licensed insurance carrier, and therefore cannot directly be used as a substitute for the NFIP. However, for the practical reasons outlined above, a GHAD can be used as a vehicle to service premium payments for a flood insurance policy for properties within the district boundaries. As envisioned, only one policy would need to be administered for a given community and the term of the policy could be set on a decades-long scale, as opposed to annually. Property owners would enjoy the benefit of having their premium contribution being tax deductible, and the efficiency of the GHAD structure would likely lower premium payments while enhancing the profit potential for the insurance carrier or financial backer. Finally, the ongoing capital improvement programs performed by the GHAD are expected to greatly reduce the loss potential to the carrier over the term of the policy.

Case Studies

Two potential case studies are illustrated in the follow sections to provide a couple examples of how a GHAD could be structured to address flood hazards.

Twin Creek Community

The Twin Creeks community is located in Stockton, California and consists of 383 residential lots. The typical residence has 2 to 4 bedrooms, is approximately 2,000 square feet, and has current market values of approximately $200,000. Two potential flooding sources, Bear Creek and Mosher Slough, are located along the northern and southern community boundaries, respectively. Interstate 5 is located along the eastern community boundary, and an auxiliary levee operated by Reclamation District 2126–Atlas Tract is located along the western community boundary. Detailed descriptions of these features are as follows:

- Interstate 5 – Interstate 5 is constructed on a raised embankment along the entire eastern frontage of the Twin Creeks community and is a critical piece of infrastructure that serves as the primary north-south interstate highway in the western United States. The embankment measures approximately 250 feet in width (measured from toe-of-embankment to toe-of-embankment) and is up to 10 feet higher than the anticipated 100-year flood elevation. Given the dimensions of the highway embankment, the quality of its construction, and its ongoing maintenance as a critical transportation corridor, failure due to either overtopping or internal erosion is considered extremely unlikely.
- Reclamation District 2126 (RD 2126) Atlas Tract Levee – The RD-2126 levee embankment is a FEMA-accredited, 100-year levee that was improved in the last 10 years. The levee was constructed and accredited as part of a levee improvement project intended to remove the area adjacent to the Twin Creeks community (Atlas Tract) from the 100-year floodplain, for the purpose of facilitating residential development of the adjacent area. The levee serves as an auxiliary flood protection structure that would only function as a flood barrier if the FEMA-accredited levees along the north, south, or west sides of Atlas Tract failed first. Flooding

from the western boundary of the Twin Creeks community could only occur in the extremely unlikely scenario of failure of the recently improved, FEMA-accredited levees during a flood event.

- Bear Creek – The levee along Bear Creek was constructed by the U.S. Army Corps of Engineers and is approximately 620 feet in length and 50 feet in width (measured from toe-of-embankment to toe-of-embankment). The levee is approximately 10 feet in height and only retains about 3 feet of water during the 100-year flood event. The Bear Creek levee is currently considered adequate to provide protection against the 100-year flood; however, it is scheduled to be de-accredited by FEMA due to a lack of sufficient certification documentation. Notwithstanding the lack of documentation, based on the relatively light hydraulic loading anticipated during a 100-year event, the potential for levee failure is relatively low and could be substantially reduced with minimal additional investment.
- Mosher Slough - The levee along Mosher Slough is approximately 1,720 feet in length and 45 feet in width (measured from toe-of-embankment to toe-of-embankment). The levee is approximately 10 feet in height and only retains about 3 feet of water during the 100-year flood event. The Mosher Slough levee is currently considered adequate to provide protection against the 100-year flood; however, it is scheduled to be de-accredited by FEMA due to a lack of sufficient certification documentation. Notwithstanding the lack of documentation, based on the relatively light hydraulic loading anticipated during a 100-year event, the potential for levee failure is relatively low and could be substantially reduced with minimal additional investment.

Potential Flooding Impacts

The 100-year flood inundation depth within the residential lots ranges from 0 to 7 feet. Nearly 10 percent of the residences are predicted to have very little to no inundation during the 100-year flood event. The following table summarizes the range of flooding depths within the residential lots:

TABLE 2 – Flood Impact Analysis – Twin Creeks

Depth of 100 year Flood Inundation (ft)	Number of Residential Lots Impacted
0	8
0 to 1	21
1 to 2	25
2 to 4	286
4 to 7	43

In addition, due to the geographic shape of the community (relatively long and narrow), further reductions in flooding potential can easily be achieved with very minor investments in pre-flood event planning and design. Cost-effective, prefabricated flood wall systems can be easily pre-designed and stockpiled to allow the community to be quickly compartmentalized prior to a potential levee breach. By deploying approximately 1,200 linear feet of portable flood protection,

the maximum number of residential units at risk of flooding from a breach along Mosher Sough would be 174 lots (approximately 45% of the total). Deployment of approximately 800 lineal feet of portable flood wall would result in reducing the flood exposure to only 86 residential units (approximately 25% of the total) from a breach along Bear Creek. The 118 lots in the central portion of the community (approximately 30% of the total) can be isolated from simultaneous breaches along both Mosher Slough and Bear Creek by deploying the combined 2,000 lineal feet of portable flood wall.

Proposed GHAD Model

As envisioned, the GHAD would be responsible for the annual routine operation and maintenance of the Bear Creek and Mosher Slough levee embankments. These activities will generally include weed and rodent control, woody vegetation life cycle management, visual inspections, and reporting. In addition, the GHAD will evaluate, design, and facilitate the construction of annual capital improvements and resource investments to improve the quality of the flood protection system, the level of protection provided, and the preparedness for flood response and damage reduction.

The GHAD budget would be established to provide adequate funding for both the annual routine maintenance activities and annual capital improvements to reduce the flood hazard potential on an ongoing basis. In addition, the budget will include funds to cover an annual flood insurance premium for an inclusive policy that covers all the parcels within the community. Based on our initial budget estimates, it appears that an annual per-lot assessment of less than $1,000 would be adequate to fund a routine annual maintenance budget of $40,000 per year and an annual capital improvement budget of $250,000 per year with a reserve accumulation/insurance premium budget of $60,000 per year. The established annualized insurance premium was based on financing a loss of $122 million dollars over the 100-year risk horizon. The flood loss assumptions included:

1. flooding throughout the entire community, to the depths shown on the attached figure,
2. a maximum coverage level of $350,000 per residence ($250K for property and $100K for contents) for the residences that experience greater than 2 feet of flooding, and
3. a factored loss for the residences with less than 2 feet of flooding (factored as a function of flooding depth).

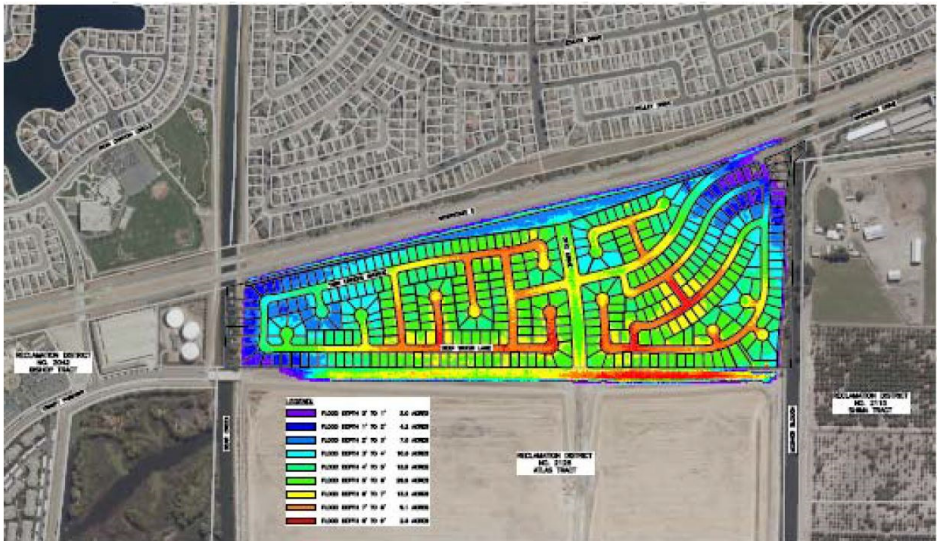

Figure 1. Predicted Twin Creeks Flood Depth (Source, Kjeldsen, Sinnock and Neudeck, Inc.)

Case Study – San Joaquin Area Flood Control Agency

The San Joaquin Area Flood Control Agency (SJAFCA) is a joint powers authority created in May 1995 between the City of Stockton, San Joaquin County and the San Joaquin County Flood Control and Water Conservation District for the purpose of addressing flood protection for the City of Stockton and surrounding County area. The District's levee system was completely upgraded in 1998 with a $70 million capital improvement project that was certified by the U.S. Army Corps of Engineers as providing protection from the 1 percent annual chance flood (100-year flood event). The project consisted of flood wall and levee improvements along 40 miles of existing channel levees, 12 miles of new levees, modifications to 24 bridges, and the addition of two major detention basins and pumps stations.

Potential Flooding Impacts

The SJAFCA district is adjacent to and contains several flooding sources, including: the San Joaquin and Calaveras Rivers; Bear, Mosher, Duck and Little John's Creeks, Pixley, Five Mile, Mormon, Mosher and French Camp Sloughs; and the Stockton Diverting and Smith Canals. The San Joaquin River is located along the western boundary of the district and serves as the primary receiving body for all of the other channels that flow through the district.

Although the district faces potential flooding threats from multiple sources, the resulting flood protection system consists of a collection of compartmentalized sub-areas with levees that isolate each sub-area to exposure only to the flooding source immediately adjacent to the sub-area. As a result, if a levee failure were to occur adjacent to one sub-area, the resulting levee breech would cause a drop in water surface elevation within the system, resulting in a lowered risk of failure in other parts of the district. The overall effect of the compartmentalized nature of the SJAFCA system is that the potential for complete inundation of the entire District is extremely low or nearly impossible.

Proposed GHAD Model

The SJAFCA assessment district consists of more than 74,000 parcels with approximately 149,000 assessed 'units'. A unit is intended to approximate an average single-family home with some larger residential parcels and commercial parcels assessed at multi-unit rates. A preliminary GHAD budget was modeled to provide adequate funding for annual routine maintenance activities as well as annual capital improvements to reduce the flood hazard potential on an ongoing basis. An annual capital improvement budget of $12 million was allocated for improvements within the District. Based on our initial budget estimates, it appears that an annual per-unit assessment of approximately $275 would be adequate to fund a routine annual maintenance budget, an annual capital improvement budget of $12 million per year, and a reserve accumulation/insurance premium budget that could finance a loss of $1.2 billion dollars over a 50-year risk horizon. The flood loss assumptions included:

1. flooding limited to a discrete portion of the District, given the unique topography, geography, and spatial distribution/compartmentalization of existing levees within the District footprint,
2. a maximum coverage level of $350,000 per unit ($250K for property and $100K for contents) for the residences that experience greater than 2 feet of flooding, and
3. a factored loss for the residences with less than 2 feet of flooding (factored as a function of flooding depth).

It should be noted that all costs are in current dollars that have been adjusted in the financial model assuming a 3 percent inflation rate.

Summary

Unlike the current flood protection and insurance model that separates the flood protection system operations from the flood-damage recovery efforts and from land use planning efforts, a GHAD has the ability to align the interests of these efforts. Relatively small amounts of revenue directed toward proactive flood protection improvement and land use planning can greatly reduce the potential exposure of flood-damage recovery. However, the local flood control maintenance agencies that are currently responsible for maintaining flood control systems do not bear the direct cost of flood-damage recovery provided by flood insurers. Conversely, those responsible for providing flood insurance typically have no ability to influence the improvements to the flood protection systems that mitigate their flood damage recovery exposure. Further, neither the local flood control maintenance agencies nor the flood insurance providers assume the responsibility for making land use decisions that impact the improvements that are at risk. Establishment of a GHAD that has the dual responsibility of operating the flood control system and maintaining insurance against a failure of that flood control system has the distinct advantage of providing an ounce of prevention to avoid paying a pound for the cure. When incorporating the additional element of land use planning, the establishment of a GHAD can provide a combination of proactive systems management, cost savings, and self-reliance.

Appendix E. Levee Relief Cut Guidance Documents and Model Floodplain Management Ordinances

APPENDIX E CONTENTS:

Note that documents in Appendix E are meant to be used as stand-alone documents and therefore the pages are not numbered as being in Appendix E.

Appendix E1

Guide to Utilizing Levee Relief Cuts to Lower Base Flood Elevations and Appendix A Sample Emergency Operations Plan

Guide to Utilizing Levee Relief Cuts to Lower Base Flood Elevations

December 2016

CONTRIBUTING AUTHORS

This report is titled:

Guide to Utilizing Levee Relief Cuts to Lower Base Flood Elevations

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Table of Contents

1. Glossary of Acronyms

BFE	Base Flood Elevation, 100-YR
CDEC	California Data Exchange Center
CPG 101	Comprehensive Preparedness Guide
DWR	Department of Water Resources
EOP	Emergency Operations Plan - Basic Plan
FCM	Flood Contingency Map
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Maps
FOC	Flood Operations Center
LMA	Levee Maintaining Agency
NFIP	National Flood Insurance Program
NAD83	North American Datum, 1983 (*horizontal*)
NAVD88	North American Vertical Datum, 1988
PED	Preliminary Engineering Design
PL 84-99	Public Law 84-99
USACE	United States Army Corp of Engineers

I. Guide Purpose and Background

1.0 PURPOSE AND INTRODUCTION

The purpose of this document is to provide guidance to levee maintaining and public safety agencies for flood containment and damage reduction through execution of a relief cut. Guidance provided includes methods for evaluating, planning, and executing a relief cut to mitigate depth, extent, and/or duration of floodwaters and subsequent damages resulting from an unplanned upstream levee break or levee overtopping. Relief cuts, when properly pre-planned and effectively implemented, also have the potential to reduce 100-yr Base Flood Elevations (BFE) thereby mitigating potential damages to property, lands, crops, etc., and reducing subsequent repair costs. Relief cuts have been a historic and accepted method for reducing flood damages after failure of a primary levee and wide experience and documentation is available for formally incorporating this flood fight action into floodplain engineering and emergency planning practices.

This Guide describes in detail criteria for developing Preliminary Engineering Designs (PEDs) for pre-planned relief cuts, conducting hydraulic modeling, and standardized engineering criteria for determining the effect of a relief cut on existing BFE calculations. The PEDs contain analysis for determining appropriateness of a relief cut, implementation time and needs, and level of effectiveness for the actual flood circumstances. Elements of the PED criteria are applicable to the determination of the "100-year Flood Relief Cut" analysis that would be part of the BFE determinations for a levee protected areas. These PEDs, however, are intended to recognize the need for adjusting relief cut implementation to actual conditions being experienced. This document assumes that relief cuts will be made with heavy equipment. The use of high explosives requires additional considerations not addressed in this document.

This document assumes that the agency with primary levee responsibility, the local levee maintaining agency (LMA), has an Emergency Operation Plan – Basic Plan (EOP) and flood-specific Annex compliant with requirements within FEMA's Comprehensive Preparedness Guide 101 (CPG101).

1.1 Background

A relief cut is a pre-planned and engineered cut in a levee for the purpose of creating an improvised weir to return impounded floodwaters into a receiving floodway, after floodwaters have entered an area protected by a levee system (e.g., due to levee overtopping or a levee breach). This action of creating a lower elevation weir thereby reduces the elevation of impounded flood waters which would otherwise reach or exceed the elevation of the levee crown at its low point within the leveed basin. Figures 1 illustrate the basic hydrology of this action. A relief cut can accomplish one or more of the following goals:

1. Control Base Flood Elevations – Maintain flood water ponding at a specific elevation that if exceeded would cause additional damage; and/or
2. Dewatering - Fully or partially drain a protected floodplain of ponded floodwaters; and
3. Minimize the depth, extent, and/or duration of ponded floodwaters, as shown in Figures 1 and 2

An example of typical series of events is depicted in Figure 1 below.

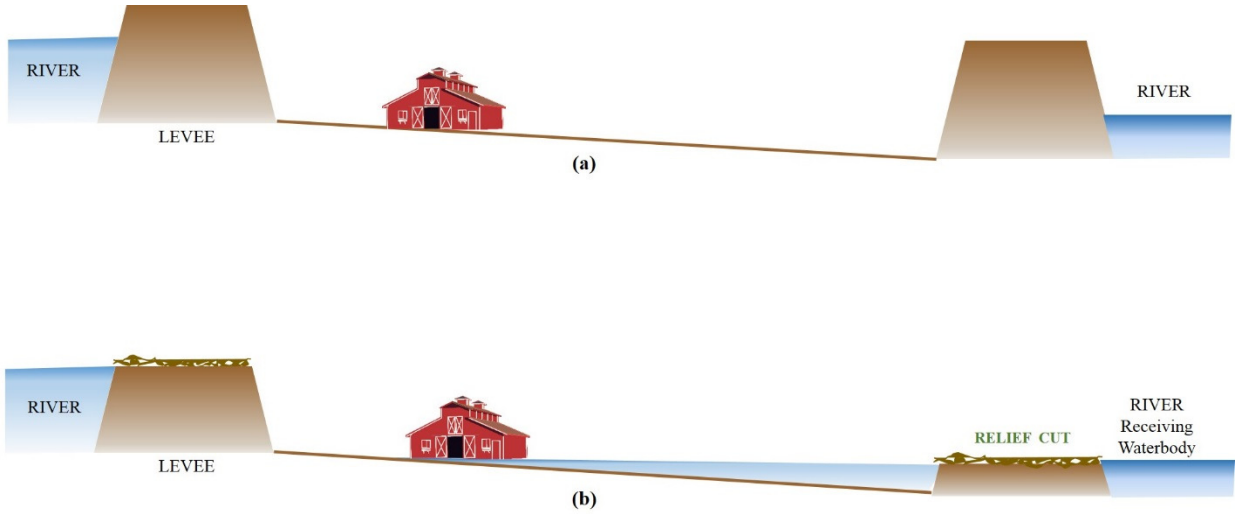


Figure 1 – A Cross Sectional View Of:

(a) A schematic of an agricultural basin prior to levee breach or levee overtopping.
(b) An upslope levee breach with a relief cut (reduces flood depth and extent).

1.2 Necessary Topographic Conditions

There are two general topographic conditions with a gradient element that make a relief cut an effective method for reducing flood extent and subsequent damages. In both cases a relief cut can reduce the elevation of impounded waters and the subsequent extent of flood water coverage and damage.

The first condition is the situation where the floodway is the low point of the area with general ground elevations rising as you move away perpendicularly from the waterway. This situation exists mostly along the San Joaquin River and portions of the Delta. In this situation floodwaters from a breach move generally along the river as it descends towards its mouth. The impounded water will move until it encounters a linear obstruction. This can be either an extension of the primary levee perpendicular to the main water due to the existence of a tributary waterway or a dryland levee placed perpendicular to the primary levee and waterway explicitly for this purpose. Since such a linear obstruction will be at a lower elevation than the location of the upstream breach it is necessary to stabilize impounded water at the level

of the water in the floodway at that point if the linear structure is not to be overtopped. A relief cut at this point, used in conjunction with the linear obstruction, accomplishes this objective.

The second condition is the situation where the floodway is the high point of the area with general ground elevations falling as you move away perpendicularly from the waterway toward lower adjacent floodways. This situation exists in the Sacramento Valley below the City of Colusa. In these cases, the protected area is generally surrounded with levees to protect residents and property from both floodways. A relief cut is an effective method of reducing the elevation of impounded water where the breach is in the floodway of higher elevation and the cut is made in the levees facing the waterway of lower elevation.

1.3 Historic Use

Historically, relief cuts have been an acknowledged expedient method for limiting flood damage after a failure of the primary flood control levee. The use of relief cuts is documented in California as far back as the 1878 flood. In that flood, relief cuts were made at Grand Island to prevent the backup of flood waters into the somewhat higher and more developed north section of the Island. A relief cut was also made in the north levee of Union Island in San Joaquin County to prevent the backup of impounded water into the more developed eastern portion of the Island.

In 1986, the Town of Thornton and 12,000 acres of agricultural land within Reclamation District 348 was flooded by a breach at the upstream end of the levee system. A relief cut was made at the mouth of Beaver Slough to reduce elevations of impounded waters, particularly assisting to keep portion of Thornton dry. In the major 1997 flood, relief cuts were made in response to breaches in Stewart Tract and along the San Joaquin River above Mossdale, and in Reclamation District 1660 along the Sutter Bypass.

The use of relief cuts has not been restricted to California. In 1993, a relief cut was made in the left bank levee of the Mississippi River to return impounded waters from an upstream breach near Columbus, Illinois, to the river, thereby preventing flooding of additional areas downstream. In that event, the United States Army Corps of Engineers (USACE) cooperated both in the planning and implementation of the cut.

The 2006 San Joaquin River flood was the first instance where relief cut contingencies and implementation criteria had been both pre-developed and documented on flood contingency maps developed by the levee maintaining agencies and the county. In this case, USACE approved the use of the cuts if needed and authorized repair under PL84-99 within 24 hours of the beginning of the flood based on the existence of those pre-developed plans. The need for implementing a relief cut was fortunately not encountered in that flood.

1.4 The Future

Up to 1998, relief cuts and other improvised engineering methods for containing flood waters from breaches in the primary flood control levee had not been a formal part of emergency preplanning efforts since their applicability was contingent upon actual conditions of a future flood event and these methods were not yet a recognized part of the national flood control and damage reduction programs. However, this document will provide guidelines to evaluate, preplan, and execute relief cuts to reduce flood damages for both a 100-yr event and floods of other magnitudes and types.

Even while the appropriateness, manner of implementation, and effectiveness of relief cuts do depend on circumstances only known at the time of the flood, they are an engineering issue which can be fruitfully addressed before a flood. For 100-year events used as the basis for floodplain management by the

national government, the engineering of relief cuts can be performed to exacting standards prior to the flood. Additional engineering can then be performed to address the contingencies of the varying characteristics of actual floods.

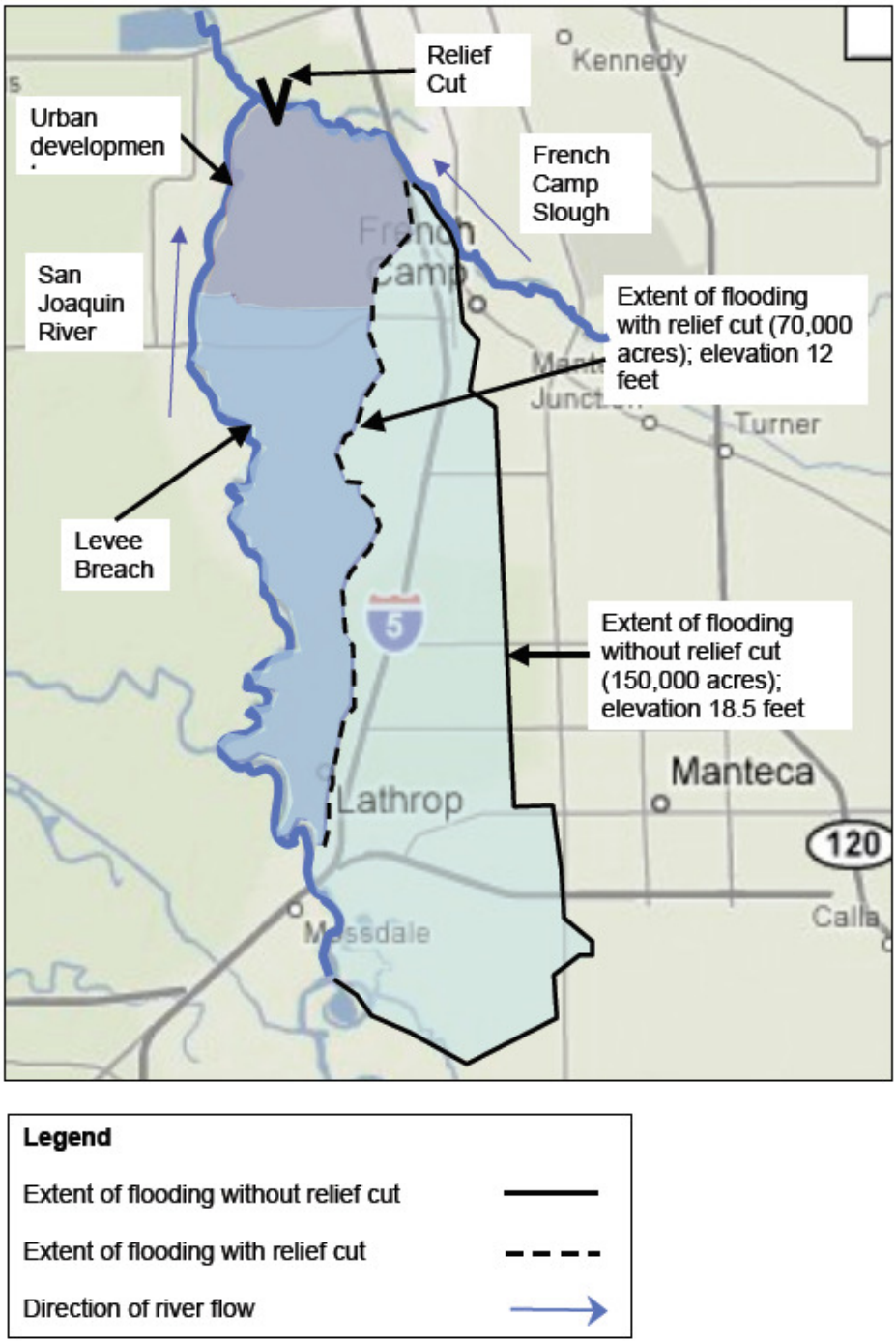


Figure 2 Example Basin – Flood Extents With and Without a Relief Cut
Medium Blue shows the predicted extent of flooding with a relief cut.
Light Blue shows the predicted extent of flooding without a relief cut.

II. Relief Cut Preliminary Engineering Designs (PED)

This Guide provides guidance for developing preliminary engineering designs for relief cuts that address the contingencies that actual floods present. In this case, the 100-year flood criteria are used as a reference only and the potential real-world variation in flood elevations, breach characteristics, and flow characteristics recognized. Such pre-flood preliminary engineering design work will assist engineers at the time of the flood to more expeditiously determine whether a relief cut would reduce damages and to finalize actual plans for implementing such a relief cut.

1.0 SITE EVALUATION AND INITIAL SELECTION

This section describes criteria for the initial selection of potential relief cut sites. These sites are selected based on general topographical conditions and site-specific features such as potential access, presence of infrastructure or residences in the vicinity, and the characteristics of the floodway into which the impounded waters will be directed. This initial analysis will serve as the basis for subsequent hydraulic modeling of levee breaks and identification of corresponding variations in relief cut criteria.

1.1 General Topographic Review

It is important that emergency planners become acquainted with the area being studied and the planned flood system behavior. This can be best achieved by working closely with local experts, such as levee maintain agency (LMA) representative or local government agencies, with broad and historical knowledge of the levee and flood control system behavior, during this initial review.

An initial step in the topographic review is to confirm that a gradient in ground or waterway elevations exists in the area of study. The existence of a gradient is the fundamental requirement for considering a relief cut to reduce flood extent, depth, or duration. Unimpeded floodwaters will flow in an area with a gradient to a location where ground elevations reach a low point. If the low point is adjacent to the primary levee or a dryland cross levee and a corresponding portion of the floodway, the levee at this point can be cut to form an improvised weir to return impounded floodwaters to a receiving waterbody. Absence of a gradient within the protected area precludes this action.

Once the existence of a gradient in ground elevation is confirmed, the next step in the topographic review is determining potential location(s) for a relief cut through a more thorough review of the area in question. Important considerations include:

1. Identify the jurisdiction with primary levee maintaining responsibility. This could be a reclamation district, levee district, Department of Water Resources (DWR) Maintenance Area, County, or a private levee. Flood Contingency maps typically outline these agencies' boundaries;

2. Make an inventory of locations where ground elevations reach a low point. Low areas that are adjacent to a levee are of particular significance since the levee can potentially be cut at these locations to relieve impounded floodwaters into the adjacent waterway;

3. Identify the direction and magnitude of the gradient in ground elevation as it will influence flow experienced within the basin. Locations near a low point where a breach would clearly leave inadequate time to safely execute a relief cut should be identified. However, a relief cut may also be executed to dewater a basin;

4. Identify and evaluate any local weirs, bypasses, or internal waterways, manmade canals, and the bifurcations of these that may increase, impede, or change the direction of flow or influence the

stage of impounded waters. For example, take note of weirs that may cause flow to back up and/or change direction; and

5. Identify raised alignments such as railroads, roads, dryland levees, cross levees, etc. that have the potential for impeding or re-directing water flow as well as noting any gaps or openings which might allow impounded water to pass and continue along natural flow patterns. These alignments may be able to temporarily contain floodwaters to a limited area, and if determined to be structurally adequate, can be used in conjunction with a relief cut to prevent further damage by preventing floodwaters from further expansion. Even if not structurally adequate for extended containment of impounded waters, these structures may become part of the relief cut PED as a method for gaining additional time to execute a relief cut at the more practical location identified in the study.

This topographic review may yield one or several locations where a relief cut may be a feasible option. A subsequent field site investigation alongside LMA representatives is recommended to each of these sites.

1.2 Field Site Investigation

Should the topographic review yield one or several locations where a relief cut may be a feasible option, a field site investigation with LMA representatives will be conducted to consider practical cut parameters, or identify major fatal flaws which would prevent implementing a relief cut (important utility crossings, homes, etc.) Features to take note of include:

1. **Residential homes or critical structures in the vicinity of the cut** that may be adversely impacted in the presence of a relief cut, usually on the receiving end of the floodwaters;

2. **Power, gas, water, or sewer infrastructure** that are penetrating into, or in the vicinity of the levee at location of a potential cut. The presence of penetrating pipelines may not necessarily rule out a site. For example, a waterline could be cut and capped prior to executing a relief cut. However, this decision is at the discretion of the jurisdiction executing the cut;

3. **Evaluate the fetch, or water expanse, of the receiving water body** to ensure it is large enough to avoid impacts to levees across the river. A larger fetch is desirable. In the absence of an adjacent receiving waterbody, floodwaters may also be released into large expanses of undeveloped land. Presence of trees or vegetation at the location of the relief cut is preferred as it could serve as energy dissipater at the time of the cut;

4. **Investigate the general characteristics of the floodway adjacent to potential relief cut sites** where impounded waters will be directed. Existence of sandbars, islands, vegetation and other waterway characteristics should be documented. The presence of other levees along the waterway should be confirmed and their general condition and location reference to potential out flow documented to guide the field site investigation; and

5. **Identify safe and accessible all-weather access routes onto and across the levee** to the site of the relief cut, considering a range of potential levee break locations. If possible, heavy equipment should have exit routes that will allow them to safely retreat once the cut has been completed and water begins to drain through the cut. However, if absolutely necessary, it is acceptable to temporarily strand heavy equipment during a relief cut in order to minimize flood damage. In such cases, personnel operating heavy equipment will need to be evacuated via boat or helicopter.

A survey of critical elevations should be conducted, referencing a known vertical datum so that elevations can be compared to the 100-yr BFE, reported stream and rivers gauges, and reference documents such as the Flood Contingency Maps (FCM). Items to survey include, but are not limited to:

1. Ground elevation adjacent to levee at relief cut site;
2. Elevation of levee crown at relief cut site;
3. Elevation of neighboring structures and important structures within the ponding area;
4. Elevation of top of any raised alignments such as railroads, roads, dryland levees, cross levees, etc.; and
5. Maximum allowable ponding elevation that allows critical facilities to remain functional during or immediately after a flood, such as major pump stations.

After one or several sites have been selected, the site information can be incorporated into a hydraulic model.

> **NOTE:** It is likely that historical documents will reference different, and in many cases multiple datums. Therefore it is critical to document the various datums and to provide conversion factors.

1.3 Permit, Environmental, Biological, and Cultural Investigations and Compliance

Once one or several locations have been selected for the relief cut, take note of possible permits and/or environmental, biological, or cultural resource issues:

- 404 Permit;
- 408 – Endangered Species Act (ESA) Permit; and
- Categorical Exclusion, Environmental Assessment, Finding of No Significant Impact, and Environmental Impact Study under the National Environmental Policy Act.

2.0 HYDROLOGIC AND HYDRAULIC ANALYSIS

This section provides guidance on the items which should be considered as part of the hydrologic and hydraulic analyses supporting a levee relief cut plan.

2.1 Purpose and Goals

The purpose and goals of the relief cut should be clearly defined prior to conducting the hydraulic analysis. The specific goals might be to (1) implement a relief cut to drain the ponded area partly or completely, (2) implement a relief cut to control ponding to a specific water surface elevation within the flooded basin, or (3) implement a relief cut to minimize the ponded area and depth.

In general, the hydraulic analysis should:

1. Provide guidance in regards to a recommended size (or range of sizes) for the levee relief cut;
2. Provide an understanding of the various hydraulic conditions which are critical to implementing a relief cut (i.e., flow characteristics of the floodwaters; how long it takes for floodwaters to completely fill the ponding area; how fast the floodwaters rise at the location of the relief cut, etc.);
3. Examine potential adverse hydraulic impacts in regards to implementing the relief cut;
4. Identify the BFE with and without the relief cut; and
5. Be completed in accordance with the (FEMA)'s Standards for Flood Risk Analysis and Mapping, located on FEMA's website at: http://www.fema.gov/guidelines-and-standards-flood-risk-analysis-and-mapping – conducted, signed and sealed by a registered professional engineer.

2.2 Hydrologic and Hydraulic Model Parameters

2.2.1 Model Software and Setup

An appropriate model should be selected in accordance with FEMA's list of approved hydraulic models (https://www.fema.gov/numerical-models-meeting-minimum-requirements-national-flood-insurance-program). The analysis could utilize multiple programs. For example, it could utilize a one-dimensional model for analyzing the stream and a different two-dimensional model for analyzing the overland flow in the floodplain.

The hydrologic and hydraulic analyses must be calibrated using data from well-documented flood events, if available. The channel models should also be configured using, or adjusted for, channel roughness values consistent with vegetation that is anticipated or likely to grow over the next 10 years. The development and setup of the model should be clearly documented.

2.2.2 Topography and Terrain Data

The digital terrain used for the analysis should be reliable and cover the entire study area. Field surveys and aerial data acquisition must be referenced to the North American Vertical Datum of 1988 (NAVD88) and the North American Datum 1983 (NAD83), which is consistent with current FEMA standards. Critical elevations used in the analysis (e.g., the levee crest) should be certified by a registered professional engineer or licensed land surveyor.

2.2.3 Inflow Hydrology

The peak flow for the analysis should match the median 100-year discharge rate, as determined from the most recent FEMA Flood Insurance Study or from the best available results of a recent flood-frequency

study. If an appropriate 100-yr discharge rate is not available, then the engineer should compute it using appropriate methods. These methods include fitting a statistical model with unregulated streamflow observations; configuring, calibrating, and applying a watershed runoff model with design precipitation; or applying regional regression equations acceptable to FEMA. The engineer may also consider conducting the analysis to a larger flood event (e.g., 200-year) for added conservativeness.

The analysis will likely require a 1-percent-annual-chance flood hydrograph to complete the modeling, making the development of a flood hydrograph necessary. Computing and selecting a representative hydrograph shape with an appropriate volume is an important step. For many systems, the hydrograph shape and volume will be a key parameter influencing the residual floodplain delineations and relief cut size. For flooding sources with gaging stations located near the study location, two methods for developing the desired-percent-chance flood hydrographs could be followed:

1. Scale a major (10-percent-annual-chance peak discharge or larger) observed flood hydrograph by multiplying the ordinates by a factor to create the desired-percent-chance flood hydrograph; and

2. Develop a balanced synthetic flood hydrograph using peak discharges and N-day volumes.

The balanced synthetic flood hydrograph should be used when no major (10-percent-annual-chance peak discharge or larger) observed flood hydrograph is available for scaling to obtain the desired hydrograph, or the volume under the observed flood hydrograph is not considered appropriate.

The above methods for developing flood hydrographs are not the only acceptable approaches. Other accepted methods developed by Federal, State, regional, and local agencies may be more relevant. The application of any method, including those above, should be evaluated for reasonableness.

2.2.4 Levee Breach Location

There are four possible scenarios that determine the levee reaches to consider for breach locations. This document's purpose is to address the first two scenarios. However, if desired, most of the document can also be made applicable for scenarios 3 and 4:

1. Part of the levee system is accredited and another part is not accredited and the relief cut is being used to lower the BFE. In this scenario, the engineer would evaluate for floodplain mapping purposes the worst case flooding and ponding that could result from a breach anywhere in the non-accredited reach of levee. Breaches would not be considered in the accredited reach of levee;

2. All of the levee system is non-accredited. In this scenario, the engineer would evaluate for both floodplain mapping purposes (i.e., lowering the BFE) and emergency planning the worst case flooding and ponding that could result from a breach anywhere in the levee system;

3. Part of the levee system is accredited and another part is not accredited and the relief cut is being used to evaluate the worst case flooding and ponding for emergency planning, irrespective of levee accreditation, so as to plan for the worst case scenario. In this scenario the engineer would evaluate the worst case flooding and ponding that could result from a breach anywhere in the levee system; and

4. All of the levee system is accredited and the relief cut is being used to evaluate the worst case flooding and ponding for emergency planning, so as to plan for the worst case scenario. In this scenario the engineer would evaluate the worst case flooding and ponding that could result from a breach anywhere in the levee system.

The analysis must identify levee breach locations that would be the most damaging and result in the fastest filling and highest composite flood water surface elevations for the ponding area. The process for selecting the locations for the upstream levee breaches should be conducted in coordination with the initial site evaluation and topographic review, as described in Section 1.

Predicting the exact location of a future breach to a levee or floodwall is not possible. However, the analysis should examine a number of potential breach scenarios which could affect the study area until a firm understanding of the resultant floodwater behavior is achieved. The breach locations should be placed to capture the full flood hazard on the landward side of the levee. The locations for the potential levee breaches could be determined using the methods described below:

1. Select initial breach locations for each levee reach, one representing a breach location near the downstream end of the levee reach and another near the upstream end of the levee reach;

2. Determine the hydrograph through each breach, also known as "the breach hydrograph," and independently analysis the hazard for the 1-percent-annual-chance flood landward of the levee for each breach; and

3. Add additional breach locations to the initial locations if any of the locations might fill the ponding area more quickly, or additional breaches can change the flood elevations or the extent of the resultant floodplain. Additional breach locations should be considered wherever the head is greatest (i.e., the difference between the BFE in the floodway and the landward levee toe elevation is greatest). The engineer may need to use judgment, through examination of the terrain landward of the levee and/or preliminary modeling results, on whether additional selected breach locations will result in any measurable change of the flood hazard. Additional locations should also be analyzed if they could change conditions at the proposed relief cut location, once this is determined.

In the end, the analysis must reflect the fact that a breach may occur along any non-accredited levee located upstream where resulting floodwaters could impact the study area. How the engineer determines the point when additional breach locations are not required should be documented. The flood hazard will be considered to have been reasonably identified when all potential storage areas and flow paths that can be reached by breach flows are reflected in the composite resultant floodplain.

Note that the critical (controlling) levee breaches will likely be used to size the relief cut. Therefore, it may be important to consider more than one controlling breach location. For example, the breach that results in the largest or deepest resultant floodplain may not be the breach which produces the fastest rate-of-rise at the relief cut location (i.e., the breach that results in the shortest time window for construction).

2.2.5 Breach Width and Depth

A rectangular breach extending vertically from the levee crest to the adjacent landside levee toe elevation should be adequate for defining the breach shape, unless additional analysis determines breach side slopes are important and necessary for accurate modeling of the breach.

The minimum breach width will be 100 feet for clay levees and 500 feet for sand levees. These minimum accepted breach widths are consistent with current FEMA Operating Guidance, which is based on a qualitative review of the historic breach width information available. The method to estimate the breach width needs to be based on sound engineering judgment and be compared to similar historical documented levee breaches, where available. Historic levee breach information is an important tool in determining breach shape and development time. The engineer performing the analysis should conduct a

thorough search for historical breach information and document how the selected breach parameters fall within the historic ranges. The engineer should also consider that levee breaches usually create large scour holes that extend deep below the landside levee toe elevation. But this is usually ignored, modeling the bottom of the breach at landward levee toe elevation, to simplify the hydraulic modeling of the levee breach. To account for this unconservative simplification, the engineer should consider using additional breach width beyond what is indicated from the historic breach width information.

The analysis documentation should provide adequate justification for the choice of breach parameters. The documentation for the analysis should also describe how the selected breach parameters fall within the historic ranges for the size, location, flooding source type, and soil type of the levee. A sensitivity analysis that evaluates a range of breach widths can be helpful in developing the justification.

2.2.6 Breach Initiation

The time when a breach is triggered will influence the peak flow and volume through the breach. The time that produces the most reasonable case should be chosen using sound engineering judgment. One option to consider is the point in time when the water rises to an elevation at which the levee fails to meet standard engineering criteria. If this level of information is not available, the engineer could consider:

- Modeling the breach as an 'open hole' (i.e., breaching the levee at the beginning of the hydraulic simulation), which would result in conservative floodplain extents and volumes for relief cut planning purposes; and
- Initiating the breach at a point in time when the channel water surface elevation is at a reasonable set distance from the top-of-levee (i.e., 4 feet from the top-of-levee). Historical data and performance should be used to justify this assumption, if available.

Note that in most cases, the selected breach trigger should occur before the peak stage. Also, if the breach is not modeled using the 'open hole' approach, then the breach trigger assumption should be included as a variable in sensitivity analysis, as described later in this section.

2.2.7 Breach Formation Time

In most cases, the time for breach formation (the time from breach initiation to the time full breach width is realized) can be set to zero to simplify the analysis. If it is determined that the breach formation time would have a significant impact on the breach hydrograph, then the variable could be considered in the analysis.

2.3 Technical Considerations

In general, the supporting hydraulic analysis should examine the full range of different levee breach scenarios which have the potential to occur and install confidence in the implementation of the overall levee relief cut plan. As such, the following should be considered as part of the hydraulic analysis technical work:

2.3.1 Locating and Sizing the Relief Cut

The process for selecting the location for the relief cut should be conducted in coordination with the initial site evaluation and topographic review, as described in Section 2. Typically, this would be at or near the lowest elevation within the basin, but it may be located elsewhere due to considerations such as hydraulic impacts and encroachments. Hydraulic modeling should then be performed to analyze how the relief cut could reduce flood risk within the study area for the controlling (worst case) upstream breach scenario, or group of controlling scenarios. In some cases, it may be appropriate to identify more than one potential relief cut location depending on where the controlling upstream breaches occur and perform

modeling for each location. Note that the worst-case scenario for sizing the relief cut may not necessarily be the breach which creates the largest floodplain; a breach which fills the area the fastest, or which has impacts to critical access may control.

A range of widths and depths should be considered by the engineer and analyzed for the relief cut. For example, the analysis could initially examine 3 different cut lengths (i.e., 300 feet; 800 feet; 1,200 feet) at three different cut depths (9 different configurations total) to obtain some initial results. Due to the low head differential between the ponding area and the receiving water body, erosion of the relief cut should normally not be assumed. The results could then be used by the designer to establish curved relationships useful for interpolation (i.e., plots showing the maximum ponding elevation vs. relief cut size). Follow-on analyses could then be conducted in order to verify the optimal recommended size. The relief cut should be sized to meet the initial goals for the controlling (worst case) 100-year breach condition.

Hydraulic modeling may reveal that the relief cut cannot be completed before it is overtopped by impounded floodwaters. In this case, the hydraulic modeling will need to reflect that the relief cut is growing during the event (assuming excavation continues after overtopping begins) in order to properly size the relief cut for the target ponding elevation.

Additionally, it should be considered under what conditions a relief cut is needed, or not needed. For example, if the levee breaches in close proximity to the relief cut location, then would a relief cut still need to be made? Where do you draw this boundary?

2.3.2 Timing Information

The hydraulic analysis should examine and document the various timing components of the breach floodwaters. Timing estimates should be conservative for relief cut planning. Important pieces of timing information to consider for development of a reliable plan include:

- How long does it take for floodwaters to reach the relief cut location?
- How fast do floodwaters rise within the ponding area, particularly at the location of the relief cut?
- How long does it take floodwaters to completely fill the ponding area?
- How long does the responding agency have to implement the cut?
- How do floodwaters affect access to the relief cut site?
- What are the water surface elevations within the channel at the relief cut location and how might they affect implementation of the cut?
- What should the construction initiating trigger(s) be?
- What should the backflow trigger(s) (if any) be?

2.3.3 Backflow Assumptions

It should be decided early on whether or not backflow through the relief cut is acceptable, and if so, at what time or head differential it would be acceptable to make the cut. The effect of allowing versus not allowing backflow could be evaluated with additional hydraulic analyses. Implementing a relief cut early and allowing backwater to flow into the study area might reduce evacuation time for some areas, but it also might result in reduced final floodplain depths and extents. The pros and cons for allowing backflow should be discussed with implementing agencies and local government if considered as part of the analysis.

2.3.4 Constructability

The hydraulic analysis should be conducted in parallel with the activities described in Section 4 and Section 5, as constructability conditions may control and require deviations from the planned widths and

depths for the cut. It should be confirmed early that the initial relief cut sizing and timing results are reasonable, conservative, and achievable. If not, then the modeling goals may need to be adjusted in order to account for other limiting factors. For example, consider whether the cut can be completed before ponding elevation reaches the bottom of the cut. If not, then the modeling would need to reflect that the levee relief cut is growing over time during the event.

Alternatively, it may be more efficient to first determine what relief cut sizes are constructible within certain time constraints considering available methods for making the cut – and then model those scenarios to confirm whether or not they meet the goals. What can make this a difficult, and therefore iterative, modeling exercise are the considerations that: (1) the relief cut may be growing during the event because it cannot be completed before the ponding level reaches the bottom of the cut, (2) there may be limitations on when backflow is allowed that complicate the relief cut design and timing, and (3) there may be significant hydraulic impacts to address.

2.3.5 Potential Adverse Hydraulic Impacts

The analysis should evaluate potential adverse hydraulic impacts resulting from the implementation of the relief cut. This analysis requires modeling of the without-project condition (i.e., no relief cut) and the resulting ponding and weir flow over the levee at its low point for comparison to the with-project condition (i.e., with a relief cut). For the without-project condition, if the levee is made of sandy soil and not protected by a hardened surface or revetment, it would be appropriate to model the overtopping erosion that would likely occur and result in a levee breach that releases water from the ponding area back into the stream.

Hydraulic impacts include:

- Conditions where the relief cut returns flow to a stream thereby increasing the peak water surface elevations downstream (i.e., does the return flow result in potential surcharging downstream);
- Conditions where the relief cut returns flow to a stream and increases peak velocities along adjacent or downstream levees (i.e., does the return flow through the relief cut have potential to adversely impact the levee across the stream from where the cut was made);
- Conditions where the relief cut exacerbates flooding within the basin (e.g., extensive backflow is allowed and it temporarily accelerates ponding); and
- Conditions where the relief cut could cause additional flooding within the basin, if not repaired in time before another large flood event.

2.4 Sensitivity Analysis

A sensitivity analysis should be performed to evaluate the effects that varying the different modeling parameters has on relief cut performance and floodwater extents and depths. The analysis is completed by varying the hydraulic input parameters within reasonable limits and re-running the simulations. Sensitivity analyses are important as they provide information in regards to how critical some of the initial assumptions may be. The sensitivity analysis can also be a source of information for responding agencies to use during a future event, since it's likely that an actual levee breach will differ from the modeled conditions (i.e., how significantly does the size of the breach impact the available time for constructing the relief cut?). Results from the sensitivity analysis may also drive considerations for the relief cut design for added conservatism.

Important parameters to evaluate as part of the sensitivity analysis include:

- Levee breach width (and depths, if a scour hole is being modeled);
- Breach initiation timing;
- Channel and floodplain N-value assumptions;
- Accuracy of topography; and
- Inflow hydrology (timing of peak stages and long durations of high water)

The results of the sensitivity analysis should be clearly documented and describe any notable changes to peak discharges, floodplain extents, etc. Also, it's important that any critical hydraulic assumptions get relayed into the final relief cut plan so if a breach occurs in the future, the actual breach conditions can be quickly compared to the modeled conditions and emergency officials can adjust their response actions accordingly. For example, the rate of inflow into the basin along with the breach location and other parameters are key to confirming that the implementation time windows, as identified in the relief cut plan, are still valid.

2.5 FEMA Mapping and Reporting Results

The final documentation should describe how the resulting floodplain reasonably represents the combined hazard boundary delineations for all of the analyzed breach scenarios (i.e., reflects the worst case 100-year flooding) with the relief cut in place. The final resultant floodplain must reflect the fact that a breach may occur at any location along upstream non-accredited reaches with potential to impact the study area. The modeled breach locations should not be apparent in the final floodplain delineation or water surface elevations.

The results for the hydraulic analysis should also:

- Include maps showing both the with-project and without-project conditions – highlighting the reductions in extents and/or floodwater elevations due to the relief cut;
- Include time series maps for the controlling levee breach that show the ponding area growth and depth over time;
- Show the location of the relief cut on the map, the locations of the levee breaches that were considered, and the locations of the controlling levee breach;
- Highlight any potential adverse hydraulic impacts, both without-project and with-project, and the difference;
- Highlight any levee access issues for reaching the cut with equipment and materials. Showing the access points on the maps will also help in planning for breaches between access points, and what the equipment routing to and from the relief cut would look like in each scenario; and
- Highlight any levee breach scenarios where, for the selected method, some of the equipment could be stranded after making the relief cut.

Note: If the levee relief cut is to be relied upon for limiting BFE's or SFHA extents, the reductions in the ponded BFE's due to an approved relief cut plan should not override/reduce the resulting flood elevations due to interior drainage or 100-year flooding from other sources, unless the relief cut plan has been specifically formulated to address those sources.

2.5.1 FEMA Flood Zone Designations

When levee relief cuts are to be utilized to reduce or eliminate BFEs, mitigate depth, extent, and/or duration of floodwaters and subsequent damages resulting from an unplanned upstream levee break or levee overtopping, the following should be considered:

- To lower BFEs in Zone A:
    1. Reductions in BFEs through the use of relief cuts should only apply to new and substantially improved agricultural structures;
    2. Any reductions in BFEs through the use of relief cuts should be documented in engineering study(s) on file in the office of the Floodplain Administrator; and
    3. The execution of a relief cut relied upon for the reduction of BFEs, should be documented in the Agency's Emergency Operation Plan – Basic Plan (EOP) and flood-specific Annex compliant with requirements within FEMA's Comprehensive Preparedness Guide 101 (CPG101).
- Reduction of BFEs in Zones A1-30, AH, and AE must be accomplished by revisions to the FIRMs using the LOMR process. The following provisions apply to the use of relief cuts to lower BFEs in Zones A1-30, AH, and AE.
    1. BFEs reductions through the use of relief cuts should only apply to new and substantially improved agricultural structures;
    2. The Floodplain Administrator should use require all new and substantially improved non-agricultural structures to conform to BFEs determined without reliance upon a relief cut; and
    3. The execution of a relief cut relied upon for the reduction of BFEs, should be documented in the Agency's Emergency Operation Plan – Basic Plan (EOP) and flood-specific Annex compliant with requirements within FEMA's Comprehensive Preparedness Guide 101 (CPG101).
- Change of Zones A1-30, AH, and AE where the BFE is reduced to ground elevation or lower must be accomplished by revisions to the FIRMs using the LOMR process. For these areas, the new zone designation can be Zone D local flood hazard area due to a relief cut or Zone X (Shaded) local flood hazard area due to a relief cut. For administration of this area, it may be advantageous to choose a zone designation that is different than adjacent zones on the FIRM. The following provisions should apply:
    1. BFEs in the Zone D local flood hazard area due to a relief cut and Zone X (Shaded) local flood hazard area due to a relief cut should only apply to agricultural structures;
    2. The Floodplain Administrator should require all new and substantially improved non-agricultural structures to conform to BFEs determined without reliance upon a relief cut; and
    3. The execution of a relief cut relied upon for the reduction of BFEs, should be documented in the Agency's Emergency Operation Plan – Basic Plan (EOP) and flood-specific Annex compliant with requirements within FEMA's Comprehensive Preparedness Guide 101 (CPG101).

3.0 PRELIMINARY ENGINEERING DESIGNS (PEDS) CONTENT AND PREPARATION

Upon review of the hydraulic model's recommended relief cut site and dimensions (depth and width) the LMA will prepare, if not already, preliminary engineering designs (PEDs) can be developed to document the relief cut execution plan. The PEDs are imperative to communicating the LMAs plan and reasoning for the intended relief cut.

3.1 Basic Elements of a PED

The basic elements of a completed PED for a relief cut will consist of the following documents.

PED Memorandum – Memorandum outlining the results of the topographic study and field investigation, any issue-specific hydraulic modeling, and design recommendations developed by the engineer.

Relief Cut Synopsis Table – Table attached to the PED Memorandum summarizing key information and conclusions, and implementation options developed by the engineer.

Levee Cross Section and Profile – Elevation diagram displaying relief cut characteristics to include elevations, levee and weir profile, and other site information.

Layout Schematic – Photos as needed showing relief cut site and surrounding environs. Key infrastructure, equipment staging areas and other information can be annotated on the photos.

3.2 Preparing Preliminary Engineering Design (PEDs) Technical Memorandum

The PEDs are the planning documents containing critical information necessary to execute a relief cut. In addition, they can serve as an information bank that will allow decision makers to make better informed decisions on the basis of a well thought-out plan in a more time-efficient manner. The PEDs are comprised of a short technical memorandum and exhibits. The technical memorandum briefly documents the situation overview including boundary waterways and general topography, critical assumptions, analysis, and any special consideration (such as protecting a critical pumping station).Critical pieces of information contained in the PEDs are relief cut dimensions since they are necessary for estimating time of completion. The dimensions of the relief cut, based on the hydraulic model, will allow the LMA to predict an excavation volume and thus forecast the required time to execute the cut. For example, if the total required excavated volume is 5,000 cubic yards, using an excavator with a 3 cubic yard bucket, with each swing taking approximately 1 minute, it will take approximately 28 hours working continuously to excavate the cut if the removal of the spoil doesn't constrain excavation. Depending on the time available, multiple excavators may be needed – which raises the possibility of stranding equipment if they are working on opposite ends of the cut.

At minimum, it is recommended that the information summarized in Table 1 on the following page, and highlighted in yellow, be obtained prior to executing a relief cut. In completing this information, it is important to envision how the equipment pieces will work together throughout the process of excavating the relief cut and removing spoil as the pond rises against the levee. The engineer should develop a schematic of this process and consider how the work may evolve as the pond rises. For example, scrapers may be the most efficient equipment for removing the top of the levee until they bog down when running over saturated levee soils. After that, excavators may take over, with spoil removal accomplished by bulldozers, loaders, and/or dump trucks. The lowered, widened levee crown may support a pair of excavators working side by side, swinging in opposite directions. A pair could be located on each end of the cut, widening the cut by working away from the other pair.

TABLE 1 _____ RELIEF CUT SYNOPSIS			
Jurisdiction		*Example: Reclamation District 123*	
Incident Commander		*First Name, Last Name*	
Critical Assumptions	**Value**	**Units**	**Comments**
100-yr BFE (at Relief Cut Site)	_____ (NAVD88)	feet	Used as a benchmark
Levee Crown Elevation (at Relief Cut Site)	____ (NAVD88)	feet	Levee profile is relatively flat, no major changes in elevation.
Other	____ (NAVD88)	feet	Ideal maximum ponding elevation of impounded flood waters within the Basin
Relief Cut Dimensions			
Length	±*600-1,200* ±_____	feet	*Recommended range based on previous successful cuts *To be adjusted based on actual conditions
Depth	± ___	feet	*Depth as prescribed by hydraulic models, site visit, and adjusted based on actual conditions. Note: 100-yr BFE is used as reference
Width at Crown	± ___	feet	*To be adjusted based on actual conditions
Waterside Slope	3H : 1V		
Landside Slope	2H : 1V		
Cut Volume	± ____	cu. yd.	
	± ____	tons	@ 1.6 tons/ cu. yd.
Estimated Time	± ___	hours	*Adjust as Required (assumes __ excavators @ 1min/swing)
Equipment	Initial Actions	❑ ❑ ❑ ❑ ❑	Equipment Options to Facilitate Initial Excavation Efforts Dozer # Needed:_____ Dump Truck # Needed:_____ *Explosives (___) Refer to _____ for considerations* Scraper # Needed:_____ Skip Loader # Needed:_____
	_____	cu. yd.	Number of Excavators (max) (2 excavators recommended)

3.3 Preparing PED Exhibits – Relief Cut Site Schematic and Cross Section and Profile

In addition, the PED exhibits will be included to illustrate the relief cut location and dimensions. The PED exhibits are comprised of:

- **Sheet 1** – **Site Schematic** - diagram showing a vicinity map and limits of the relief cut (see attached example). Include an aerial base map, and identify major road names, waterway names, levee and/or river miles.
- **Sheet 2** – **Cross-Section and Profile Exhibit**s- a cross-section and profile view of the levee showing the dimensions of the relief cut. Identify any homes, facilities, or utility crossings in the section view (see Attachment A).

3.3.1 Preparing the Site Schematic

Oftentimes, levees are located in rural areas which can make it difficult to identify specific segments of levee that are far from main roads. Therefore, the first sheet will detail a vicinity map and aerial base map of the relief cut site to help decision makers efficiently locate the site and specific levee segment. The aerial sheet should identify:

1. The LMA;
2. Levee miles and/or river miles;
3. The names of any surrounding waterbodies (rivers, streams, bypasses, etc.);
4. Identify any major facilities or locally recognized landmarks (i.e., large pump stations, weirs, Smith's Barn, etc.);
5. Identify any road names, including rural and county roads;
6. Identify the extent of the relief cut, it is helpful to also show stationing (levee profile alignment);
7. Identify the Levee Section View alignment at the location of the relief cut; and
8. Identify the intended direction flow that floodwaters will take when the relief cut is executed (from the basin to the receiving waterbody).

This diagram will also assist decision makers to quickly review routes for heavy equipment to access the relief cut site and retrieve from the relief cut site. Refer to the sample aerial sheet for recommended style and layout.

3.3.2 Preparing the Relief Cut Cross-Section and Profile Exhibit

Once the segment of levee on which the relief cut will be executed is identified, it is helpful to develop an exhibit that shows the profile view of the levee along the length of the relief cut and a typical levee cross section within the limits of the relief cut. Critical information can then be conveyed on the exhibits that can help future decision makers reach a decision promptly. At minimum, the following information is recommended:

1. 100 Year BFE relative to relief cut depth;
2. Elevation of the bottom of the relief cut;
3. Preliminary relief cut width;
4. Identify any levee penetrations, utility type, pipe size and material if possible;
5. Identify any other critical elevations, such as elevation of neighboring town or maximum allowable elevation before pumps are negatively impacted; and
6. Reference datum.

Refer to the sample profile and cross-section exhibit for recommended style and layout.

3.4 Integrating PEDs into Response Organizational Structure and Plans

The PEDs are incorporated in the LMA's Flood Contingency Maps as attachments. This guidance document employs the principles and procedures established by the Standardized Emergency Management System (SEMS) and National Incident Management System (NIMS) to facilitate the interface within jurisdiction with primary levee maintaining responsibilities and among all echelons of government during the evaluation, approval, and execution phase of a relief cut.

The organizational structure of the LMA, including appointing an Incident Commander, is detailed in the LMA's Emergency Operations Plan – Basic Plan (EOP) under *Section 3 – Organization and Assignment of Responsibilities* (see attached example). Other elements of the LMA EOP relevant to implementation of the relief cut PED are as follows.

3.4.1 Response Activation Triggers

Trigger conditions for preparing and executing pre-planned relief cuts are documented in each jurisdiction's Emergency Operations Plan – Basic Plan (EOP) under *Section 2.2.3 Alert, Activation, and Initial Response*. Objective conditions are identified for each trigger that as a minimum prompt

1. PED review and PL84-99 Pre-Approval Actions;
2. Consult the PED technical memorandum and exhibits; and
3. Execution of the relief cut.

3.4.2 Jurisdictional Pre-Event Approval Process

Each levee maintaining agency will ultimately determine that a relief cut is a feasible option through review of the NFIP analysis and PED development, and incorporation of those documents into its approved jurisdictional emergency operations plan. If the levee in question is a Project Levee, the relief cut must be approved by the USACE to obtain Public Law 84-99 rehabilitation after the flood. If the levee in question is not a Project Levee, approval from the USACE is not required. The general process is shown below.

Actions

1. LMA decides a relief cut is appropriate for damage reduction and incorporates relevant NFIP analysis and/or PEDs into its jurisdictional emergency operations plan;
2. LMA adopts its emergency operations plan as part of the flood safety plan required by CPG101;
3. County and/or city whose residents are protected by LMA adopt the LMA emergency operations plan (and attached PEDs) as part of the flood safety plan required by CPG101; and
4. LMA provides copy of flood contingency map and all PEDs related to project levees to USACE and any other appropriate regional, state, and federal agencies (e.g., State Department of Water Resources, Central Valley Flood Protection Board, etc.).

3.4.3 Execution of Proclamation of Local Emergency

LMA will work with its county to ensure that a Proclamation of Local Emergency is enacted either at any specific trigger point or when the potential for needing to execute a relief cut makes such an action advisable.

3.4.4 Forwarding PEDs for PL84-99 Pre-Approval at Beginning of Flood Event

Upon transition to emergency operations (ICS activation trigger) at the time of the flood the LMA will officially request USACE pre-approval to make planned relief cuts in the event of a breach in accordance

as long as PED criteria are met. LMA confirms that county appropriate state agencies have access to the PEDs.

4.0 EXECUTING A RELIEF CUT

The following section will detail the recommended sequence of actions prior to, during, and immediately after the relief cut execution.

4.1 Sequence of Actions

Once the approval has been obtained, or LMA decided to execute the relief cut, the following actions will take place.

In locations where breach width needs to be controlled to avoid impacting adjacent facilities, the flood fight strategy should be to armor ends of breach to prevent expansion of breach width.

Actions

1. Ensure that Proclamation of Local Emergency has been executed;
2. Provide media/public notification of planned emergency actions;
3. Armor ends of breach and repair breach as soon as safely possible;
4. Initiate patrols to monitor growth of ponding area to identify opportunities to protect property or contain impounded waters, and make growth projections;
5. Evaluate District pumps serviceability and the practicality of placing additional pumping capacity at pre-planned locations;
6. If necessary, request and obtain approval from the USACE to execute the relief cut;
7. Make the relief cut if feasible and appropriate;
8. Protect interior slopes of levees impacted by impounded flood waters;
9. Review and prepare to initiate dewatering plan as appropriate to remove any trapped ponded floodwaters;
10. Review and update as needed, the plan to perform initial repairs of the levee breach and relief cut immediately after the flood event; and
11. Initiate dewatering plan as appropriate and interim repairs for the levee breach and relief cut (followed by permanent repairs before the next flood season).

4.2 Documentation of Expenditures and Expenditures for Mutual Aid

Each LMA will assign an individual in responsible charge for keeping and maintaining records of expenditures, incidents, hours, etc. per NIMS/SIMS requirements. This is documented in each LMA's EOP under *Section 3.2.7 – Document Expenditures, Emergency Actions, and Requests for Mutual Aid.* Sample record keeping sheets are also provided in the EOP as attachments. Documentation of ponding stage, receiving water body stage, and progress during construction of the relief cut should be well documented.

5.0 PRACTICAL CONSIDERATIONS

The previously described topographic, site, and hydraulic evaluations and analyses of a relief cut will be used to reappraise the designated floodplain extent and 100-yr BFE based upon assumed conditions. However, at the time of the event, the true size, flowrate, and distance of the levee failure from the anticipated relief cut site will be known, thus allowing relief cut dimensions to be updated based on true conditions. A relief cut is a feasible option if the hydraulic model suggests a relief cut to be viable option and minimum conditions are met:

1. The anticipated elevation of impounded floodwaters within the impacted area at the location of the relief cut is HIGHER than the water elevation of the receiving waterbody;

   OR

   The anticipated elevation of impounded floodwaters within the impacted area of the relief cut is HIGHER than the water elevation of the receiving water but at the time of making the relief cut the elevation of the impounded floodwaters is LOWER than the elevation of the receiving water body and some backflow may be experienced;

   AND

2. There is enough time to safely access the relief cut site, execute a relief cut, and retreat from the site. However, if absolutely necessary, heavy equipment may be temporarily stranded. In which case, a boat or helicopter must be on standby to remove the operator(s).

The amount of available time is a dependent on the several factors, including:

1. Distance of the levee breach from the relief cut site;
2. Rate at which floodwaters are entering and ponding within the basin; and
3. Required time to cut the levee to a depth that will result in the desired maximum ponding depth as constrained by the elevation of the water surface of the receiving waterbody.

5.1 Relief Cut Dimension Adjustments

Relief cut dimensions can be adjusted based on characteristics of the upstream levee breach in an effort to equalize flow, and thus prevent continued rise and expansion of ponded floodwaters. Once the event is taking place, and actual conditions are known, Table 1 can be updated accordingly.

5.1.2 Relief Cut Depth

The depth of the relief cut may be limited to the elevation of water in the receiving waterbody, as shown in Figure 3, to prevent backflow from the receiving water body when impounded floodwaters are below the elevation of the receiving waterbody. Theoretically, the depth of the relief cut will be estimated based upon pre-event hydraulic evaluations and analyses approximately. However, at the time of the flood, the relief cut depth may be constrained by the actual water surface elevation in the receiving water body.

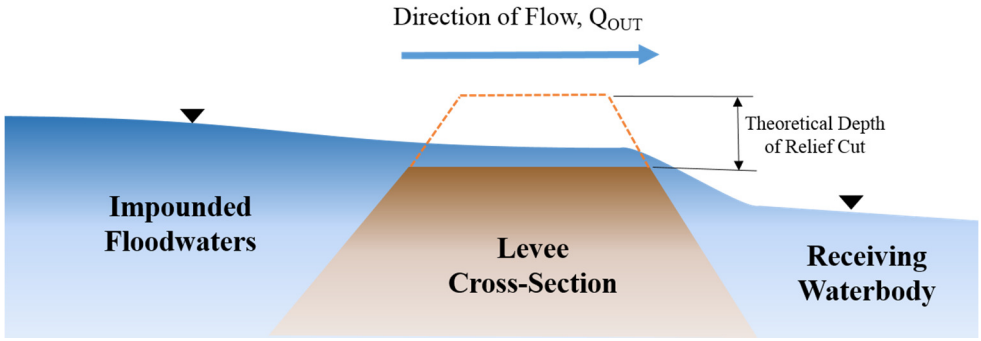


Figure 3 – Theoretical Depth of Relief Cut

Alternatively, the cut may be made deeper than the elevation of the water surface of the receiving waterbody as shown in Figure 4 below. This deeper cut can reduce ponding even further, if done properly and carefully, and reduce the effort required to dewater any remaining trapped floodwaters after the flood event is over. A relief cut that allows temporary backflow may lower the ultimate ponding elevation by making the cut deeper and/or wider than could be accomplished without allowing backflow. This is a tradeoff that may temporarily increase the depth and size of the pond until it reaches the elevation of the water surface of the receiving waterbody.

Results from modeling can be used to determine whether the relief cut needs to be deeper than the elevation of the water surface of the receiving waterbody in order to achieve the target ponding elevation.

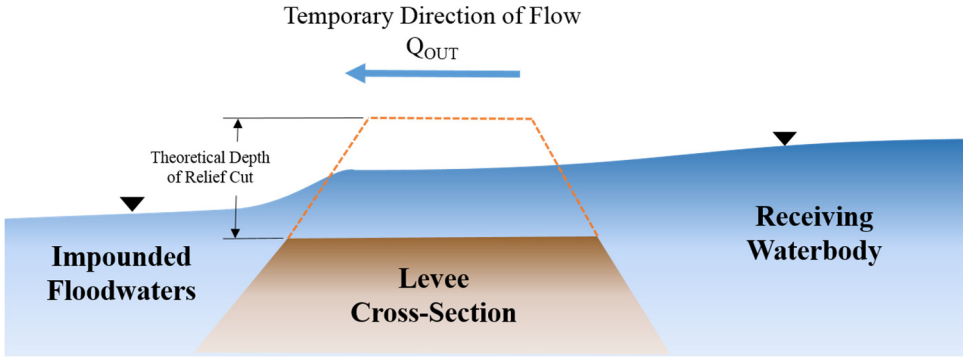


Figure 4 – Alternative Theoretical Depth of Relief Cut

5.1.3 Relief Cut Width

Historically, successful relief cut widths have ranged from 600 ft. to 1,200 ft. Relief cuts larger than this may require methods other than mechanical removal of the levee material.

5.2 Time Considerations

Once the relief cut dimensions have been confirmed based upon real-time conditions, adjust the estimated total time requirement.

5.3 Summary of Practical Considerations

In the face of an actual event, the size of the relief cut can be adjusted to accommodate actual conditions. Table 1 summarizes critical information that is needed, and may be adjusted during an actual event to execute a relief cut appropriate for the event.

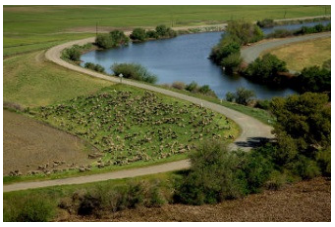
Appendix A – Sample Emergency Response Plan (Basic Plan)

APPENDIX A
SAMPLE EMERGENCY OPERATIONS PLAN

Emergency Operations Plan
Basic Plan

_____ COUNTY EMERGENCY RESPONSE &
FLOOD PREPAREDNESS PROJECT

DECEMBER 2016


This document was last updated on [DATE].

Prepared by_____for _____

This document is compliant with requirements of FEMA's Comprehensive Preparedness Guide 101 (CPG101)

Contents

PLAN PROMULGATION

Month Day, Year

To whom it may concern:

This document and accompanying annex map, having been duly reviewed and approved by the _____ (Jurisdiction), is hereby promulgated as the official emergency plan of the Jurisdiction. Jurisdiction staff is hereby directed to use this plan as the basis for emergency response to flood events. This plan is compliant with requirements within FEMA's Comprehensive Planning Guide 101 (CPG101), and is compliant with the National Incident Management System (NIMS), National Response Framework and the California Standardized Emergency Management System (SEMS),

The Jurisdiction's Appointee is hereby directed to distribute this plan to outside agencies in accordance with the Record of Initial Distribution to ensure proper inter-agency coordination during emergency operations. The Jurisdiction's Appointee shall review this plan and accompanying annex annually for needed changes and updates and is authorized to make routine updates and changes to the plan required by changes in Jurisdiction operations and personnel and changes to outside agency plans that affect Jurisdiction operations.

The Jurisdiction shall review this plan once every three years and after any major flood event where the plan was used to guide Jurisdiction response. The Jurisdiction's Appointee shall maintain a record of plan reviews and approval actions in accordance with Jurisdiction documentation procedures and policies.

Sincerely,

_____,
Jurisdiction _____

RECORD OF CHANGES AND REVIEWS

Revision # or Review Date	Name of Person Performing Review	Sections Revised	Date of Distribution	Name of Approving Authority

RECORD OF INITIAL DISTRIBUTION

Agency Name	Address	Date Provided
Jurisdiction _____	Address	
_____ County Office of Emergency Services	Address	
_____ County Planning, Public Works, Flood Management and Environmental Protection	Address	
_____ Fire Protection Jurisdiction	Address	
State Department of Water Resources		
State Office of Emergency Services		
Others		

SECTION 1 - PLAN INTRODUCTION

1.1 Purpose

The purpose of this Flood Safety Plan is to ensure that Jurisdiction staff can meet response objectives in a flood emergency as well as effectively interact with other jurisdictions performing emergency functions within and around the Jurisdiction. This plan is intended to be used in conjunction with the emergency operations plans of the county and state partner agencies to facilitate multi-jurisdictional coordination within Jurisdiction's boundaries. Although this is a public document, specific procedures and information are of a sensitive nature and personal information may be edited out of publicly available versions. The full document is subject to restricted-use handling procedures.

1.2 Scope

This Jurisdiction, as an independent jurisdiction, has responsibility for _____within its jurisdictional boundaries. While the Jurisdiction will work with, and assist if possible, the local agencies(s) responsible for other public safety functions within the Jurisdiction, this Jurisdiction emergency operations plan only contains detailed procedures for meeting Jurisdiction emergency responsibilities. The manner of interacting with other agencies is described, but the operational plans of other agencies with public safety responsibilities within the area protected by Jurisdiction levees are only referenced in this document.

This plan will cover in detail the following:

- Jurisdiction's Flood Preparedness Procedures
- Jurisdiction's Levee Patrol Procedures
- Jurisdiction's Flood Fight Procedures
- Jurisdiction's Flood Water Removal Procedures
- Jurisdiction's Recovery and After-Action Follow up Procedures

1.3 Plan Structure

This Flood Safety Plan is structured as a traditional functional emergency operations plan in accordance with Comprehensive Preparedness Guide (CPG) 101 v. 2.0 issued by the Federal Emergency Management Agency (FEMA). Consistent with that guidance, and a Levee Maintaining Jurisdiction's limited responsibilities and lack of internal departments, this emergency operations plan consists of this Basic Plan, containing general Jurisdiction response procedures, and one hazard-specific Annex A – Flood Contingency Map, containing the Jurisdiction's detailed flood fight plan. This Annex A is in map format and is also called the "flood contingency map" in reference and guidance documents.

SECTION 2 - CONCEPT OF OPERATIONS

2.1 Situation Overview

[*Insert brief description of type of flooding threat (e.g. tidal and/or riverine), that creates high water conditions affecting Levee Maintaining Jurisdiction (Jurisdiction). Describe significant characteristics of waterways that face* Jurisdiction *levees; average fetch and channel width, any important obstructions and sand berms, etc. Describe levees as to certification status, height, crown, crown surface, and notable characteristics. Describe population within the* Jurisdiction *and critical infrastructure.*]

2.2. General Approach to Seasonal Flood Operations

Jurisdiction staff will carry out routine preparedness activities at the beginning of flood season as described in this section. Annex A of this plan describes the concept of operations and protocols for Jurisdiction flood fight activities. **Section 3, Organization and Responsibilities**, of this document describes authorities and responsibilities for performing both routine and emergency activities.

2.2.1 Routine Preparedness and Infrastructure Maintenance

Jurisdiction staff perform the following routine flood preparedness actions:

1. Inspect levees in accordance with Jurisdiction operations & maintenance (O&M) manual
2. Vegetation and rodent control per Jurisdiction O&M manual
3. Inspect and inventory of Jurisdiction flood fight supplies
4. Inspect access gates, irrigation and drainage gates and levee penetrations as necessary, per Jurisdiction O&M procedures
5. Provide annual employee training in accordance with training policy **(see Attachment 1)**
6. Conduct semi-annual joint inspections of levees with State inspectors
7. Conduct periodic joint inspections of levees with Federal inspectors

The Jurisdiction operations & maintenance manual is available for review in separate documents.

2.2.2 Monitoring and Analysis

The Jurisdiction will monitor and analyze throughout the flood season the water conditions, elevations, and forecasts for waterways affecting Jurisdiction levees for the purpose of promptly identifying heightened threats to the integrity of its levee and drainage systems. The objective of this monitoring effort is to identify objective conditions that warrant additional actions beyond routine flood season preparedness activities.

<u>Datum</u>

All elevations in this plan or displayed on the Annex A flood contingency maps will use the NAVD88 datum (North American Vertical Datum, 1988).

Primary Monitoring Gauge

The Jurisdiction is responsible for conducting this monitoring process to identify when triggers for taking additional action beyond routine flood preparedness are reached as described in **Section 2.2.3**. The Jurisdiction will use the following gauges and information sources in its monitoring effort.

Name of Gauge(s) -

Designations (if any)	Elevation (NAVD88)
Monitor	
Flood	
Danger	

Secondary Monitoring Gauges and Information Sources

List other gauges

2.2.3 Alerting, Activation, and Initial Response

Gauges and information sources previously identified will be monitored to detect the following objective conditions which will trigger the response actions shown below. These, and additional actions as directed by Jurisdiction trustees, may be taken by Jurisdiction staff at any time it is felt that conditions affecting the levees and drainage system warrant such action.

In addition to monitoring river stages, the following conditions should also be monitored since they could exacerbate the threat to levee integrity and/or increase level of alertness. These conditions can include:

- High Winds (> 20 mph);
- Rapid Rise in River condition;
- High Tide Condition;
- Low Barometric Pressure Conditions;
- Anticipated Dam Releases; and
- Snowpack Conditions (anticipated runoff).

The following conditions and respective required actions are hereby established:

Table 2. Trigger Elevations and Response Actions		
Condition	**Action(s)**	**Action Taken? Yes/No If No, Explain**
THREAT TO LEVEE INTEGRITY		
Identification, or verified report, of any out of the ordinary condition on the Jurisdiction levee system that presents a potential risk of levee failure *Upslope Levee Failure*	1. Jurisdiction President notifies Jurisdiction Board and Jurisdiction Engineer. A Delegation of Authority Letter is issued confirming Jurisdiction _____Incident Commander. 2. Jurisdiction Incident Commander activates Jurisdiction personnel and arranges safety/staking and SEMS/NIMS review. 3. Jurisdiction Incident Commander activates Jurisdiction response facilities and resources per Annex A and assigns response functions as needed in accordance with Incident Command System (ICS) protocols. 4. Incident Commander mobilizes Prepositioned Equipment at relief cut sites to be on standby, as shown on the Annex A – Flood Contingency Map. 5. Jurisdiction Incident Commander initiates action to prevent levee failure and restore levee condition. 6. Jurisdiction Incident Commander contacts _____ County Office of Emergency Services and confers on the advisability of a proclamation of local emergency, if not already issued. 7. Jurisdiction Incident Commander notifies the State/Federal Flood Operations Center. 8. Jurisdiction considers executing Emergency Resolution (Attachment 4) or Notification of Emergency (Attachment 5), if not already. 1. Execute Relief Cut in Accordance with Preliminary Engineering Designs (PEDs)	

LEVEL I – MONITOR STAGE		
___ft @_____ *(Example 33.5 ft @ Fremont Weir (FRE)*	1. Jurisdiction Appointee notifies Jurisdiction Board that monitor stage has been reached. 2. Jurisdiction Appointee activates Jurisdiction staff and arranges safety/staking and SEMS/NIMS review and orders double check of inventories. 3. Jurisdiction Appointee initiates twice a day levee patrols in accordance with Jurisdiction patrol plan. 4. Jurisdiction Appointee mobilizes resources to maintain one truck loaded with flood fight materials 5. Jurisdiction Appointee notifies _____ County OES that Jurisdiction monitor stage has been reached.	

LEVEL II – FLOOD STAGE		
___?ft @_____	1. Jurisdiction Appointee notifies Board of Jurisdiction that flood stage has been reached. 2. Jurisdiction Appointee initiates four levee patrols per day (every 6 hours) in accordance with Jurisdiction patrol plan. 3. Jurisdiction Appointee contacts _____ County OES to coordinate a proclamation of local emergency if not already done. 4. Jurisdiction Appointee notifies _____ Fire Protection Jurisdiction that Flood Stage has been reached and known or anticipated levee problems; Fire Jurisdiction and _____ County OES consider releasing a public safety advisory. 5. Incident Commander mobilizes Preposition Equipment at relief cut sites to be on standby, as shown on the Annex A – Flood Contingency Map.	

LEVEL III – DANGER STAGE

____ft @_____	1. Jurisdiction Appointee notifies Board of Jurisdiction and a Delegation of Authority Letter is issued appointing or confirming Jurisdiction Incident Commander. 2. Jurisdiction Incident Commander activates incident command facilities as shown on Annex A flood contingency map and _____Unified Flood Fight Command protocols including 24-hour staffing of Jurisdiction field command post. 3. Jurisdiction Patrol Group Supervisor initiates 24-hour continual levee patrols in accordance with Jurisdiction patrol plan 4. Jurisdiction Incident Commander contacts _____ County OES and coordinates a proclamation of local emergency if not already done. 5. Jurisdiction Incident Commander notifies _____ Fire Protection Jurisdiction of Danger stage.	

2.3 Public Alert and Warning

The agencies identified below have the responsibility for providing emergency services to the general public within Reclamation Jurisdiction _____. The Jurisdiction will promptly notify these agencies of identified concerns with their levees or internal drainage system in accordance with the _____Unified Flood Fight Command protocols and will provide detailed information on the characteristics of the threat.

- _____ County Office of Emergency Services
- _____ County Sheriff's Department
- _____ County Fire Protection Jurisdiction
- Others

The Jurisdiction will coordinate operations with these agencies through the _____ Unified Flood Fight Command. Response procedures for above public safety agencies will be found in agency emergency plans, _____ and Emergency Operations Plans, and _____Unified Flood Fight Command protocols.

2.4 Flood Fight Operations

Flood fight operations, including levee patrol, will be conducted in accordance with the procedures in this Basic Plan and those shown on Annex A. Annex A displays the Jurisdiction's concept of operations for emergency communications, patrol, flood fight, and dewatering operations. This concept of operations will be modified as needed to meet the demands of actual emergency conditions. Plans of other agencies with responsibility for warning and evacuation within the Jurisdiction are referenced on Annex A as well as in this plan.

2.5 Federal and State Disaster Assistance

The policy of the Jurisdiction is to maintain mitigation and emergency plans and procedures, and the physical condition of its levees at the level required to be eligible for disaster assistance under the federal Stafford Act and PL84-99 program and the California Disaster Assistance Act. Emergency operations will be conducted and documented in compliance with conditions of those programs for reimbursement of disaster expenses. Jurisdiction has assigned its Jurisdiction Secretary/Book Keeper to maintain documentation during an emergency necessary for receipt of such assistance.

To ensure that the Jurisdiction takes steps to quickly access the recovery process, these actions should be considered if an incident is imminent or occurring:

- PL-84-99:
    - Pre-develop a USACE PL84-99 request letter on Jurisdiction letterhead
    - Contact DWR Flood Operations Center
    - Follow-up call to USACE Jurisdiction office that a request was made to DWR
    - Notify County of PL84-99 request, send copy of written request

- State and other Federal programs:
    - Request _____ County to Proclaim the Existence of a Local Emergency
    - Notify Jurisdiction administration when the Proclamation is established

SECTION 3 - ORGANIZATION AND ASSIGNMENT OF RESPONSIBILITIES

3.1 Organization

The Jurisdiction will use its paid, contract, and volunteer staff as shown below to perform its responsibilities in a flood emergency.

Insert Organization Chart

Jurisdiction establishes through approval of this plan the additional job description and function of "Emergency Levee Worker" for the purpose of hiring, acquisition of volunteers, or re-assigning of Jurisdiction staff duties to support emergency operations. Volunteer emergency levee workers recruited through County Disaster Service Workers Program or emergency levee workers acquired directly through hire or re-assignment will work under the appropriate Jurisdiction Incident Commander.

3.2 Assignment of Responsibilities

The Jurisdiction has made the following assignments of authority and responsibility to ensure that needed emergency actions can be taken promptly and efficiently.

3.2.1 Make Legal and Financial Commitments on behalf of Jurisdiction

Normal purchasing and contract authorities remain in effect. Upon designation of a Jurisdiction Incident Commander in accordance with trigger conditions of **Section 2.2.3**, the following additional policy will be effective with those normal authorities:

Jurisdiction Emergency Procurement Policy
Upon appointment of a Jurisdiction Incident Commander in accordance with **Section 2.2.3**, the Jurisdiction Incident Commander is authorized to make necessary expenditures or contracts to correct threats to levee integrity upon consultation with the Board President or Vice President. The members of the Jurisdiction Board will be notified of such purchase or contract decisions as soon as practical and/or consistent with the needs of the emergency. The Jurisdiction Incident Commander shall follow the emergency procurement procedures shown in **Section 6.3**.

3.2.2 Represent Jurisdiction in _____ County Multi-Agency Coordination (MAC) Group

Assigned:_____

3.2.3 Provide Public Information

Assigned:_____

3.2.4 Maintain Emergency Equipment, Supplies, and Resources

Assigned:_____

3.2.5 Monitor Water Conditions, Elevations, and Forecasts
Assigned:_____

3.2.6 Activate and/or Direct Jurisdiction Staff during emergency operations
Assigned:_____

3.2.7 Document Expenditures, Emergency Actions, and Requests for Mutual Aid
Assigned:_____

SECTION 4 - DIRECTION, CONTROL, AND COORDINATION

4.1 Management and Control of Jurisdiction Operations and Coordination within Jurisdiction

Jurisdiction staff authorized and responsible for carrying out the actions outlined in **Section 3, Organization and Responsibilities** will use the direction, control, and coordination facilities and processes described in this section. Communications and logistics systems for command, coordination, and response are described in **Sections 5 and 6**.

Jurisdiction staff will use the National Incident Management System (NIMS), and the Standardized Emergency Management System (SEMS), to organize Jurisdiction response activities. Jurisdiction staff will comply with the procedures of any established field Unified Flood Fight Command to which the Jurisdiction is assigned, the Multi-Agency Coordination System (MACS), or any other "as needed" command structure put in place by local officials purposes of inter-agency coordination.

4.1.1. Management and Policy

The Jurisdiction shall maintain direction and control of Jurisdiction operations during emergency periods. The Jurisdiction Board shall meet and confer as deemed necessary by the Jurisdiction Management during emergency operations to perform their policy making and financial responsibilities during emergency response operations. Jurisdiction meetings will occur in the field or if needed at the office of the Jurisdiction.

Jurisdiction will issue a Delegation of Authority letter **(see Attachment 2)** upon reaching the trigger condition indicated in **Section 2.2.3**.

4.1.2 Jurisdiction Incident Command

The Jurisdiction will appoint one Incident Commander to manage all threats to levee integrity or containment actions on its levee system as an *Incident Complex* during any single flood event as allowed and defined in NIMS protocols. The Jurisdiction will operate on a 24-hour operational period and issue an Incident Action Plan (written or verbal) outlining Jurisdiction response objectives at the beginning of each operational period.

Jurisdiction Incident Commander Protocol

The Jurisdiction Board authorize, through the approval of this plan, the Jurisdiction Appointee to assume the position of Jurisdiction Incident Commander in accordance with the trigger conditions of **Section 2.2.3**. In that case, the Jurisdiction Appointee will complete and distribute the modified Delegation of Authority Letter **(see Attachment 2)** to Jurisdiction staff and [*NAME*] Unified Flood Fight Command members. The Jurisdiction Appointee is furthermore authorized to transfer the Jurisdiction Incident Command function to another staff member if appropriate through issuance of a Delegation of Authority Letter which will also be distributed to Jurisdiction staff and [*NAME*] Unified Flood Fight Command members.

4.1.3 Incident Command Facilities

Jurisdiction field command post, upon activation, will be located at:

- Location Adress:_____

Other incident command facilities (e.g., staging areas, heliports) for Jurisdiction are as shown in Annex A.

4.2 Management and Coordination with Other Jurisdictions

The Jurisdiction Appointee will ensure that proper management and coordination is maintained with the following:

- Other public agencies and jurisdictions operating within the Jurisdiction
- Neighboring Levee Maintaining or Reclamation Jurisdictions
- _____ County EOC

The following procedures will be followed to accomplish this function.

4.2.1 Unified Flood Fight Command

_____ County [or Counties] has [have] established a pre-planned unified flood fight command to facilitate coordination and mutual aid between neighboring levee maintaining agencies and supporting city/county/fire Jurisdiction, state, and federal agencies. Regional Levee Maintaining Jurisdictions participate in the assigned unified flood fight command to coordinate the development and implementation of joint flood response incident action plans. Unified situation assessment, resources, and tactical planning of multi-agency flood fight activities will take place within the operational protocols of the unified commands.

The Jurisdiction will participate in the _____ Unified Flood Fight Command. Refer to _____ Unified Flood Fight Command Map for additional details on the activation and operation of this unified command.

4.2.2 County Emergency Operations Center (EOC)

The County of _____ maintains and hosts the emergency operations center (EOC) at [*ADDRESS OF EMERGENCY OPERATIONS CENTER*] The EOC will prioritize allocation of resources including mutual aid, perform information sharing, and conduct coordination processes in accordance with the multi-agency coordination system (MACS) procedures maintained by both[NAME OF COUNTY] OES.

The County's or EOC's Planning/Intelligence Section will provide disaster intelligence and situational status to participating jurisdictions upon activation in an emergency. This Levee Maintaining Jurisdiction will participate in this disaster intelligence and information sharing process. See relevant County or relevant plans and procedures.

The Levee Maintaining Jurisdiction will communicate with the EOC through cellular telephones or physical participation in EOC management meetings. In addition, the Jurisdiction will communicate with the EOC through the established [*NAME*] Unified Flood Fight Command.

4.2.3 State-Federal Flood Operations Center

The State has special authority to assist Jurisdiction with flood fight operations. The State maintains the State-Federal Flood Operations Center (FOC) to perform these functions and support the operations of other State and Federal agencies. The Jurisdiction will maintain communications with the FOC in order to receive and provide information with that facility and to request technical assistance.

The Jurisdiction will communicate with the State-Federal Flood Operations Center through cellular telephones, internet email, or physical participation in [*NAME*] Unified Flood Fight Command or through the [*NAME*] EOC when State and federal representatives are present.

4.2.4 Joint Information Center

Public Information to the general public will also be coordinated, planned, and carried out through the [*JURISDICTION NAME*] Public Information Officer (PIO) or Joint Information Centers (JIC) if activated. The Jurisdiction will assist with risk communication as requested by partner agencies. See relevant_____ County plans and procedures for additional information.

The Jurisdiction will provide an information officer as requested who will have authority to approve information releases. The Jurisdiction information officer will identify the location and schedule of the JIC if established from the County PIO at the beginning of the flood event

SECTION 5 - COMMUNICATIONS

5.1 Communications Organization

The Jurisdiction will maintain adequate communications equipment to implement this emergency plan. This section identifies equipment and/or systems available for communications:

1. Between Jurisdiction staff, contractors, and other staff working under Jurisdiction supervision
2. With other public agencies operating within the Jurisdiction
3. With neighboring Jurisdictions
4. With the _____ County EOC
5. With the State Flood Operations Center

5.2 Jurisdiction Internal Communications

The Jurisdiction will maintain adequate communications equipment to communicate internally with personnel and volunteers in order to implement this emergency plan. This section identifies equipment and/or systems available for communications with outside agencies:
Communication: _____

5.3 Communications with Other Jurisdictions

Communications will be by cellular phone or internet email, unless Jurisdiction is issued radios by another jurisdiction or through a request to the appropriate County EOC.

5.3.1 _____ EOC

Cellular telephones, internet email, and physical participation in management meetings.

5.3.2 State-Federal Flood Operations Center

Cellular telephones, internet email

SECTION 6 - LOGISTICS AND FINANCE/ADMINISTRATION

6.1 Mutual Aid

The Jurisdiction is a member of the [*STATE*]Master Mutual Aid Agreement by virtue of being located within _____ County who is a signatory to that agreement and will follow the processes outlined in those documents for requesting and providing mutual aid through standard and established protocols. Additional requests for support outside of the established Mutual Aid systems such as requests for technical assistance and services, flood fight crews, supplies and materials, and other resources will be made through the _____ Unified Flood fight Command to _____ EOC as appropriate. See _____ County plans and procedures for additional information.

6.2 Resources

See Attachment 3 for Jurisdiction pre-event inventories and stockpiles of flood fight resources and location(s) where they are stored during pre-event period.

6.3 Procurement

In the event of the issuance of a proclamation of local emergency by _____ County, or issuance of an emergency resolution by the Jurisdiction Board, the following emergency procurement procedures will be followed by Jurisdiction _____:

Jurisdiction will maintain standard forms for initiating and executing emergency contracts and purchase orders with private vendors. Jurisdiction will maintain a standard form for emergency contracts under $_____ issued in a less formal bid-environment, i.e. two to three telephone bids, and a separate contract form for contracts over $_____ adding a bonding requirement. Contracts over $_____ will be awarded through a formal bid process if practicable in light of emergency conditions.

Jurisdiction staff will establish a separate filing system for expenditures or financial documents pertaining to responding to the emergency. The filing system will be organized by date and vendor. All contracts, purchase orders, invoices, and payment documentation will be notated with the levee site(s) where the services or materials acquired were used. The office staff maintaining this filing system will verify this location cross reference with the Jurisdiction Incident Commander each morning when the Jurisdiction Incident Action Plan (IAP) is issued.

6.4 Logistics Facilities

See Annex A for locations of pre-planned delivery points, locations of Jurisdiction supplies, and Jurisdiction supply staging areas and other logistics facilities.

6.5 Finance and Administration

The Jurisdiction will maintain financial and administrative records associated with emergency response in accordance with *44 C.F.R. Part 13--Uniform Administrative Requirements for Grants and Cooperative Agreements to State and Local Governments*. Emergency construction records, including field reports, procurement and construction management files will be maintained by both the Jurisdiction and the Jurisdiction Engineer. Jurisdiction will maintain a safety plan for employees and work rules as appropriate.

Normal Jurisdiction work rules and financial procedures will remain in effect during the emergency period except where modified or supplemented by procedures in this plan or issued by the Jurisdiction Board at the time of the emergency.

The Jurisdiction [*POSITION WITH JURISDICTION (e.g., secretary, president, etc.)]* will maintain and ensure compliance with Jurisdiction financial and administrative procedures during an emergency period to include compliance with any special procedures that may be appropriate to emergency operations and in accord with Board policies.

SECTION 7 - PLAN DEVELOPMENT AND MAINTENANCE

7.1 Plan Development and Maintenance

The Jurisdiction Board is responsible for overseeing the development of this [*NAME OF JURISDICTION*] Flood Safety Plan. The Jurisdiction Appointee is responsible for performing an annual review of this plan to determine the need for revisions or updates and issue authorized to approve routine updates and revisions.

The Jurisdiction Board will approve this plan when initially completed and will formally review and re-approve the Emergency Operations Plan and Annex A at least every three years.

7.2 Training and Exercises

The Jurisdiction will comply with the [*Name of County Adopted Training Program(s)]* to ensure effective implementation of this emergency operations plan and to meet minimum federal and state requirements for disaster reimbursement. All Jurisdiction training will comply with the National Incident Management System (NIMS) and the Standardized Emergency Management System (SEMS).

All Jurisdiction Board members, employees, and volunteers who have emergency assignments or who are assigned to the "emergency levee worker" job function will receive NIMS/SEMS training in accordance with the Jurisdiction Training Policy shown in Attachment 1. In addition, Jurisdiction employees will receive training on the following subjects.

- Jurisdiction Flood Safety Plan (EOP – Basic Plan and Annex A – Flood Contingency Map)
- State Flood Fight Methods

Jurisdiction staff will participate in internal exercises and exercises sponsored by the _____ County or other local or state agencies.

7.3 Plan Evaluation

The Jurisdiction Appointee will participate in the preparation of a written after-action report with the County after any emergency affecting Jurisdiction levees where a proclamation of local emergency was issued or an emergency resolution by the Jurisdiction Board. The Jurisdiction Board will review the after-action report which will briefly describe Jurisdiction operations, any response problems that arose, and damage sustained by the Jurisdiction. The after-action report will also contain recommendations for improving flood emergency operations in the future. The Jurisdiction Board will provide direction to Jurisdiction staff as to the preparation of changes, additions, or revisions to the Jurisdiction flood safety plan.

SECTION 8 - AUTHORITIES AND REFERENCES

Federal

Federal Civil Defense Act of 1950 (Public Law 920, as amended)

Robert T Stafford Disaster Relief and Emergency Assistance Act of 1988 (Public Law 93-288, as amended)

Comprehensive Preparedness Guidance (CPG) 101 v. 2.0

State

List

State of California, Emergency Plan, July 2009

California Emergency Services Act (as amended), 1970

Local

_____ County Hazard Mitigation Plan

_____ County Emergency Operations Plan

ATTACHMENT 1: EMERGENCY RESPONSE/TRAINING POLICY

Jurisdiction
Emergency Response and Training Policy

The Jurisdiction hereby adopt the National Incident Management System (NIMS) for organizing emergency response activities. The Jurisdiction further establish the following emergency response and training policies compliant with that system and the Standardized Emergency Management System (SEMS).

Emergency Response

In an emergency, the Jurisdiction Board is responsible for determining general response policy and performing financial oversight. The Jurisdiction Appointee, or Jurisdiction Incident Commander if appointed, are responsible for organizing Jurisdiction response activities, supervising any hired staff or contractors working for the Jurisdiction, and for coordinating with outside agencies. The Jurisdiction hereby establishes the position of Emergency Levee Worker for purposes of hiring or re-assigning staff or recruiting volunteers at the time of the emergency for levee patrol and basic flood fight duties.

National Incident Management System Training Guidance

In regard to meeting national and State training requirements, the Jurisdiction will comply with the provisions of the National Incident Management System Training Program Manual, September 2011 and any subsequent revisions to that document. The Jurisdiction will also comply with any State Emergency Management System training requirements.

The NIMS Training Program Manual indicates that federal training guidance is not absolute and that organizations should tailor their training to the level of incident complexity that their staff would potentially manage. After careful review of the definitions of incident complexity levels shown on Page 16 of the NIMS Training Program Manual, this Jurisdiction has determined that Jurisdiction responsibilities to patrol its levees and respond to threats to levee structural integrity would require Jurisdiction staff to manage Type 4 incidents. Jurisdiction training requirements outlined below meet NIMS training recommendations for Type 4 incidents (pages 17 and 18, NIMS Training Program Manual, September 2011) and SEMS training requirements.

Jurisdiction Training Requirements

The Board of Trustees hereby establishes the following training requirements for Jurisdiction staff involved in flood emergency operations.

Members of the Board of Trustees and Jurisdiction Appointee shall complete the _____ County Emergency Management Training.

Staff hired or transferred to serve as Emergency Levee Workers at the time of an emergency shall receive a 2-hour Emergency Levee Worker Safety, Procedures, and Incident Management Course (ELW-1) that will include a summary of the SEMS Introduction, IS-100, IS-200, and IS-700 courses and levee monitoring procedures and safety information for their emergency duties prior to

beginning work. In addition, such staff will receive tailgate safety briefings for specific, complex emergency work that they may be called upon to perform.

Individuals appointed as Jurisdiction Incident Commander and Deputy Incident Commander at the time of the emergency shall have completed, at a minimum, the SEMS Introduction, ICS-100 Introduction to the Incident Command System, ICS-200 ICS for Single Resources and Initial Action Incidents, and IS-700 NIMS An Introduction courses to meet Type 4 incident management requirements. If neither individual has completed those courses prior to this assignment, then both individuals will complete the Emergency Levee Worker Safety, Procedures, and Incident Management Course (ELW-1) and the additional Incident Commander Module (ELW-IC) upon receipt of flood warning.

This policy was hereby approved by the Board of Trustees on _____.

By: _____
President, Reclamation Jurisdiction _____

ATTACHMENT 2: DELEGATION OF AUTHORITY LETTER

Jurisdiction _____

Delegation of Authority Letter

As of _____ hrs, _____, I have delegated/assumed the authority and responsibility for the
(Time) (Date) (circle one)

complete management of the Jurisdiction _____ Incident to
_____
(Name of Incident)

_____ acting as Jurisdiction Incident Commander and Deputy
(Name of Individuals if other than Jurisdiction Manager)

Incident Commander respectively.

Instructions

The Incident Commander is accountable to the Jurisdiction Board for the overall management of this incident including control of all Jurisdiction staff and contractors. Incident commander will adhere to relevant and applicable laws, policies, and professional standards.

General considerations for management of the incident are:

1. Provide for safety of Jurisdiction staff.
2. Keep the Board and Board Secretary informed of key actions, and the situation.
3. Comply with the Joint Jurisdiction Flood Safety Plan and document conditions requiring its modification

Specific directions and clarifications of authority for this incident are:

1.
2.
3.
4.

By: _____
(Title)

_____
Date

ATTACHMENT 3: JURISDICTION FLOOD FIGHT SUPPLY INVENTORY

ATTACHMENT 4: RESOLUTION TEMPLATE

RESOLUTION OF THE *JURISDICTION OF ___*

RESOLUTION No. ___

Upon special notice to and consent by the Jurisdiction Board Jurisdiction ____, of the County of ____, State of ____, an emergency meeting of the Jurisdiction Board was held at the Jurisdiction offices at **[LOCATION]** on **[DAY and DATE**] at **[TIME].** The Board agrees that an emergency situation exists which requires immediate action by the Jurisdiction

[DESCRIPTION OF EMERGENCY EVENT, JUSTIFICATION]

EMERGENCY DECLARATION

WHEREAS, the Jurisdiction Board have considered the condition of the Jurisdiction's Levees and the potential risk of general operation at the expense of public safety and agricultural production; and

WHEREAS, the Jurisdiction Board have noted that the__(*area, river system*)____ is and will continue to experience high water levels resulting from heavy rainfalls and runoff, and high winds; and

WHEREAS, the Jurisdiction is experiencing **[DESCRIPTION OF EMERGENCY EVENT]**; and

WHEREAS, after consultation with the Jurisdiction staff and engineers after a visual assessment of the condition of the Jurisdiction's levees on **[DATE(S) and TIME(S)],** the Jurisdiction finds and declares on **[DATE]** that an emergency situation exists and that all necessary and required work to protect the Jurisdiction and the Jurisdiction's levees should be completed at the earliest possible date.

NOW, THEREFORE, BE IT RESOLVED AND ORDERED by the Jurisdiction Board as follows:

1. As of **[DATE]** an emergency situation exists within the Jurisdiction and along the Jurisdiction's levees, which requires the Jurisdiction to proceed immediately with the work to prevent the possible flooding of the Jurisdiction, and failure to its levees at the earliest possible time.

2. That the Jurisdiction President, and/or staff be hereby authorized and directed to acquire such materials and equipment and to enter into contracts necessary and appropriate to meet the emergency needs of the Jurisdiction in accordance with the Grimes Basin Flood Safety Plan.

CERTIFICATION

I, _____, President and Board member of Jurisdiction _____ (Jurisdiction) do hereby certify that the above is a true and correct copy of the resolution which the Board of Trustees of the Jurisdiction unanimously adopted on **[DATE].**

Executed on _____, in _____, *State*.

_____
Jurisdiction President

ATTACHMENT 5: REGULATORY NOTIFICATION TEMPLATE

Jurisdiction Letterhead
EMERGENCY NOTIFICATION

DATE: _____

TO: _____, State *Agency*

_____, President, Jurisdiction Board

FROM: _____, Jurisdiction _____,

SUBJECT: Jurisdiction _____ Emergency Notification Request for Regulatory Coordination Support

Jurisdiction _____ is preparing to respond to an eminent emergency situation. Depending on changes in weather and river conditions, the Jurisdiction shall determine that there is an emergency situation that may threaten the Jurisdiction's ability to provide flood protection to the public. The Jurisdiction is formally requesting the support of the State to support the Jurisdiction efforts by assisting with notification of all required regulatory agencies to satisfy state and federal notification requirements. It is the intent of the Jurisdiction to prepare for and flood fight any and all incidents that may arise during this pending emergency situation.

This Notification that is being requested by the Jurisdiction should satisfy the regulatory agencies request to be provided sufficient time to respond to the pending actions. Depending on conditions, and willingness of the responding regulatory agencies, representatives may be able to access the Jurisdiction levees along with the Jurisdiction Incident Commander or representative to assess the flood fight preparations or ongoing flood fight activities. Representatives of these agencies must be properly equipped with suitable supplies and equipment to be prepared for on-site conditions. Please contact the Jurisdiction Incident Commander immediately for any information at _____ or _____.

Regards,

_____
_____, Jurisdiction President
_____

ATTACHMENT 6: EMERGENCY AUTHORITIES RESOLUTION

JURISDICTION NO.

RESOLUTION 20_-02

**A RESOLUTION OF THE BOARD OF JURISDICTION _____
SETTING PRIORITIES FOR
DECISION MAKING AUTHORITY IN EVENT OF EMERGENCY**

WHEREAS, in the event any or all Jurisdiction Board Members are not available, and an emergency action requires that authority be exercised, there is a need to establish a chain of command for such emergency decision making authority;

WHEREAS, pursuant to State Contract Code, Jurisdiction may take action to negotiate and award a contract for construction of work to prevent damage or repair damaged works, and procure necessary equipment, services, and supplies, without advertising for bids and expend any sum reasonably required in an emergency; and

WHEREAS, such action either requires a _ _ majority of the Board, and/or such authority may be delegated to an appropriate person or persons;

WHEREAS, the Board desires to delegate such authority as set forth in this Resolution.

NOW, THEREFORE, BE IT RESOLVED, AND IT IS HEREBY RESOLVED BY THE BOARD OF JURISDICTION _____ AS FOLLOWS:

1. In the unavailability either in person or telephone of a majority of the Board of Trustees, emergency decision-making authority relative to emergencies may be exercised by the following persons in the order of priority listed.

    a. The President of the Board o;

    b. Any single Board Member;

    c. Jurisdiction Appointees, who are presently _____:

    Name_____
    Day Phone: ( )
    Mobile Phone: ( )
    Home Phone: ( )

2. Such emergency decision-making authority includes the following powers:

    a. In case of emergency, the person designated above as the emergency decision-maker may negotiate and award a contract for construction of work to prevent damage or repair damaged works, and procure necessary equipment, services, and supplies, and take any directly related and immediate action required by that emergency, without advertising for bids, and expend any sum reasonably necessary to cure the emergency.

    b. The emergency decision-maker shall, if practicable, informally solicit bids or request for proposals to seek to obtain the best terms possible, including the lowest price term, given the urgent circumstances of the emergency, and, promptly after the emergency ends, shall document the circumstances of the emergency and the bid or proposal accepted.

    c. The emergency decision-maker shall report to the Board the reasons justifying why the emergency did not permit a delay resulting from a competitive solicitation for bids and why the action was necessary to respond to the emergency. Such report shall be made at the next regular meeting of the Jurisdiction, if such meeting occurs within 14 days of the emergency, or if no such meeting will occur within 14 days, the decision-maker shall call a special meeting of the Board of Trustees within 7 days after the emergency, and make such report at that time, and, for this purpose only, shall have the power to call such meeting.

3. For the purpose of this Resolution, "emergency" is defined as an imminent threat to public health, safety, or welfare or an imminent threat to the flood control or drainage facilities of Jurisdiction _____, or an imminent threat of flooding of Jurisdiction _____, and action is necessary to respond to such threat, and the imminence of such is that it will not permit a delay resulting from a competitive solicitation of bids.

4. All previous resolutions relating to the subject of this resolution are repealed.

PASSED AND ADOPTED this ____ day of _____, 20___, by the following vote, TO WIT:

Appendix E2
Sample Cost Sheets

Levee Incident Tracking Sheet

Create an entry for each incident occurring on the levee system that is a distinct geographically defined problem area. Complete a cost tracking sheet for each incident to record resources used to remediate the problem.

Name of Levee Maintaining Agency:	Name/Designator for Flood Event: (Obtain from your Operational Area)

Entry #__:

Incident Name:	Incident Tracking No:	Date/Time Problem Identified:
Incident Location (e.g. Stationing, Levee Miles):		Incident Location (Lat/Long):

Description of Problem (Include type, dimensions, cause if known, rate of progression, method of discovery, etc.):

Entry #__:

Incident Name:	Incident Tracking No:	Date/Time Problem Identified:
Incident Location (e.g. Stationing, Levee Miles):		Incident Location (Lat/Long):

Description of Problem (Include type, dimensions, cause if known, rate of progression, etc.):

Entry #__:

Incident Name:	Incident Tracking No:	Date/Time Problem Identified:
Incident Location (e.g. Stationing, Levee Miles):		Incident Location (Lat/Long):

Description of Problem (Include type, dimensions, cause if known, rate of progression, etc.):

Entry #__:

Incident Name:	Incident Tracking No:	Date/Time Problem Identified:
Incident Location (e.g. Stationing, Levee Miles):		Incident Location (Lat/Long):

Description of Problem (Include type, dimensions, cause if known, rate of progression, etc.):

Sheet #_____ Person Completing:

Levee Incident Cost Tracking Sheet

Complete one form for each incident listed on Incident Tracking Sheet. Use continuation pages as needed.

Incident Name:	Incident Tracking Number:	Date/Time Work Started:
Description of Remedial Work Performed:		Location (Lat/Long):
		Enter hours worked/used. Day 1 is from date/time work started to midnight, then midnight to midnight

	#	Name/Crew #	Organization	Status (e.g. staff, volunteer)	Source for Cost/Employment Conditions (Contract#; Mutual Aid #; etc.)	Day 1	Day 2	Day 3	Day 4
Personnel (District, Direct Hire, M.A.)	1								
	2								
	3								
	4								
	5								
	6								

	#	Type and Identifier	Owner	Method of Acquisition	Source for Cost/Specifications (Contract#; PO#; Mutual Aid #; etc.)	Day 1	Day 2	Day 3	Day 4
Equipment (District, Rental, M.A.)	1								
	2								
	3								
	4								
	5								

	#	Description	Source/Vendor	Method of Acquisition	Source for Cost/Specifications (Contract#; PO#; Mutual Aid #; etc.)	Amt Used on Day 1	Amt Used on Day 2	Amt Used on Day 3	Amt Used on Day 4
Material (Direct Purchase)	1								
	2								
	3								
	4								

	#	Name of Company	Bids Solicited (Y/N)	Contract#/PO#	Contract Tasks (e.g. "All Remedial Work"; "Provide Material")	Day 1	Day 2	Day 3	Day 4
Contractor	1								
	2								
	3								
	4								

Individual Completing: Date/Time Submitted: Sheet #:

Levee Incident Cost Tracking Sheet Continuation Page

□ Additional Days □ Additional Resources

Use page to either 1) add additional days of work for resources identified on initial Incident Cost Sheet (Carry over Item # and Name/Designator only); or 2) add additional resources used that could not be listed on initial Cost Sheet. DO NOT DO BOTH ON SAME SHEET

Incident Name:	Date/Time Work Started:	Location: (include Lat/Long)

Personnel (District or Mutual Aid)	#	Name/Crew #	Organization or Status (e.g. volunteer)	Method of Acquisition	Source for Cost/Employment Conditions (Contract#; Mutual Aid #; etc.)	Day ___	Day ___	Day ___	Day ___

Equipment (District, Rental, M.A.)	#	Type and Designator	Owner	Method of Acquisition	Source for Cost/Specifications (Contract#; PO#; Mutual Aid #; etc.)	Day ___	Day ___	Day ___	Day ___

Material (Direct Purchase)	#	Description	Source/Vendor	Method of Acquisition	Source for Cost/Specifications (Contract#; PO#; Mutual Aid #; etc.)	Day ___	Day ___	Day ___	Day ___

Contractor	#	Name of Company	Bids Solicited (Y/N)	Contract#/PO#	Contract Tasks (e.g. "All Remedial Work"; "Provide Material")	Day ___	Day ___	Day ___	Day ___

Individual Completing: Date/Time Submitted: Sheet #: Continuation from Sheet #:

Appendix E3
Sample Emergency Contract

Job Number ######
Contract Number ####-04-07-06-01
Reclamation District No. ####
Name

DOCUMENT 00####
EMERGENCY RENTAL CONTRACT

This agreement made and entered this 7th day of April, 2006 by and between Reclamation District No. ####, [NAME OF DISTRICT] hereinafter DISTRICT, and _____ Construction hereinafter CONTRACTOR.

For and in consideration of the payments hereinafter specified to be made by DISTRICT, CONTRACTOR agrees at its own proper cost and expense, to do and/or provide the following in accordance with work as directed by DISTRICT:

Perform equipment rental work in Walthall Slough Levee Emergency Relief Cut.

ITEM	DESCRIPTION	UNIT PRICE	TOTAL
1.	Move-in & Move-out	$_____ Each	$_____
2.	Standby Time (Good for 30 days)	No charge for seven (7) day period.	
3.	Weekdays Hourly Rate	$_____ per Hour	
4.	Saturdays Hourly Rate	$_____ per Hour	
5.	Sundays Hourly Rate	$_____ per Hour	

The total and final accepted price will be based upon the completed work items accepted at the unit prices specified.

CONTRACTOR shall be responsible for its own work, property and/or materials until completion and final acceptance of the work by the DISTRICT. In the event of loss or damage, it shall proceed promptly to make repairs or replacement of the damaged work, property and/or materials at its own expense, as directed by the DISTRICT. CONTRACTOR waives all rights CONTRACTOR might have against DISTRICT for loss of or damage to CONTRACTOR'S work, property or materials. Payment shall not be construed as a waiver of this or of any other terms of the Contract.

CONTRACTOR shall pay for all material, labor, taxes, insurance and other claims, liabilities, and obligations of any nature arising from any aspect of its work performed under this Contract, and shall furnish satisfactory evidence of such payments upon request of DISTRICT. CONTRACTOR agrees to indemnify, defend and hold harmless the DISTRICT from all suits, liens, or other claims of any nature arising from its failure to make such payments.

CONTRACTOR shall provide and maintain at all times during the performance the following insurance:

Insurance covering Public Liability, Property Damage, and Contractor's Contractual Liability arising out of or relating to CONTRACTOR'S performance hereunder (all including but not limited to work performance and operation of automobiles, trucks and other vehicles) in amounts of not less than $1,000,000 per occurrence, protecting CONTRACTOR and DISTRICT against liability for damages because of injuries (including death) and in an amount of not less than $1,000,000 per occurrence against liability for damages to property.

All insurance required hereunder shall be maintained in full force and effect in a company or companies satisfactory to DISTRICT, shall be maintained at CONTRACTOR'S expense until performance in full hereof and such insurance shall be subject to the requirement that DISTRICT must be notified by ten (10) days' written notice before cancellation of any such policy. In the event of threatened cancellation for non-payment of premium, DISTRICT may pay it for CONTRACTOR and deduct the same payment from amounts then or subsequently owing to CONTRACTOR hereunder.

Worker's Compensation insurance meeting the requirements of both the State of California and the Federal Longshoreman's and Harbor Worker's Act to the extent applicable.

CONTRACTOR shall furnish evidence of such insurance to DISTRICT.

CONTRACTOR specifically obligates itself to DISTRICT in the following respects (and this agreement is made upon such express condition), to wit:

CONTRACTOR shall be responsible for any liability imposed by law and for injuries to or death of any person including but not limited to workmen and the public, or damage to property resulting from defects or obstructions or from any cause whatsoever during the progress of the work or at any time before its completion and final acceptance.

CONTRACTOR shall indemnify and save harmless the DISTRICT and all officers and employees thereof connected with the work from all claims, suits or actions of every name, kind and description, brought for, or on account of, injuries to or death of any person including but not limited to workmen and the public, or damage to property resulting from the construction of the work or by or in consequence of any negligence in guarding the work, use of improper materials in construction of the work, or by account of any act or omission by CONTRACTOR or his agents during the progress of the work or at any time before its completion and final acceptance, except for matters arising from the sole negligence or willful misconduct of the DISTRICT.

CONTRACTOR shall be fully and exclusively responsible for and shall pay when due any and all applicable contributions, allowances or other payments or deductions, however termed, required by union labor agreements now or hereafter in force.

CONTRACTOR shall indemnify DISTRICT against, and save it harmless from any and all loss, damage, costs, expenses and attorney's fees suffered or incurred on account of any breach of the aforesaid obligations and covenants, and any other provisions or covenants of this Contract. At any time before final settlement or adjudication of any loss, damage, liability, claim, demand, suit or cause of action for which CONTRACTOR hereby agrees to indemnify and save DISTRICT harmless, DISTRICT may withhold from any payments due or to become due under this Contract the reasonable value thereof, as determined by DISTRICT, except for matters arising from the sole negligence or willful misconduct of the DISTRICT.

CONTRACTOR specifically agrees that it is, or prior to the start of work hereunder will become, a CONTRACTOR and an employing unit subject as an employer, to all applicable Unemployment Compensation Statutes.

CONTRACTOR further agrees as regards, (a) the production, purchase and sale, furnishing and delivering, pricing, and use or consumption of materials, supplies and equipment, (b) the hire, tenure or conditions of employment of employees and their hours of work and rates of and the payment of their wages, and (c) the keeping of records, making of reports, and the payment, collection, and/or deduction of Federal, State and Municipal taxes and contributions that CONTRACTOR will keep and have available all necessary records and make all payments, reports, collections, deductions, and otherwise do any and all things so as to fully comply with all Federal, State and Municipal laws, ordinances, regulations, and requirements in regard to any and all said matters insofar as they affect or involve the CONTRACTOR'S performance of this Contract, all so as to fully relieve DISTRICT from and protect it against any and all responsibility or liability therefor or in regard thereto.

In accordance with the provisions of Section 1770 et seq. of the Labor Code, CONTRACTOR shall conform to the general prevailing rate of per diem wages as determined by the Director of Industrial Relations. Copies of the prevailing rate of per diem wages are on file at the office of the State's Department of Industrial Relations, Division of Labor Standards, Bureau of Field Enforcement Office and will be made available upon request or may be obtained at www.dirca.gov/DLSR/statistics_research.html.

DISTRICT is implementing a Labor Compliance Program, which requires the filing of certified payrolls with the Labor Compliance Program designated compliance person. DISTRICT will provide CONTRACTOR with the address and requirement for submission. Attached hereto is as **Appendix A** is a checklist of labor law requirements. The requirements set forth therein are incorporated into the Contract as of set forth therein and shall in the event of inconsistency; supersede any other provisions in the contract.

It is the CONTRACTOR'S responsibility to comply with the provisions of Section 1776 of the Labor Code in regard to payroll records. Such payroll records shall be certified and shall be available for the inspection by the DISTRICT, any State or Federal agency involved in the financing of the work, and as otherwise required by law. Attached is a copy of Section 1776.

The CONTRACTOR shall be responsible for compliance with the requirements of Labor Code section 1777.5 pertaining to apprentices and all apprenticed occupations.

CONTRACTOR shall make travel and subsistence payments to each workman needed to execute the work, as such travel and subsistence payments are defined in the applicable collective bargaining agreements filed in accordance with Section 1773.8 of the Labor Code.

CONTRACTOR certifies that he is aware of the provisions of Section 3700 of the Labor Code which require every employer to be insured against liability for workmen's compensation or to undertake self-insurance in accordance with the provisions of that code, and that he will comply with such provisions before commencing the performance of the work of this Contract.

If CONTRACTOR should commence any proceeding under the Bankruptcy Act, or if CONTRACTOR be adjudged a bankrupt, or if CONTRACTOR should make any assignment for the benefit of creditors, or if a receiver should be appointed on account of CONTRACTOR'S insolvency, then the DISTRICT may, without prejudice to any other right or remedy, terminate the Contract and complete the work by giving notice to CONTRACTOR and his surety according to the provisions set forth herein. CONTRACTOR'S Surety shall have the right to complete the work by commencing work within 30 days as specified herein; and, in the event CONTRACTOR'S Surety fails to commence work within 30 days, DISTRICT shall have the right to complete, or cause completion of the work all as specified herein.

If CONTRACTOR should abandon the work under this Contract, or if the Contract or any portion of the Contract should be sublet or assigned without the consent of the DISTRICT, or if the ENGINEER should be of the opinion that the conditions of the Contract in respect to the rate of progress of the work are not

being fulfilled or any part thereof is unnecessarily delayed, or if CONTRACTOR should willfully violate or breach, or fail to execute in good faith, any of the terms or conditions of the Contract, or if CONTRACTOR should persistently refuse or fail to supply enough properly skilled labor or materials, or fail to make prompt payment to subcontractors for material or labor, or persistently disregard laws, ordinances or proper instruction or orders of the ENGINEER, then, notwithstanding any provision to the contrary herein, the DISTRICT may give CONTRACTOR and his Surety written notification to immediately correct the situation or the Contract shall be terminated.

In the event that such notice is given, and, in the event such situation is not corrected, or satisfactory arrangement for correction is not made, within 10 days form the date of such notice, the CONTRACTOR shall upon the expiration of said 10 days cease and terminate. In the event of any such termination, DISTRICT shall immediately serve notice thereof upon the Surety and CONTRACTOR; and the Surety shall have the right to take over and perform the Contract, provided, however, that if the Surety does not commence performance thereof within 30 days from the date of the mailing to such Surety of notice of termination, DISTRICT may take over the work and prosecute the same to completion by Contract, or otherwise, for the account and at the expense of CONTRACTOR, and his Surety shall be liable to DISTRICT for any excess cost occasioned DISTRICT thereby, as hereinafter set forth.

In the event DISTRICT completed the work, or causes the work to be completed, as aforesaid, no payment of any sum shall be made to CONTRACTOR until the work is complete. The cost of completing the work, including but not limited to, extra contract costs, the costs of DISTRICT forces, extra costs of administration and management incurred by DISTRICT, either direct or indirect, shall be deducted from any sum then due, or which becomes due, to CONTRACTOR from DISTRICT. If no sum sufficient to pay the difference between sums due to CONTRACTOR from DISTRICT and the cost of completing work, and there is a sum remaining due to CONTRACTOR after DISTRICT deducts the aforementioned costs of completing the work, the DISTRICT shall thereupon pay such sum to CONTRACTOR and his Surety.

No act by DISTRICT before the work is finally accepted including, but not limited to, exercise of other rights under the Contract, actions at law or in equity, extensions of time, payments, claims of liquidated damages, occupation or acceptance of any part of the work, waiver of any prior breach of the Contract or failure to take action pursuant to this paragraph upon the happening of any prior default or breach by CONTRACTOR shall be construed to be a waiver or to stop DISTRICT from acting pursuant to this paragraph upon any subsequent event, occurrence or failure by CONTRACTOR to fulfill the terms and conditions of the Contract. The rights of DISTRICT pursuant to this paragraph are cumulative and in addition to all other rights of DISTRICT pursuant to this Contract and at law or in equity.

Under California Government Code, Section 4215, “Responsibility of Public Agency”, the CONTRACTOR shall be compensated for the costs of locating, repairing damage not due to the failure of the CONTRACTOR to exercise reasonable care, and removing or relocating such utility facilities not indicated in the plans and specifications with reasonable accuracy, and for equipment on the project necessarily idled during such work. The CONTRACTOR shall not be assessed liquidated damages for delay in completion of the project, when such delay was caused by the failure of the public agency or the OWNER of the utility to provide for removal or relocation of such utility facilities.

Under California Government Code 6109, “Ineligible and debarred Subcontractors”, the CONTRACTOR is prohibited from performing work on a public works project with a Subcontractor who is ineligible to perform work on the public works project pursuant to Section 1777.1 or 1777.7 of the California Labor Code.

This agreement shall not be modified except by written document executed by the parties hereto.

DISTRICT: Reclamation District No. _____
District Name
123 Street Way
City, CA 9####

BY:
_____

CONTRACTOR: Teichert Construction
P. O. Box 1118
Stockton, CA 95201-1118

BY:
_____

Appendix A

Checklist for Labor Law requirements

And

District labor Compliance Program

(Pursuant to CCR16430)

The federal and state labor law requirements applicable to the contract are composed of but not limited to the following:

1. Payment of prevailing wage rates.

The Contractor to whom the Contract is awarded and its Subcontractors hired for the public works project are required to pay the specified general prevailing wage rate to all workers employed in the execution of the contract. The Contractor's shall pay prevailing wages under Labor Code Section 1770 et seq. should the project exceed the exemption amounts.

The Contractor shall comply with Labor Code Section 1775, "Forfeiture for paying less than prevailing wage rates; Amount of penalty; Payments to workers; Liability of Prime Contractor; Notification of complaint".

The Contractor is responsible for ascertaining and complying with all current general prevailing wage rates for crafts and any rate changes that occur during the life of the contract. Information on all prevailing wage rates and all rate changes are to be posted at the job site for all workers to view.

2. Apprentices

It is the duty of the Contractor and the Subcontractors to employ registered apprentices on the public works project under Labor Code Section 1777.5.

3. Penalties

There are penalties required for Contractor and Subcontractor failure to pay prevailing wages rate (for non exempt projects) and for failure to employ apprentices including forfeitures and debarment under Labor Code Sections 1775, 1777.5 and 1813.

4. Certified Payroll Records

Contractors and Subcontractors are required to keep accurate payroll records showing the name, address, social security number and work classification of each employee and owner performing work, the straight time and overtime hours worked each day and each week, the fringe benefits, and the actual per diem wage paid to each owner, journeyperson, apprentice worker or other employee hired for the public works project under Labor Code Section 1776.

Employee payroll records shall be certified and shall be made available for inspection at all reasonable hours at the principal office of the Contractor or Subcontractor or shall be furnished to any employee, or his/her authorized representative on request, according to Labor Code Section 1776.

Each Contractor and Subcontractor and its subcontractor shall submit its certified payroll record to the District (or its designated agent) on a weekly basis. If there was no work performed during a given week, the certified payroll may be annotated: "no work" for that week.

5. Nondiscrimination in Employment

Employment discrimination is prohibited under Labor Code Sections 1735 and 1777.6, the government code, the public contracts code and the Civil Rights Act of 1964, as amended. All

Contractors and Subcontractors are required to implement equal employment opportunity employment practices for women and minorities as delineated below:

a. Equal Employment Poster

The equal employment poster shall be posted at the job site in a conspicuous place, available to employees and applicants for employment and shall remain posted for the duration of the project.

6. Kickbacks Prohibited

Contractors and Subcontractors are prohibited from accepting, taking wages illegally or extracting "kickback" from employee wages under Labor Code Section 1778.

7. Acceptance of Fees Prohibited

Contractors or Subcontractors are prohibited for registering any person for public work under Labor Code Section 1779 or for filling work orders on public works contracts pursuant to Labor Code Section 1780.

8. Listing of Subcontractors

All Prime Contractors are required to list properly all Subcontractors hired to perform work on the public works project covering more than one-half of 1 percent (½ of 1%), according to Government Code Section 4199 et seq.

Under Public Contract Code Section 6109, “Ineligible and debarred Subcontractors”, the Contractor is prohibited from performing work on a public works project with a Subcontractor who is ineligible to perform work on the public works project pursuant to Section 1777.1 or 1777.7 of the California Labor Code.

9. Proper Licensing

Contractors are required to be licensed properly and to require that all Subcontractors be properly licensed. Penalties are required for employing workers while unlicensed under Labor Code Section 1021 and under the California License Law found at Business and Professions Code 7000 et seq.

10. Unfair Competition Prohibited

Contractors and Subcontractors are prohibited from engaging in unfair competition as specified under Business and Professional Code Sections 17200 to 17208.

11. Workers Compensation Insurance

Labor Code Section 1861 requires that Contractors and Subcontractors are insured properly for worker's compensation.

12. OSHA

Contractors and Subcontractors are required to abide by the occupational, safety and health laws and regulations that apply to the particular construct

Appendix E4

CALIFORNIA MODEL FLOODPLAIN MANAGEMENT ORDINANCE

Modified for Using Lower Base Flood Elevations through the use of Levee Relief Cuts

CALIFORNIA

MODEL

FLOODPLAIN MANAGEMENT

ORDINANCE

FOR
NONCOASTAL COMMUNITIES

December 2006

Modified for Using Lower Base Flood Elevations through the use of Levee Relief Cuts*

This California Model Floodplain Management Ordinance has been developed as a tool to help communities meet the minimum requirements of the National Flood Insurance Program (NFIP). Communities choosing not to use this model ordinance must ensure their ordinance meets the minimum requirements of the NFIP.

Department of Water Resources
The Resources Agency, State of California

*Modifications are shown in blue text with strikeout and underline

Table of Contents

Instructions for Creating Your Community's Ordinance

1) **PROVIDE COMMUNITY SPECIFIC INFORMATION AS REQUESTED IN BRACKETS.**
This model ordinance contains **{brackets}** that must be replaced with community specific information such as your community's name, address, or name of the responsible party.

2) **ACCESSORY STRUCTURES.**
This model ordinance contains the definition for accessory structures and construction requirements in Section 5.1.C.5 to allow for the permitting of an "**Accessory structure**" within special flood hazard areas **without a variance**.

3) **UPDATE CROSS REFERENCES.**
Cross references and bracketed items throughout this document are underlined in red and bolded only to facilitate locating to ensure changes are made and to match actual numbering used by your community and not intended to reflect a suggested final format.

4) **DETERMINE IF YOUR COMMUNITY WANTS TO ADOPT HIGHER STANDARDS RECOMMENDED BY THE STATE OF CALIFORNIA.**
This model ordinance meets the minimum standards required to participate in the National Flood Insurance Program. Community adoption of higher standards can be applied towards credit under the Community Rating System (CRS) program and result in reduced premiums for the entire community. The State of California recommends:

   - **Freeboard.** See Appendix 2.0.A, page 2~~2~~4.
   - **Determining BFE's in Unnumbered A Zones.** See Appendix 2.0.B, page 2~~2~~6.
   - **Determining Market Value of Existing Structures.** See Appendix 2.0.C, page 2~~2~~6.
   - **Increased Cost of Compliance (ICC) Coverage—Repetitive Loss Provisions.** See Appendix 2.0.D, page 2~~3~~6.
   - **Non-conversion of Enclosed Areas Below the Lowest Floor.** See Appendix 2.0.E, page 2~~3~~7.

5) **DETERMINE IF YOUR COMMUNITY HAS SPECIAL REQUIREMENTS**

   - **Alluvial Fan Advisory.**
   See Appendix 1.0, page 2~~1~~4.
   - **Crawlspace Construction.**
   See Appendix 3.0.A, page 2~~4~~8.
   - **Mudslide (i.e., mudflow) Prone Areas.** (Zone M)
   See Appendix 3.0.B, page 2~~5~~9.
   - **Erosion Prone Areas.** (Zone E)
   See Appendix 3.0.C, page ~~26~~30.

6) **PRIOR TO ADOPTION, SUBMIT DRAFT TO:**

   - Other community departments, including Attorney's office.

- Department of Water Resources or FEMA Region IX for review and approval.

7) **AFTER ADOPTION, SEND A COPY OF THE ADOPTED ORDINANCE CERTIFIED BY THE CITY/COUNTY CLERK TO FEMA REGION IX AND A COPY TO DWR.**

SECTION 1.0
STATUTORY AUTHORIZATION,
FINDINGS OF FACT,
PURPOSE AND METHODS

1.1 STATUTORY AUTHORIZATION.

The Legislature of the State of California has in Government Code Sections 65302, 65560, and 65800 conferred upon local governments the authority to adopt regulations designed to promote the public health, safety, and general welfare of its citizenry. Therefore, the **{community governing body}** of **{name of county or municipality}** does hereby adopt the following floodplain management regulations.

1.2 FINDINGS OF FACT.

A. The flood hazard areas of **{name of county or municipality}** are subject to periodic inundation which results in loss of life and property, health and safety hazards, disruption of commerce and governmental services, extraordinary public expenditures for flood protection and relief, and impairment of the tax base, all of which adversely affect the public health, safety, and general welfare.

B. These flood losses are caused by uses that are inadequately elevated, floodproofed, or protected from flood damage. The cumulative effect of obstructions in areas of special flood hazards which increase flood heights and velocities also contributes to flood losses.

1.3 STATEMENT OF PURPOSE.

It is the purpose of this ordinance to promote the public health, safety, and general welfare, and to minimize public and private losses due to flood conditions in specific areas by legally enforceable regulations applied uniformly throughout the community to all publicly and privately owned land within flood prone, mudslide [i.e. mudflow] or flood related erosion areas. These regulations are designed to:

A. Protect human life and health;

B. Minimize expenditure of public money for costly flood control projects;

C. Minimize the need for rescue and relief efforts associated with flooding and generally undertaken at the expense of the general public;

D. Minimize prolonged business interruptions;

E. Minimize damage to public facilities and utilities such as water and gas mains; electric, telephone and sewer lines; and streets and bridges located in areas of special flood hazard;

F. Help maintain a stable tax base by providing for the sound use and development of areas of special flood hazard so as to minimize future blighted areas caused by flood damage;

G. Ensure that potential buyers are notified that property is in an area of special flood hazard; and

H. Ensure that those who occupy the areas of special flood hazard assume responsibility for their actions.

1.4 METHODS OF REDUCING FLOOD LOSSES.

In order to accomplish its purposes, this ordinance includes regulations to:

A. Restrict or prohibit uses which are dangerous to health, safety, and property due to water or erosion hazards, or which result in damaging increases in erosion or flood heights or velocities;

B. Require that uses vulnerable to floods, including facilities which serve such uses, be protected against flood damage at the time of initial construction;

C. Control the alteration of natural floodplains, stream channels, and natural protective barriers, which help accommodate or channel floodwaters;

D. Control filling, grading, dredging, and other development which may increase flood damage;

E. Prevent or regulate the construction of flood barriers which will unnaturally divert floodwaters or which may increase flood hazards in other areas; and

SECTION 2.0
DEFINITIONS

Unless specifically defined below, words or phrases used in this ordinance shall be interpreted so as to give them the meaning they have in common usage and to give this ordinance its most reasonable application.

"**A zone**" - see "**Special flood hazard area**".

"**Accessory structure**" means a structure that is either:

1. Solely for the parking of no more than 2 cars; or

2. A small, low cost shed for limited storage, less than 150 square feet and $1,500 in value.

"**Accessory use**" means a use which is incidental and subordinate to the principal use of the parcel of land on which it is located.

"Agricultural structure" means a structure used solely for agricultural purposes in which the use is exclusively in connection with the production, harvesting, storage, drying, or raising, of agricultural commodities, including the raising of livestock.

"**Alluvial fan**" means a geomorphologic feature characterized by a cone or fan-shaped deposit of boulders, gravel, and fine sediments that have been eroded from mountain slopes, transported by flood flows, and then deposited on the valley floors, and which is subject to flash flooding, high velocity flows, debris flows, erosion, sediment movement and deposition, and channel migration.

"**Apex**" means a point on an alluvial fan or similar landform below which the flow path of the major stream that formed the fan becomes unpredictable and alluvial fan flooding can occur.

"**Appeal**" means a request for a review of the Floodplain Administrator's interpretation of any provision of this ordinance.

"**Area of shallow flooding**" means a designated AO or AH Zone on the Flood Insurance Rate Map (FIRM). The base flood depths range from one to three feet; a clearly defined channel does not exist; the path of flooding is unpredictable and indeterminate; and velocity flow may be evident. Such flooding is characterized by ponding or sheet flow.

"**Area of special flood hazard**" - See "Special flood hazard area."

"**Base flood**" means a flood which has a one percent chance of being equaled or exceeded in any given year (also called the "100-year flood"). Base flood is the term used throughout this ordinance.

"**Base flood elevation**" (BFE) means the elevation shown on the Flood Insurance Rate Map for Zones AE, AH, A1-30, VE and V1-V30 that indicates the water surface elevation resulting from a flood that has a 1-percent or greater chance of being equaled or exceeded in any given year.

"**Basement**" means any area of the building having its floor subgrade - i.e., below ground level - on all sides.

"**Building**" - see "**Structure**".

"**Development**" means any man-made change to improved or unimproved real estate, including but not limited to buildings or other structures, mining, dredging, filling, grading, paving, excavation or drilling operations or storage of equipment or materials.

"**Encroachment**" means the advance or infringement of uses, plant growth, fill, excavation, buildings, permanent structures or development into a floodplain which may impede or alter the flow capacity of a floodplain.

"**Existing manufactured home park or subdivision**" means a manufactured home park or subdivision for which the construction of facilities for servicing the lots on which the manufactured homes are to be affixed (including, at a minimum, the installation of utilities, the construction of streets, and either final site grading or the pouring of concrete pads) is completed before **{insert date your first floodplain management ordinance was adopted}**.

"**Expansion to an existing manufactured home park or subdivision**" means the preparation of additional sites by the construction of facilities for servicing the lots on which the manufactured homes are to be affixed (including the installation of utilities, the construction of streets, and either final site grading or the pouring of concrete pads).

"**Flood, flooding, or flood water**" means:

1. A general and temporary condition of partial or complete inundation of normally dry land areas from the overflow of inland or tidal waters; the unusual and rapid accumulation or runoff of surface waters from any source; and/or mudslides (i.e., mudflows); and

2. The condition resulting from flood-related erosion.

"**Flood Boundary and Floodway Map (FBFM)**" means the official map on which the Federal Emergency Management Agency or Federal Insurance Administration has delineated both the areas of special flood hazards and the floodway.

"**Flood Insurance Rate Map (FIRM)**" means the official map on which the Federal Emergency Management Agency or Federal Insurance Administration has delineated both the areas of special flood hazards and the risk premium zones applicable to the community.

"**Flood Insurance Study**" means the official report provided by the Federal Insurance Administration that includes flood profiles, the Flood Insurance Rate Map, the Flood Boundary and Floodway Map, and the water surface elevation of the base flood.

"**Floodplain or flood-prone area**" means any land area susceptible to being inundated by water from any source - see "**Flooding**."

"**Floodplain Administrator**" is the community official designated by title to administer and enforce the floodplain management regulations.

"**Floodplain management**" means the operation of an overall program of corrective and preventive measures for reducing flood damage and preserving and enhancing, where possible, natural resources in the floodplain, including but not limited to emergency preparedness plans, flood control works, floodplain management regulations, and open space plans.

"**Floodplain management regulations**" means this ordinance and other zoning ordinances, subdivision regulations, building codes, health regulations, special purpose ordinances (such as grading and erosion control) and other application of police power which control development in flood-prone areas. This term

describes federal, state or local regulations in any combination thereof which provide standards for preventing and reducing flood loss and damage.

"**Floodproofing**" means any combination of structural and nonstructural additions, changes, or adjustments to structures which reduce or eliminate flood damage to real estate or improved real property, water and sanitary facilities**,** structures, and their contents. For guidelines on dry and wet floodproofing, see FEMA Technical Bulletins TB 1-93, TB 3-93, and TB 7-93.

"**Floodway**" means the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than one foot. Also referred to as "Regulatory Floodway."

"**Floodway fringe**" is that area of the floodplain on either side of the "Regulatory Floodway" where encroachment may be permitted.

"**Fraud and victimization**" as related to **Section 6.0** of this ordinance, means that the variance granted must not cause fraud on or victimization of the public. In examining this requirement, the **{community governing body}** will consider the fact that every newly constructed building adds to government responsibilities and remains a part of the community for fifty to one-hundred years. Buildings that are permitted to be constructed below the base flood elevation are subject during all those years to increased risk of damage from floods, while future owners of the property and the community as a whole are subject to all the costs, inconvenience, danger, and suffering that those increased flood damages bring. In addition, future owners may purchase the property, unaware that it is subject to potential flood damage, and can be insured only at very high flood insurance rates.

"**Functionally dependent use**" means a use which cannot perform its intended purpose unless it is located or carried out in close proximity to water. The term includes only docking facilities, port facilities that are necessary for the loading and unloading of cargo or passengers, and ship building and ship repair facilities, and does not include long-term storage or related manufacturing facilities.

"**Governing body**" is the local governing unit, i.e. county or municipality, that is empowered to adopt and implement regulations to provide for the public health, safety and general welfare of its citizenry.

"**Hardship**" as related to **Section 6** of this ordinance means the exceptional hardship that would result from a failure to grant the requested variance. The **{community governing body}** requires that the variance be exceptional, unusual, and peculiar to the property involved. Mere economic or financial hardship alone is not exceptional. Inconvenience, aesthetic considerations, physical handicaps, personal preferences, or the disapproval of one's neighbors likewise cannot, as a rule, qualify as an exceptional hardship. All of these problems can be resolved through other means without granting a variance, even if the alternative is more expensive, or requires the property owner to build elsewhere or put the parcel to a different use than originally intended.

"**Highest adjacent grade**" means the highest natural elevation of the ground surface prior to construction next to the proposed walls of a structure.

"**Historic structure**" means any structure that is:

1. Listed individually in the National Register of Historic Places (a listing maintained by the Department of Interior) or preliminarily determined by the Secretary of the Interior as meeting the requirements for individual listing on the National Register;

2. Certified or preliminarily determined by the Secretary of the Interior as contributing to the historical significance of a registered historic district or a district preliminarily determined by the Secretary to

qualify as a registered historic district;

3. Individually listed on a state inventory of historic places in states with historic preservation programs which have been approved by the Secretary of Interior; or

4. Individually listed on a local inventory of historic places in communities with historic preservation programs that have been certified either by an approved state program as determined by the Secretary of the Interior or directly by the Secretary of the Interior in states without approved programs.

"**Levee**" means a man-made structure, usually an earthen embankment, designed and constructed in accordance with sound engineering practices to contain, control or divert the flow of water so as to provide protection from temporary flooding.

"**Levee system**" means a flood protection system which consists of a levee, or levees, and associated structures, such as closure and drainage devices, which are constructed and operated in accord with sound engineering practices.
"**Lowest floor**" means the lowest floor of the lowest enclosed area, including basement (see **"Basement"** definition).

1. An unfinished or flood resistant enclosure below the lowest floor that is usable solely for parking of vehicles, building access or storage in an area other than a basement area, is not considered a building's lowest floor provided it conforms to applicable non-elevation design requirements, including, but not limited to:

   a. The flood openings standard in **Section 5.1.C.3**;

   b. The anchoring standards in **Section 5.1.A**;

   c. The construction materials and methods standards in **Section 5.1.B**; and

   d. The standards for utilities in **Section 5.2**.

2. For residential structures, all subgrade enclosed areas are prohibited as they are considered to be basements (see **"Basement"** definition). This prohibition includes below-grade garages and storage areas.

"**Manufactured home**" means a structure, transportable in one or more sections, which is built on a permanent chassis and is designed for use with or without a permanent foundation when attached to the required utilities. The term "manufactured home" does not include a "recreational vehicle".

"**Manufactured home park or subdivision**" means a parcel (or contiguous parcels) of land divided into two or more manufactured home lots for rent or sale.

> "Market value" **is defined in the** {name of county or municipality} **substantial damage/improvement procedures. See** Section 4.2.B.1**.**

"**Mean sea level**" means, for purposes of the National Flood Insurance Program, the National Geodetic Vertical Datum (NGVD) of 1929, North American Vertical Datum (NAVD) of 1988, or other datum, to which base flood elevations shown on a community's Flood Insurance Rate Map are referenced.

"**New construction**", for floodplain management purposes, means structures for which the "start of construction" commenced on or after **{insert date your first floodplain management ordinance was adopted}**, and includes any subsequent improvements to such structures.

"**New manufactured home park or subdivision**" means a manufactured home park or subdivision for which the construction of facilities for servicing the lots on which the manufactured homes are to be affixed (including at a minimum, the installation of utilities, the construction of streets, and either final site grading or the pouring of concrete pads) is completed on or after **{insert date your first floodplain management ordinance was adopted}**.

"**Obstruction**" includes, but is not limited to, any dam, wall, wharf, embankment, levee, dike, pile, abutment, protection, excavation, channelization, bridge, conduit, culvert, building, wire, fence, rock, gravel, refuse, fill, structure, vegetation or other material in, along, across or projecting into any watercourse which may alter, impede, retard or change the direction and/or velocity of the flow of water, or due to its location, its propensity to snare or collect debris carried by the flow of water, or its likelihood of being carried downstream.

"**One-hundred-year flood**" or "100-year flood" - see "**Base flood**."

"**Program deficiency**" means a defect in a community's floodplain management regulations or administrative procedures that impairs effective implementation of those floodplain management regulations.

"**Public safety and nuisance**" as related to **Section 6** of this ordinance, means that the granting of a variance must not result in anything which is injurious to safety or health of an entire community or neighborhood, or any considerable number of persons, or unlawfully obstructs the free passage or use, in the customary manner, of any navigable lake, or river, bay, stream, canal, or basin.

"**Recreational vehicle**" means a vehicle which is:

1. Built on a single chassis;

2. 400 square feet or less when measured at the largest horizontal projection;

3. Designed to be self-propelled or permanently towable by a light-duty truck; and

4. Designed primarily not for use as a permanent dwelling but as temporary living quarters for recreational, camping, travel, or seasonal use.

"**Regulatory floodway**" means the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than one foot.

"**Remedy a violation**" means to bring the structure or other development into compliance with State or local floodplain management regulations, or if this is not possible, to reduce the impacts of its noncompliance. Ways that impacts may be reduced include protecting the structure or other affected development from flood damages, implementing the enforcement provisions of the ordinance or otherwise deterring future similar violations, or reducing State or Federal financial exposure with regard to the structure or other development.

"Relief Cut" means temporary removal or lowering of a levee segment to reduce depth, extent, and/or duration of floodwaters following an upstream levee failure or overtopping.

"**Riverine**" means relating to, formed by, or resembling a river (including tributaries), stream, brook, etc.

"**Sheet flow area**" - see "**Area of shallow flooding**."

"**Special flood hazard area (SFHA)**" means an area in the floodplain subject to a 1 percent or greater chance of flooding in any given year. It is shown on an FHBM or FIRM as Zone A, AO, A1-A30, AE, A99, or, AH.

"**Start of construction**" includes substantial improvement and other proposed new development and means the date the building permit was issued, provided the actual start of construction, repair, reconstruction, rehabilitation, addition, placement, or other improvement was within 180 days from the date of the permit. The actual start means either the first placement of permanent construction of a structure on a site, such as the pouring of slab or footings, the installation of piles, the construction of columns, or any work beyond the stage of excavation; or the placement of a manufacture home on a foundation. Permanent construction does not include land preparation, such as clearing, grading, and filling; nor does it include the installation of streets and/or walkways; nor does it include excavation for a basement, footings, piers, or foundations or the erection of temporary forms; nor does it include the installation on the property of accessory buildings, such as garages or sheds not occupied as dwelling units or not part of the main structure. For a substantial improvement, the actual start of construction means the first alteration of any wall, ceiling, floor, or other structural part of a building, whether or not that alteration affects the external dimensions of the building.

"**Structure**" means a walled and roofed building that is principally above ground; this includes a gas or liquid storage tank or a manufactured home.

"**Substantial damage**" means damage of any origin sustained by a structure whereby the cost of restoring the structure to its before damaged condition would equal or exceed 50 percent of the market value of the structure before the damage occurred.

"**Substantial improvement**" means any reconstruction, rehabilitation, addition, or other improvement of a structure, the cost of which equals or exceeds 50 percent of the market value of the structure before the "start of construction" of the improvement. This term includes structures which have incurred "substantial damage", regardless of the actual repair work performed. The term does not, however, include either:

1. Any project for improvement of a structure to correct existing violations or state or local health, sanitary, or safety code specifications which have been identified by the local code enforcement official and which are the minimum necessary to assure safe living conditions; or

2. Any alteration of a "historic structure," provided that the alteration will not preclude the structure's continued designation as a "historic structure."

"**Variance**" means a grant of relief from the requirements of this ordinance which permits construction in a manner that would otherwise be prohibited by this ordinance.

"**Violation**" means the failure of a structure or other development to be fully compliant with this ordinance. A structure or other development without the elevation certificate, other certifications, or other evidence of compliance required in this ordinance is presumed to be in violation until such time as that documentation is provided.

"**Water surface elevation**" means the height, in relation to the National Geodetic Vertical Datum (NGVD) of 1929, North American Vertical Datum (NAVD) of 1988, or other datum, of floods of various magnitudes and frequencies in the floodplains of coastal or riverine areas.

"**Watercourse**" means a lake, river, creek, stream, wash, arroyo, channel or other topographic feature on or over which waters flow at least periodically. Watercourse includes specifically designated areas in which substantial flood damage may occur.

SECTION 3.0
GENERAL PROVISIONS

3.1 LANDS TO WHICH THIS ORDINANCE APPLIES.

This ordinance shall apply to all areas of special flood hazards within the jurisdiction of **{name of county or municipality}**.

3.2 BASIS FOR ESTABLISHING THE AREAS OF SPECIAL FLOOD HAZARD.

The areas of special flood hazard identified by the Federal Emergency Management Agency (FEMA) in the "Flood Insurance Study (FIS) for **{name of county or municipality (exact title of study)}"** dated **{date}**, with accompanying Flood Insurance Rate Maps (FIRM's) and Flood Boundary and Floodway Maps (FBFM's), dated **{date}**, and all subsequent amendments and/or revisions, are hereby adopted by reference and declared to be a part of this ordinance. This FIS and attendant mapping is the minimum area of applicability of this ordinance and may be supplemented by studies for other areas which allow implementation of this ordinance and which are recommended to the **{community governing body}** by the Floodplain Administrator. The study, FIRM's and FBFM's are on file at **{department, address}**.

3.3 COMPLIANCE.

No structure or land shall hereafter be constructed, located, extended, converted, or altered without full compliance with the terms of this ordinance and other applicable regulations. Violation of the requirements (including violations of conditions and safeguards) shall constitute a misdemeanor. Nothing herein shall prevent the **{community governing body}** from taking such lawful action as is necessary to prevent or remedy any violation.

3.4 ABROGATION AND GREATER RESTRICTIONS.

This ordinance is not intended to repeal, abrogate, or impair any existing easements, covenants, or deed restrictions. However, where this ordinance and another ordinance, easement, covenant, or deed restriction conflict or overlap, whichever imposes the more stringent restrictions shall prevail.

3.5 INTERPRETATION.

In the interpretation and application of this ordinance, all provisions shall be:

A. Considered as minimum requirements;

B. Liberally construed in favor of the governing body; and

C. Deemed neither to limit nor repeal any other powers granted under state statutes.

3.6 WARNING AND DISCLAIMER OF LIABILITY.

The degree of flood protection required by this ordinance is considered reasonable for regulatory purposes and is based on scientific and engineering considerations. Larger floods can and will occur on rare occasions. Flood heights may be increased by man-made or natural causes. This ordinance does not imply that land outside the areas of special flood hazards and local flood hazards or uses permitted within such areas will be free from flooding or flood damages. This ordinance shall not create liability on the part of **{community governing body}**, any officer or employee thereof, the State of California, or the Federal Emergency Management Agency, for any flood damages that result from reliance on this ordinance or any administrative decision lawfully made hereunder.

3.7 **SEVERABILITY.**

This ordinance and the various parts thereof are hereby declared to be severable. Should any section of this ordinance be declared by the courts to be unconstitutional or invalid, such decision shall not affect the validity of the ordinance as a whole, or any portion thereof other than the section so declared to be unconstitutional or invalid.

SECTION 4.0
ADMINISTRATION

4.1 DESIGNATION OF THE FLOODPLAIN ADMINISTRATOR.

The **{e.g., City Manager, Director of Planning, Public Works, or Building Official, etc.}** is hereby appointed to administer, implement, and enforce this ordinance by granting or denying development permits in accord with its provisions.

4.2 DUTIES AND RESPONSIBILITIES OF THE FLOODPLAIN ADMINISTRATOR.

The duties and responsibilities of the Floodplain Administrator shall include, but not be limited to the following:

A. Permit Review.

Review all development permits to determine:

1. Permit requirements of this ordinance have been satisfied, including determination of substantial improvement and substantial damage of existing structures;

2. All other required state and federal permits have been obtained;

3. The site is reasonably safe from flooding;

4. The proposed development does not adversely affect the carrying capacity of areas where base flood elevations have been determined but a floodway has not been designated. This means that the cumulative effect of the proposed development when combined with all other existing and anticipated development will not increase the water surface elevation of the base flood more than 1 foot at any point within the **{name of county or municipality}**; and

5. All Letters of Map Revision (LOMR's) for flood control projects are approved prior to the issuance of building permits. Building Permits must not be issued based on Conditional Letters of Map Revision (CLOMR's). Approved CLOMR's allow construction of the proposed flood control project and land preparation as specified in the "start of construction" definition.

B. Development of Substantial Improvement and Substantial Damage Procedures.

1. Using FEMA publication FEMA 213, "Answers to Questions About Substantially Damaged Buildings," develop detailed procedures for identifying and administering requirements for substantial improvement and substantial damage, to include defining "Market Value."

2. Assure procedures are coordinated with other departments/divisions and implemented by community staff.

C. Review, Use and Development of Other Base Flood Data.

When base flood elevation data has not been provided in accordance with **Section 3.2**, the Floodplain Administrator shall obtain, review, and reasonably utilize any base flood elevation and floodway data available from a federal or state agency, or other source, in order to administer **Section 5**.

NOTE: A base flood elevation may be obtained using one of two methods from the FEMA publication, FEMA 265, "Managing Floodplain Development in Approximate Zone A Areas – A Guide for Obtaining and Developing Base (100-year) Flood Elevations" dated July 1995.

D. Notification of Other Agencies.

1. Alteration or relocation of a watercourse:

   a. Notify adjacent communities and the California Department of Water Resources prior to alteration or relocation;

   b. Submit evidence of such notification to the Federal Emergency Management Agency; and

   c. Assure that the flood carrying capacity within the altered or relocated portion of said watercourse is maintained.

2. Base Flood Elevation changes due to physical alterations:

   a. Within 6 months of information becoming available or project completion, whichever comes first, the floodplain administrator shall submit or assure that the permit applicant submits technical or scientific data to FEMA for a Letter of Map Revision (LOMR).

   b. All LOMR's for flood control projects are approved prior to the issuance of building permits. Building Permits must not be issued based on Conditional Letters of Map Revision (CLOMR's). Approved CLOMR's allow construction of the proposed flood control project and land preparation as specified in the "start of construction" definition.

   Such submissions are necessary so that upon confirmation of those physical changes affecting flooding conditions, risk premium rates and floodplain management requirements are based on current data.

3. Changes in corporate boundaries:

   Notify FEMA in writing whenever the corporate boundaries have been modified by annexation or other means and include a copy of a map of the community clearly delineating the new corporate limits.

E. Documentation of Floodplain Development.

Obtain and maintain for public inspection and make available as needed the following:

1. Certification required by **Section 5.1.C.1 and Section 5.4** (lowest floor elevations);

2. Certification required by **Section 5.1.C.2** (elevation or floodproofing of nonresidential structures);

3. Certification required by **Sections 5.1.C.3** (wet floodproofing standard);

4. Certification of elevation required by **Section 5.3.A.3** (subdivisions and other proposed development standards);

5. Certification required by **Section 5.6.B** (floodway encroachments); and

6. Maintain a record of all variance actions, including justification for their issuance, and report such variances issued in its biennial report submitted to the Federal Emergency Management Agency.

F. Map Determination.

Make interpretations where needed, as to the exact location of the boundaries of the areas of special flood hazard, where there appears to be a conflict between a mapped boundary and actual field conditions. The person contesting the location of the boundary shall be given a reasonable opportunity to appeal the interpretation as provided in **Section 4.4**.

F. Remedial Action.

Take action to remedy violations of this ordinance as specified in **Section 3.3**.

G. Biennial Report.

Complete and submit Biennial Report to FEMA.

H. Planning.

Assure community's General Plan is consistent with floodplain management objectives herein.

4.3 DEVELOPMENT PERMIT.

A development permit shall be obtained before any construction or other development, including manufactured homes, within any area of special flood hazard established in **Section 3.2**. Application for a development permit shall be made on forms furnished by the **{name of community}**. The applicant shall provide the following minimum information:

A. Plans in duplicate, drawn to scale, showing:

1. Location, dimensions, and elevation of the area in question, existing or proposed structures, storage of materials and equipment and their location;
2. Proposed locations of water supply, sanitary sewer, and other utilities;
3. Grading information showing existing and proposed contours, any proposed fill, and drainage facilities;
4. Location of the regulatory floodway when applicable;
5. Base flood elevation information as specified in **Section 3.2 or Section 4.2.C**;
6. Proposed elevation in relation to mean sea level, of the lowest floor (including basement) of all structures; and
7. Proposed elevation in relation to mean sea level to which any nonresidential structure will be floodproofed, as required in **Section 5.1.C.2** of this ordinance and detailed in FEMA Technical Bulletin TB 3-93.

B. Certification from a registered civil engineer or architect that the nonresidential floodproofed building meets the floodproofing criteria in **Section 5.1.C.2**.

C. For a crawl-space foundation, location and total net area of foundation openings as required in **Section 5.1.C.3** of this ordinance and detailed in FEMA Technical Bulletins 1-93 and 7-93.

D. Description of the extent to which any watercourse will be altered or relocated as a result of proposed development.

E. All appropriate certifications listed in **Section 4.2.E** of this ordinance.

4.4 APPEALS.

The **{community governing body}** of **{name of county or municipality}** shall hear and decide appeals when it is alleged there is an error in any requirement, decision, or determination made by the Floodplain Administrator in the enforcement or administration of this ordinance.

SECTION 5.0
PROVISIONS FOR FLOOD HAZARD REDUCTION

5.1 STANDARDS OF CONSTRUCTION.

In all areas of special flood hazards the following standards are required:

A. Anchoring.

All new construction and substantial improvements of structures, including manufactured homes, shall be adequately anchored to prevent flotation, collapse or lateral movement of the structure resulting from hydrodynamic and hydrostatic loads, including the effects of buoyancy.

B. Construction Materials and Methods.

All new construction and substantial improvements of structures, including manufactured homes, but excluding agricultural structures, shall be constructed:

1. With flood resistant materials**,** and utility equipment resistant to flood damage for areas below the base flood elevation;

2. Using methods and practices that minimize flood damage;

3. With electrical, heating, ventilation, plumbing and air conditioning equipment and other service facilities that are designed and/or located so as to prevent water from entering or accumulating within the components during conditions of flooding; and

4. Within Zones AH or AO, so that there are adequate drainage paths around structures on slopes to guide flood waters around and away from proposed structures.

C. Elevation and Floodproofing.

1. **Residential construction.**

All new construction or substantial improvements of residential structures shall have the lowest floor, including basement:

a. In AE, AH, A1-30 Zones, elevated to or above the base flood elevation.

b. In an AO zone, elevated above the highest adjacent grade to a height equal to or exceeding the depth number specified in feet on the FIRM, or elevated at least 2 feet above the highest adjacent grade if no depth number is specified.

c. In an A zone, without BFE's specified on the FIRM [unnumbered A zone], elevated to or above the base flood elevation; as determined under **Section 4.2.C**.

Upon the completion of the structure, the elevation of the lowest floor, including basement, shall be certified by a registered civil engineer or licensed land surveyor, and verified by the community building inspector to be properly elevated. Such certification and verification shall be provided to the Floodplain Administrator.

2. **Nonresidential construction.**

   All new construction or substantial improvements of nonresidential structures shall either be elevated to conform with Section 5.1.C.1 or:

   a. Be floodproofed, together with attendant utility and sanitary facilities, below the elevation recommended under Section 5.1.C.1, so that the structure is watertight with walls substantially impermeable to the passage of water;

   b. Have structural components capable of resisting hydrostatic and hydrodynamic loads and effects of buoyancy; and

   c. Be certified by a registered civil engineer or architect that the standards of Section 5.1 C.2.a & b are satisfied. Such certification shall be provided to the Floodplain Administrator.

3. **Flood openings.**

   All new construction and substantial improvements of structures with fully enclosed areas below the lowest floor (excluding basements) that are usable solely for parking of vehicles, building access or storage, and which are subject to flooding, shall be designed to automatically equalize hydrostatic flood forces on exterior walls by allowing for the entry and exit of floodwater. Designs for meeting this requirement must meet the following minimum criteria:

   a. For non-engineered openings:

      1. Have a minimum of two openings on different sides having a total net area of not less than one square inch for every square foot of enclosed area subject to flooding;

      2. The bottom of all openings shall be no higher than one foot above grade;

      3. Openings may be equipped with screens, louvers, valves or other coverings or devices provided that they permit the automatic entry and exit of floodwater; and

      4. Buildings with more than one enclosed area must have openings on exterior walls for each area to allow flood water to directly enter; or

   b. Be certified by a registered civil engineer or architect.

4. **Manufactured homes**.

   a. See Section 5.4.

5. **Garages and low cost accessory structures.**

   a. Attached garages.

      1. A garage attached to a residential structure, constructed with the garage floor slab below the BFE, must be designed to allow for the automatic entry of flood waters. See Section 5.1.C.3. Areas of the garage below the BFE must be constructed with flood resistant materials. See Section 5.1.B.

2. A garage attached to a nonresidential structure must meet the above requirements or be dry floodproofed. For guidance on below grade parking areas, see FEMA Technical Bulletin TB-6.

b. Detached garages and accessory structures.

1. "Accessory structures" used solely for parking (2 car detached garages or smaller) or limited storage (small, low-cost sheds), as defined in **Section 2**, may be constructed such that its floor is below the base flood elevation (BFE), provided the structure is designed and constructed in accordance with the following requirements:

a) Use of the accessory structure must be limited to parking or limited storage;

b) The portions of the accessory structure located below the BFE must be built using flood-resistant materials;

c) The accessory structure must be adequately anchored to prevent flotation, collapse and lateral movement;

d) Any mechanical and utility equipment in the accessory structure must be elevated or floodproofed to or above the BFE;

e) The accessory structure must comply with floodplain encroachment provisions in **Section 5.6**; and

f) The accessory structure must be designed to allow for the automatic entry of flood waters in accordance with **Section 5.1.C.3**.

2. Detached garages and accessory structures not meeting the above standards must be constructed in accordance with all applicable standards in **Section 5.1**.

5.2 STANDARDS FOR UTILITIES.

A. All new and replacement water supply and sanitary sewage systems shall be designed to minimize or eliminate:

1. Infiltration of flood waters into the systems; and

2. Discharge from the systems into flood waters.

B. On-site waste disposal systems shall be located to avoid impairment to them, or contamination from them during flooding.

5.3 STANDARDS FOR SUBDIVISIONS AND OTHER PROPOSED DEVELOPMENT.

A. All new subdivisions proposals and other proposed development, including proposals for manufactured home parks and subdivisions, greater than 50 lots or 5 acres, whichever is the lesser, shall:

1. Identify the Special Flood Hazard Areas (SFHA) and Base Flood Elevations (BFE).

2. Identify the elevations of lowest floors of all proposed structures and pads on the final plans.

3. If the site is filled above the base flood elevation, the following as-built information for each structure shall be certified by a registered civil engineer or licensed land surveyor and provided as part of an application for a Letter of Map Revision based on Fill (LOMR-F) to the Floodplain Administrator:

    a. Lowest floor elevation.

    b. Pad elevation.

    c. Lowest adjacent grade.

B. All subdivision proposals and other proposed development shall be consistent with the need to minimize flood damage.

C. All subdivision proposals and other proposed development shall have public utilities and facilities such as sewer, gas, electrical and water systems located and constructed to minimize flood damage.

D. All subdivisions and other proposed development shall provide adequate drainage to reduce exposure to flood hazards.

5.4 STANDARDS FOR MANUFACTURED HOMES.

A. All manufactured homes that are placed or substantially improved, on sites located: (1) outside of a manufactured home park or subdivision; (2) in a new manufactured home park or subdivision; (3) in an expansion to an existing manufactured home park or subdivision; or (4) in an existing manufactured home park or subdivision upon which a manufactured home has incurred "substantial damage" as the result of a flood, shall:

1. Within Zones A1-30, AH, and AE on the community's Flood Insurance Rate Map, be elevated on a permanent foundation such that the lowest floor of the manufactured home is elevated to or above the base flood elevation and be securely fastened to an adequately anchored foundation system to resist flotation, collapse, and lateral movement.

B. All manufactured homes to be placed or substantially improved on sites in an existing manufactured home park or subdivision within Zones A1-30, AH, and AE on the community's Flood Insurance Rate Map that are not subject to the provisions of **Section 5.4.A** will be securely fastened to an adequately anchored foundation system to resist flotation, collapse, and lateral movement, and be elevated so that either the:

1. Lowest floor of the manufactured home is at or above the base flood elevation; or

2. Manufactured home chassis is supported by reinforced piers or other foundation elements of at least equivalent strength that are no less than 36 inches in height above grade.

Upon the completion of the structure, the elevation of the lowest floor including basement shall be certified by a registered civil engineer or licensed land surveyor, and verified by the community building inspector to be properly elevated. Such certification and verification shall be provided to the Floodplain Administrator.

5.5 STANDARDS FOR RECREATIONAL VEHICLES.

A. All recreational vehicles placed in Zones A1-30, AH, and AE will either:

1. Be on the site for fewer than 180 consecutive days; or

2. Be fully licensed and ready for highway use. A recreational vehicle is ready for highway use if it is on its wheels or jacking system, is attached to the site only by quick disconnect type utilities and security devices, and has no permanently attached additions; or

3. Meet the permit requirements of **Section 4.3** of this ordinance and the elevation and anchoring requirements for manufactured homes in **Section 5.4.A**.

5.6 FLOODWAYS.

Since floodways are an extremely hazardous area due to the velocity of flood waters which carry debris, potential projectiles, and erosion potential, the following provisions apply:

A. Until a regulatory floodway is adopted, no new construction, substantial development, or other development (including fill) shall be permitted within Zones A1-30 and AE, unless it is demonstrated that the cumulative effect of the proposed development, when combined with all other development, will not increase the water surface elevation of the base flood more than 1 foot at any point within the **{name of county or municipality}**.

B. Within an adopted regulatory floodway, the **{name of county or municipality}** shall prohibit encroachments, including fill, new construction, substantial improvements, and other development, unless certification by a registered civil engineer is provided demonstrating that the proposed encroachment shall not result in any increase in flood levels during the occurrence of the base flood discharge.

C. If **Sections 5.6.A & B** are satisfied, all new construction, substantial improvement, and other proposed new development shall comply with all other applicable flood hazard reduction provisions of **Section 5**.

5.7 RELIEF CUTS.

For certain leveed areas, levee relief cuts can be utilized to reduce BFEs, mitigate depth, extent, and/or duration of floodwaters and subsequent damages resulting from an unplanned upstream levee break or levee overtopping. Reduction of BFEs in Zone A, and/or the reduction or elimination of SFHAs through the use of relief cuts shall be accomplished by revisions to the FIRMs using the LOMR process. The following provisions apply to the use of relief cuts to lower BFEs in Zone A:

A. Reductions in BFEs through the use of relief cuts shall only apply to the permitting and approval of agricultural structures.

B. Any reductions in BFEs through the use of relief cuts shall be documented in engineering study(s) on file in the office of the Floodplain Administrator.

C. The execution of a relief cut relied upon for the reduction of BFEs, shall be documented in the Agency's Emergency Operation Plan – Basic Plan (EOP) and flood-specific Annex compliant with requirements within FEMA's Comprehensive Preparedness Guide 101 (CPG101).

For the use of relief cuts please refer to the *"Guide to Utilizing Levee Relief Cuts to Lower Base Flood Elevations"* (December 2016).

SECTION 6.0
VARIANCE PROCEDURE

6.1 NATURE OF VARIANCES.

The issuance of a variance is for floodplain management purposes only. Insurance premium rates are determined by statute according to actuarial risk and will not be modified by the granting of a variance.

The variance criteria set forth in this section of the ordinance are based on the general principle of zoning law that variances pertain to a piece of property and are not personal in nature. A variance may be granted for a parcel of property with physical characteristics so unusual that complying with the requirements of this ordinance would create an exceptional hardship to the applicant or the surrounding property owners. The characteristics must be unique to the property and not be shared by adjacent parcels. The unique characteristic must pertain to the land itself, not to the structure, its inhabitants, or the property owners.

It is the duty of the **{community governing body}** to help protect its citizens from flooding. This need is so compelling and the implications of the cost of insuring a structure built below flood level are so serious that variances from the flood elevation or from other requirements in the flood ordinance are quite rare. The long term goal of preventing and reducing flood loss and damage can only be met if variances are strictly limited. Therefore, the variance guidelines provided in this ordinance are more detailed and contain multiple provisions that must be met before a variance can be properly granted. The criteria are designed to screen out those situations in which alternatives other than a variance are more appropriate.

6.2 CONDITIONS FOR VARIANCES.

A. Generally, variances may be issued for new construction, substantial improvement, and other proposed new development to be erected on a lot of one-half acre or less in size contiguous to and surrounded by lots with existing structures constructed below the base flood level, providing that the procedures of **Sections 4 and 5** of this ordinance have been fully considered. As the lot size increases beyond one-half acre, the technical justification required for issuing the variance increases.

B. Variances may be issued for the repair or rehabilitation of "**historic structures**" (as defined in **Section 2** of this ordinance) upon a determination that the proposed repair or rehabilitation will not preclude the structure's continued designation as an historic structure and the variance is the minimum necessary to preserve the historic character and design of the structure.

C. Variances shall not be issued within any mapped regulatory floodway if any increase in flood levels during the base flood discharge would result.

D. Variances shall only be issued upon a determination that the variance is the "minimum necessary" considering the flood hazard, to afford relief. "Minimum necessary" means to afford relief with a minimum of deviation from the requirements of this ordinance. For example, in the case of variances to an elevation requirement, this means the **{community governing body}** need not grant permission for the applicant to build at grade, or even to whatever elevation the applicant proposes, but only to that elevation which the **{community governing body}** believes will both provide relief and preserve the integrity of the local ordinance.

E. Any applicant to whom a variance is granted shall be given written notice over the signature of a community official that:

1. The issuance of a variance to construct a structure below the base flood level will result in increased premium rates for flood insurance up to amounts as high as $25 for $100 of insurance coverage, and

2. Such construction below the base flood level increases risks to life and property. It is recommended that a copy of the notice shall be recorded by the Floodplain Administrator in the Office of the **{name of county}** Recorder and shall be recorded in a manner so that it appears in the chain of title of the affected parcel of land.

F. The Floodplain Administrator will maintain a record of all variance actions, including justification for their issuance, and report such variances issued in its biennial report submitted to the Federal Emergency Management Agency.

6.3 APPEAL BOARD.

A. In passing upon requests for variances, the **{community governing body}** shall consider all technical evaluations, all relevant factors, standards specified in other sections of this ordinance, and the:

1. Danger that materials may be swept onto other lands to the injury of others;

2. Danger of life and property due to flooding or erosion damage;

3. Susceptibility of the proposed facility and its contents to flood damage and the effect of such damage on the existing individual owner and future owners of the property;

4. Importance of the services provided by the proposed facility to the community;

5. Necessity to the facility of a waterfront location, where applicable;

6. Availability of alternative locations for the proposed use which are not subject to flooding or erosion damage;

7. Compatibility of the proposed use with existing and anticipated development;

8. Relationship of the proposed use to the comprehensive plan and floodplain management program for that area;

9. Safety of access to the property in time of flood for ordinary and emergency vehicles;

10. Expected heights, velocity, duration, rate of rise, and sediment transport of the flood waters expected at the site; and

11. Costs of providing governmental services during and after flood conditions, including maintenance and repair of public utilities and facilities such as sewer, gas, electrical, and water system, and streets and bridges.

B. Variances shall only be issued upon a:

1. Showing of good and sufficient cause;

2. Determination that failure to grant the variance would result in exceptional **"hardship"** to the

applicant; and

3. Determination that the granting of a variance will not result in increased flood heights, additional threats to public safety, or extraordinary public expense, create a nuisance (see **"Public safety and nuisance"**), cause **"fraud and victimization**" of the public, or conflict with existing local laws or ordinances.

C. Variances may be issued for new construction, substantial improvement, and other proposed new development necessary for the conduct of a functionally dependent use provided that the provisions of **Sections 6.3.A through 6.3.D** are satisfied and that the structure or other development is protected by methods that minimize flood damages during the base flood and does not result in additional threats to public safety and does not create a public nuisance.

D. Upon consideration of the factors of **Section 6.2.A** and the purposes of this ordinance, the **{community governing body}** may attach such conditions to the granting of variances as it deems necessary to further the purposes of this ordinance.

APPENDIX
Appendices

1.0 ALLUVIAL FAN ADVISORY

Hazards of Alluvial Fan Development

Alluvial fans present a unique flood hazard environment where the combination of sediment, slope, and topography create an ultra hazardous condition for which elevation on fill will not provide reliable protection. Active alluvial fan flooding is characterized by flow path uncertainty combined with abrupt deposition and erosion. As a result, any area of an alluvial fan may be subject to intense flood hazards.

The technology of mathematically modeling the hydrodynamics of water and debris flows for alluvial fans is still in the early development stage. The Federal Emergency Management Agency (FEMA) has formulated a mapping procedure for the purpose of defining the likelihood of flood hazards on inundated alluvial fan zones to be used for flood insurance purposes and general floodplain regulation, referred to as the FEMA alluvial fan methodology.

An active alluvial fan flooding hazard is indicated by three related criteria:

a. Flow path uncertainty below the hydrographic apex;

b. Abrupt deposition and ensuing erosion of sediment as a stream or debris flow loses its competence to carry material eroded from a steeper, upstream source area; and

c. An environment where the combination of sediment availability, slope, and topography creates an ultra hazardous condition for which elevation on fill will not reliably mitigate the risk.

Inactive alluvial fan flooding is similar to traditional riverine flood hazards, but occurs only on alluvial fans. It is characterized by flow paths with a higher degree of certainty in realistic assessments of flood risk or in the reliable mitigation of the hazard. Counter to active alluvial fan flooding hazards, an inactive alluvial fan flooding hazard is characterized by relatively stable flow paths. However, areas of inactive alluvial fan flooding, as with active alluvial fan flooding, may be subject to sediment deposition and erosion, but to a degree that does not cause flow path instability and uncertainty.

An alluvial fan may exhibit both active alluvial fan flooding and inactive alluvial fan flooding hazards. The hazards may vary spatially or vary at the same location, contingent on the level of flow discharge. Spatially, for example, upstream inactive portions of the alluvial fan may distribute flood flow to active areas at the distal part of the alluvial fan. Hazards may vary at the same location, for example, with a flow path that may be stable for lower flows, but become unstable at higher flows.

More detailed information can be found at FEMA's website: "Guidelines for Determining Flood Hazards on Alluvial Fans" at http://www.fema.gov/fhm/ft_afgd2.shtm#1.

Alluvial Fans and LOMR's

The NFIP does not allow for the removal of land from the floodplain based on the placement of fill (LOMR-F) in alluvial fan flood hazard areas. The NFIP will credit a major structural flood control project, through the LOMR process, that will effectively eliminate alluvial fan flood hazards from the protected area. Details about map revisions for alluvial fan areas can be found in the Code of Federal Regulations at Title 44, Part 65.13.

Alluvial Fan Task Force

As stated in AB 2141 (Longville, Chapter 878, Statutes of 2004), the State of California Department of Water Resources will convene an Alluvial Fan Task Force (AFTF). The AFTF will produce an alluvial fan model ordinance for local communities and a recommendations report to the legislature. As of March 2006, the model ordinance and report are projected to be completed by 2007.

2.0 HIGHER STANDARDS RECOMMENDED BY THE STATE OF CALIFORNIA

This model ordinance meets the minimum standards required to participate in the National Flood Insurance Program. Community adoption of higher standards can be applied towards credit under the Community Rating System (CRS) program and result in reduced premiums for all flood insurance policy holders within the entire community. The State of California recommends:

A. Freeboard.

- To elevate at least 2 feet above the minimum required base flood elevation, make the following changes:

  1. Modify Sections 5.1.C.1.a, 5.1.C.1.c, and 5.4.A.1 by replacing "elevated to or above" with "elevated 2 feet above."

  2. Modify Section 5.4.B.1 by replacing "at or above" with "at least 2 feet above."

  3. Replace Section 5.1.C.1.b with:

     In an AO zone, elevated above the highest adjacent grade to a height 2 feet above the depth number specified in feet on the FIRM, or elevated at least 4 feet above the highest adjacent grade if no depth number is specified.

B. Determining BFE's in Unnumbered A Zones.

- Replace "may" with "shall" in the second paragraph of Section 4.2.C to read:

  "NOTE: A base flood elevation shall…."

C. Determining Market Value of Existing Structures.

- Replace the "Market value" definition in Section 2 with:

  "**Market value**" shall be determined by estimating the cost to replace the structure in new condition and adjusting that cost figure by the amount of depreciation which has accrued since the structure was constructed.

  1. The cost of replacement of the structure shall be based on a square foot cost factor determined by reference to a building cost estimating guide recognized by the building construction industry.

  2. The amount of depreciation shall be determined by taking into account the age and physical deterioration of the structure and functional obsolescence as approved by the floodplain administrator, but shall not include economic or other forms of external obsolescence.

  Use of replacement costs or accrued depreciation factors different from those contained in recognized building cost estimating guides may be considered only if such factors are included in a report prepared by an independent professional appraiser and supported by a written explanation of the differences.

D. Increased Cost of Compliance (ICC) Coverage—Repetitive Loss Provisions.

This provision allows communities the opportunity for flood insurance policy holders to have ICC coverage made available in repetitive loss situations.

- Modify the definition of "Substantial damage" as follows:

  "**Substantial damage**" means:

  1. Damage of any origin sustained by a structure whereby the cost of restoring the structure to its before damaged condition would equal or exceed 50 percent of the market value of the structure before the damage occurred; or

  2. Flood-related damages sustained by a structure on two separate occasions during a 10-year period for which the cost of repairs at the time of each such event, on the average, equals or exceeds 25 percent of the market value of the structure before the damage occurred. This is also known as "repetitive loss."

E. Non-conversion of Enclosed Areas Below the Lowest Floor.

- Insert/add the following section as Section 4.2.J.

  A. Non-conversion of Enclosed Areas Below the Lowest Floor.

  To ensure that the areas below the BFE shall be used solely for parking vehicles, limited storage, or access to the building and not be finished for use as human habitation without first becoming fully compliant with the floodplain management ordinance in effect at the time of conversion, the Floodplain Administrator shall:

  1. Determine which applicants for new construction and/or substantial improvements have fully enclosed areas below the lowest floor that are 5 feet or higher;

  2. Enter into a "NON-CONVERSION AGREEMENT FOR CONSTRUCTION WITHIN FLOOD HAZARD AREAS" or equivalent with the **{name of county or municipality}**. The agreement shall be recorded with the **{name of county}** County Recorder as a deed restriction. The non-conversion agreement shall be in a form acceptable to the Floodplain Administrator and County Counsel; and

  3. Have the authority to inspect any area of a structure below the base flood elevation to ensure compliance upon prior notice of at least 72 hours.

3.0 SPECIAL REQUIREMENTS

A. Crawlspace Construction.

Communities with construction practices that result in crawl spaces with interior floors up to 2 feet below grade have historically been in violation of the NFIP requirements. FEMA Technical Bulletin 11-01 now provides accommodation for these practices.

- Remove the following from "Lowest floor" definition in Section 2:

  2. For residential structures, all subgrade enclosed areas are prohibited as they are considered to be basements (see **"Basement"** definition). This prohibition includes below-grade garages and storage areas.

- Add the following section into your ordinance at Section 5.1.C:

  5.1.C.{X} Crawlspace Construction.

  This sub-section applies to buildings with crawl spaces up to 2 feet below grade. Below-grade crawl space construction in accordance with the requirements listed below will not be considered basements.

  a. The building must be designed and adequately anchored to resist flotation, collapse, and lateral movement of the structure resulting from hydrodynamic and hydrostatic loads, including the effects of buoyancy. Crawl space construction is not allowed in areas with flood velocities greater than 5 feet per second unless the design is reviewed by a qualified design professional, such as a registered architect or professional engineer;

  b. The crawl space is an enclosed area below the BFE and, as such, must have openings that equalize hydrostatic pressures by allowing for the automatic entry and exit of floodwaters. For guidance on flood openings, see FEMA Technical Bulletin 1-93;

  c. Crawl space construction is not permitted in V zones. Open pile or column foundations that withstand storm surge and wave forces are required in V zones;

  d. Portions of the building below the BFE must be constructed with materials resistant to flood damage. This includes not only the foundation walls of the crawl space used to elevate the building, but also any joists, insulation, or other materials that extend below the BFE; and

  e. Any building utility systems within the crawl space must be elevated above BFE or designed so that floodwaters cannot enter or accumulate within the system components during flood conditions.

  f. Requirements for all below-grade crawl space construction, in addition to the above requirements, to include the following:

     1. The interior grade of a crawl space below the BFE must not be more than 2 feet below the lowest adjacent exterior grade (LAG), shown as D in figure 3 of Technical Bulletin 11-01;

2. The height of the below-grade crawl space, measured from the interior grade of the crawl space to the top of the crawl space foundation wall must not exceed 4 feet (shown as L in figure 3 of Technical Bulletin 11-01) at any point;

3. There must be an adequate drainage system that removes floodwaters from the interior area of the crawl space within a reasonable period of time after a flood event, not to exceed 72 hours; and

4. The velocity of floodwaters at the site should not exceed 5 feet per second for any crawl space. For velocities in excess of 5 feet per second, other foundation types should be used.

B. <u>Mudslide (i.e., Mudflow) Prone Areas</u>. (Zone M)

- Communities with mudslide prone areas shall insert the following:

1. Definitions to Section 2:

"**Area of special mudslide (i.e., mudflow) hazard**″ is the area subject to severe mudslides (i.e., mudflows). The area is designated as Zone M on the Flood Insurance Rate Map (FIRM).

″**Mudslide**″ describes a condition where there is a river, flow or inundation of liquid mud down a hillside, usually as a result of a dual condition of loss of brush cover and the subsequent accumulation of water on the ground, preceded by a period of unusually heavy or sustained rain.

″**Mudslide** (i.e., mudflow) **prone area**″ means an area with land surfaces and slopes of unconsolidated material where the history, geology, and climate indicate a potential for mudflow.

2. Section "**5.{X} <u>Mudslide (i.e., Mudflow) Prone Areas</u>**":

5.{X} <u>Mudslide (i.e., Mudflow) Prone Areas</u>.

A. The Floodplain Administrator shall review permits for proposed construction of other development to determine if it is proposed within a mudslide area.

B. Permits shall be reviewed to determine that the proposed site and improvement will be reasonably safe from mudslide hazards. Factors to be considered in making this determination include, but are not limited to:

1. The type and quality of soils;

2. Evidence of ground water or surface water problems;

3. Depth and quality of any fill;

4. Overall slope of the site; and

5. Weight that any proposed development will impose on the slope.

C. Within areas which may have mudslide hazards, the Floodplain Administrator shall require:

1. A site investigation and further review by persons qualified in geology and soils engineering;

2. The proposed grading, excavation, new construction, and substantial improvement be adequately designed and protected against mudslide damages;

3. The proposed grading, excavations, new construction, and substantial improvement not aggravate the existing hazard by creating either on-site or off-site disturbances; and

4. Drainage, planting, watering, and maintenance not endanger slope stability.

C. Erosion-prone areas. (Zone E)

- Communities with erosion prone areas shall insert the following:

1. Definitions into Section 2:

"**Area of special flood-related erosion hazard**" is the land within a community which is most likely to be subject to severe flood-related erosion losses. The area may be designated as Zone E on the Flood Insurance Rate Map (FIRM).

"**Flood-related erosion**" means the collapse or subsidence of land along the shore of a lake or other body of water as a result of undermining caused by waves or currents of water exceeding anticipated cyclical level or suddenly caused by an unusually high water level in a natural body of water, accompanied by a severe storm, or by an unanticipated force of nature, such as a flash flood or an abnormal tidal surge, or by some similarly unusually and unforeseeable event which results in flooding.

"**Flood-related erosion area**" or "**Flood-related erosion prone area**" means a land area adjoining the shore of a lake or other body of water, which due to the composition of the shoreline or bank and high water levels or wind-driven currents, is likely to suffer flood-related erosion damage.

"**Flood-related erosion area management**" means the operation of an overall program of corrective and preventive measures for reducing flood-related erosion damage, including but not limited to emergency preparedness plans, flood-related erosion control works, and floodplain management regulations.

2. Section "**5.{X} FLOOD-RELATED EROSION-PRONE AREA**" into Section 5:

5.{X} FLOOD-RELATED EROSION-PRONE AREA

A. The Floodplain Administrator shall require permits for proposed construction and other development within all flood-related erosion-prone areas known to the community.

B. Permit applications shall be reviewed to determine whether the proposed site alterations and improvements will be reasonably safe from flood-related erosion, and will not cause flood-related erosion hazards or otherwise aggravate the existing hazard.

C. If a proposed improvement is found to be in the path of flood-related erosion or would increase the erosion hazard, such improvement shall be relocated or adequate protective measures shall be taken to avoid aggravating the existing erosion hazard.

D. Within Zone E on the Flood Insurance Rate Map, a setback is required for all new development from the ocean, lake, bay, riverfront or other body of water to create a safety buffer consisting of a natural vegetative or contour strip. This buffer shall be designated according to the flood-related erosion hazard and erosion rate, in relation to the anticipated ″useful life″ of structures, and depending upon the geologic, hydrologic, topographic, and climatic characteristics of the land. The buffer may be used for suitable open space purposes, such as for agricultural, forestry, outdoor recreation and wildlife habitat areas, and for other activities using temporary and portable structures only.

Appendix E5

CALIFORNIA MODEL FLOODPLAIN MANAGEMENT ORDINANCE

Modified for Using Lower Base Flood Elevations and Zone D or Zone X (Shaded) Through the Use of Levee Relief Cuts

CALIFORNIA

MODEL

FLOODPLAIN MANAGEMENT

ORDINANCE

FOR
NONCOASTAL COMMUNITIES

December 2006

Modified for Using Lower Base Flood Elevations and Zone D or Zone X (Shaded) Through the Use of Levee Relief Cuts*

This California Model Floodplain Management Ordinance has been developed as a tool to help communities meet the minimum requirements of the National Flood Insurance Program (NFIP). Communities choosing not to use this model ordinance must ensure their ordinance meets the minimum requirements of the NFIP.

Department of Water Resources
The Resources Agency, State of California

*Modifications are shown in blue text with strikeout and underline

Table of Contents

Instructions for Creating Your Community's Ordinance

1) **PROVIDE COMMUNITY SPECIFIC INFORMATION AS REQUESTED IN BRACKETS.**
This model ordinance contains **{brackets}** that must be replaced with community specific information such as your community's name, address, or name of the responsible party.

2) **ACCESSORY STRUCTURES.**
This model ordinance contains the definition for accessory structures and construction requirements in Section 5.1.C.5 to allow for the permitting of an "**Accessory structure**" within special flood hazard areas **without a variance**.

3) **UPDATE CROSS REFERENCES.**
Cross references and bracketed items throughout this document are underlined in red and bolded only to facilitate locating to ensure changes are made and to match actual numbering used by your community and not intended to reflect a suggested final format.

4) **DETERMINE IF YOUR COMMUNITY WANTS TO ADOPT HIGHER STANDARDS RECOMMENDED BY THE STATE OF CALIFORNIA.**
This model ordinance meets the minimum standards required to participate in the National Flood Insurance Program. Community adoption of higher standards can be applied towards credit under the Community Rating System (CRS) program and result in reduced premiums for the entire community. The State of California recommends:

   - **Freeboard.** See Appendix 2.0.A, page 2~~2~~7.
   - **Determining BFE's in Unnumbered A Zones.** See Appendix 2.0.B, page 2~~2~~7.
   - **Determining Market Value of Existing Structures.** See Appendix 2.0.C, page 2~~2~~7.
   - **Increased Cost of Compliance (ICC) Coverage—Repetitive Loss Provisions.** See Appendix 2.0.D, page 2~~3~~7.
   - **Non-conversion of Enclosed Areas Below the Lowest Floor.** See Appendix 2.0.E, page 2~~3~~8.

5) **DETERMINE IF YOUR COMMUNITY HAS SPECIAL REQUIREMENTS**

   - **Alluvial Fan Advisory.**
     See Appendix 1.0, page 2~~1~~5.
   - **Crawlspace Construction.**
     See Appendix 3.0.A, page 249.
   - **Mudslide (i.e., mudflow) Prone Areas.** (Zone M)
     See Appendix 3.0.B, page ~~25~~30.
   - **Erosion Prone Areas.** (Zone E)
     See Appendix 3.0.C, page ~~26~~31.

6) **PRIOR TO ADOPTION, SUBMIT DRAFT TO:**

   - Other community departments, including Attorney's office.

- Department of Water Resources or FEMA Region IX for review and approval.

7) **AFTER ADOPTION, SEND A COPY OF THE ADOPTED ORDINANCE CERTIFIED BY THE CITY/COUNTY CLERK TO FEMA REGION IX AND A COPY TO DWR.**

SECTION 1.0
STATUTORY AUTHORIZATION, FINDINGS OF FACT, PURPOSE AND METHODS

1.1 STATUTORY AUTHORIZATION.

The Legislature of the State of California has in Government Code Sections 65302, 65560, and 65800 conferred upon local governments the authority to adopt regulations designed to promote the public health, safety, and general welfare of its citizenry. Therefore, the **{community governing body}** of **{name of county or municipality}** does hereby adopt the following floodplain management regulations.

1.2 FINDINGS OF FACT.

A. The flood hazard areas of **{name of county or municipality}** are subject to periodic inundation which results in loss of life and property, health and safety hazards, disruption of commerce and governmental services, extraordinary public expenditures for flood protection and relief, and impairment of the tax base, all of which adversely affect the public health, safety, and general welfare.

B. These flood losses are caused by uses that are inadequately elevated, floodproofed, or protected from flood damage. The cumulative effect of obstructions in areas of special flood hazards which increase flood heights and velocities also contributes to flood losses.

1.3 STATEMENT OF PURPOSE.

It is the purpose of this ordinance to promote the public health, safety, and general welfare, and to minimize public and private losses due to flood conditions in specific areas by legally enforceable regulations applied uniformly throughout the community to all publicly and privately owned land within flood prone, mudslide [i.e. mudflow] or flood related erosion areas. These regulations are designed to:

A. Protect human life and health;

B. Minimize expenditure of public money for costly flood control projects;

C. Minimize the need for rescue and relief efforts associated with flooding and generally undertaken at the expense of the general public;

D. Minimize prolonged business interruptions;

E. Minimize damage to public facilities and utilities such as water and gas mains; electric, telephone and sewer lines; and streets and bridges located in areas of special flood hazard;

F. Help maintain a stable tax base by providing for the sound use and development of areas of special flood hazard so as to minimize future blighted areas caused by flood damage;

G. Ensure that potential buyers are notified that property is in an area of special flood hazard; and

H. Ensure that those who occupy the areas of special flood hazard assume responsibility for their actions.

1.4 METHODS OF REDUCING FLOOD LOSSES.

In order to accomplish its purposes, this ordinance includes regulations to:

A. Restrict or prohibit uses which are dangerous to health, safety, and property due to water or erosion hazards, or which result in damaging increases in erosion or flood heights or velocities;

B. Require that uses vulnerable to floods, including facilities which serve such uses, be protected against flood damage at the time of initial construction;

C. Control the alteration of natural floodplains, stream channels, and natural protective barriers, which help accommodate or channel floodwaters;

D. Control filling, grading, dredging, and other development which may increase flood damage;

E. Prevent or regulate the construction of flood barriers which will unnaturally divert floodwaters or which may increase flood hazards in other areas; and

SECTION 2.0
DEFINITIONS

Unless specifically defined below, words or phrases used in this ordinance shall be interpreted so as to give them the meaning they have in common usage and to give this ordinance its most reasonable application.

"**A zone**" - see "**Special flood hazard area**".

"**Accessory structure**" means a structure that is either:

1. Solely for the parking of no more than 2 cars; or

2. A small, low cost shed for limited storage, less than 150 square feet and $1,500 in value.

"**Accessory use**" means a use which is incidental and subordinate to the principal use of the parcel of land on which it is located.

"Agricultural structure" means a structure used solely for agricultural purposes in which the use is exclusively in connection with the production, harvesting, storage, drying, or raising, of agricultural commodities, including the raising of livestock.

"**Alluvial fan**" means a geomorphologic feature characterized by a cone or fan-shaped deposit of boulders, gravel, and fine sediments that have been eroded from mountain slopes, transported by flood flows, and then deposited on the valley floors, and which is subject to flash flooding, high velocity flows, debris flows, erosion, sediment movement and deposition, and channel migration.

"**Apex**" means a point on an alluvial fan or similar landform below which the flow path of the major stream that formed the fan becomes unpredictable and alluvial fan flooding can occur.

"**Appeal**" means a request for a review of the Floodplain Administrator's interpretation of any provision of this ordinance.

"**Area of shallow flooding**" means a designated AO or AH Zone on the Flood Insurance Rate Map (FIRM). The base flood depths range from one to three feet; a clearly defined channel does not exist; the path of flooding is unpredictable and indeterminate; and velocity flow may be evident. Such flooding is characterized by ponding or sheet flow.

"**Area of special flood hazard**" - See "Special flood hazard area."

"**Base flood**" means a flood which has a one percent chance of being equaled or exceeded in any given year (also called the "100-year flood"). Base flood is the term used throughout this ordinance.

"**Base flood elevation**" (BFE) means the elevation shown on the Flood Insurance Rate Map for Zones AE, AH, A1-30, VE and V1-V30 that indicates the water surface elevation resulting from a flood that has a 1-percent or greater chance of being equaled or exceeded in any given year.

"**Basement**" means any area of the building having its floor subgrade - i.e., below ground level - on all sides.

"**Building**" - see "**Structure**".

"**Development**" means any man-made change to improved or unimproved real estate, including but not limited to buildings or other structures, mining, dredging, filling, grading, paving, excavation or drilling operations or storage of equipment or materials.

"**Encroachment**" means the advance or infringement of uses, plant growth, fill, excavation, buildings, permanent structures or development into a floodplain which may impede or alter the flow capacity of a floodplain.

"**Existing manufactured home park or subdivision**" means a manufactured home park or subdivision for which the construction of facilities for servicing the lots on which the manufactured homes are to be affixed (including, at a minimum, the installation of utilities, the construction of streets, and either final site grading or the pouring of concrete pads) is completed before **{insert date your first floodplain management ordinance was adopted}**.

"**Expansion to an existing manufactured home park or subdivision**" means the preparation of additional sites by the construction of facilities for servicing the lots on which the manufactured homes are to be affixed (including the installation of utilities, the construction of streets, and either final site grading or the pouring of concrete pads).

"**Flood, flooding, or flood water**" means:

1. A general and temporary condition of partial or complete inundation of normally dry land areas from the overflow of inland or tidal waters; the unusual and rapid accumulation or runoff of surface waters from any source; and/or mudslides (i.e., mudflows); and

2. The condition resulting from flood-related erosion.

"**Flood Boundary and Floodway Map (FBFM)**" means the official map on which the Federal Emergency Management Agency or Federal Insurance Administration has delineated both the areas of special flood hazards and the floodway.

"**Flood Insurance Rate Map (FIRM)**" means the official map on which the Federal Emergency Management Agency or Federal Insurance Administration has delineated both the areas of special flood hazards and the risk premium zones applicable to the community.

"**Flood Insurance Study**" means the official report provided by the Federal Insurance Administration that includes flood profiles, the Flood Insurance Rate Map, the Flood Boundary and Floodway Map, and the water surface elevation of the base flood.

"**Floodplain or flood-prone area**" means any land area susceptible to being inundated by water from any source - see "**Flooding**."

"**Floodplain Administrator**" is the community official designated by title to administer and enforce the floodplain management regulations.

"**Floodplain management**" means the operation of an overall program of corrective and preventive measures for reducing flood damage and preserving and enhancing, where possible, natural resources in the floodplain, including but not limited to emergency preparedness plans, flood control works, floodplain management regulations, and open space plans.

"**Floodplain management regulations**" means this ordinance and other zoning ordinances, subdivision regulations, building codes, health regulations, special purpose ordinances (such as grading and erosion control) and other application of police power which control development in flood-prone areas. This term

describes federal, state or local regulations in any combination thereof which provide standards for preventing and reducing flood loss and damage.

"**Floodproofing**" means any combination of structural and nonstructural additions, changes, or adjustments to structures which reduce or eliminate flood damage to real estate or improved real property, water and sanitary facilities**,** structures, and their contents. For guidelines on dry and wet floodproofing, see FEMA Technical Bulletins TB 1-93, TB 3-93, and TB 7-93.

"**Floodway**" means the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than one foot. Also referred to as "Regulatory Floodway."

"**Floodway fringe**" is that area of the floodplain on either side of the "Regulatory Floodway" where encroachment may be permitted.

"**Fraud and victimization**" as related to **Section 6.0** of this ordinance, means that the variance granted must not cause fraud on or victimization of the public. In examining this requirement, the **{community governing body}** will consider the fact that every newly constructed building adds to government responsibilities and remains a part of the community for fifty to one-hundred years. Buildings that are permitted to be constructed below the base flood elevation are subject during all those years to increased risk of damage from floods, while future owners of the property and the community as a whole are subject to all the costs, inconvenience, danger, and suffering that those increased flood damages bring. In addition, future owners may purchase the property, unaware that it is subject to potential flood damage, and can be insured only at very high flood insurance rates.

"**Functionally dependent use**" means a use which cannot perform its intended purpose unless it is located or carried out in close proximity to water. The term includes only docking facilities, port facilities that are necessary for the loading and unloading of cargo or passengers, and ship building and ship repair facilities, and does not include long-term storage or related manufacturing facilities.

"**Governing body**" is the local governing unit, i.e. county or municipality, that is empowered to adopt and implement regulations to provide for the public health, safety and general welfare of its citizenry.

"**Hardship**" as related to **Section 6** of this ordinance means the exceptional hardship that would result from a failure to grant the requested variance. The **{community governing body}** requires that the variance be exceptional, unusual, and peculiar to the property involved. Mere economic or financial hardship alone is not exceptional. Inconvenience, aesthetic considerations, physical handicaps, personal preferences, or the disapproval of one's neighbors likewise cannot, as a rule, qualify as an exceptional hardship. All of these problems can be resolved through other means without granting a variance, even if the alternative is more expensive, or requires the property owner to build elsewhere or put the parcel to a different use than originally intended.

"**Highest adjacent grade**" means the highest natural elevation of the ground surface prior to construction next to the proposed walls of a structure.

"**Historic structure**" means any structure that is:

1. Listed individually in the National Register of Historic Places (a listing maintained by the Department of Interior) or preliminarily determined by the Secretary of the Interior as meeting the requirements for individual listing on the National Register;

2. Certified or preliminarily determined by the Secretary of the Interior as contributing to the historical

significance of a registered historic district or a district preliminarily determined by the Secretary to qualify as a registered historic district;

3. Individually listed on a state inventory of historic places in states with historic preservation programs which have been approved by the Secretary of Interior; or

4. Individually listed on a local inventory of historic places in communities with historic preservation programs that have been certified either by an approved state program as determined by the Secretary of the Interior or directly by the Secretary of the Interior in states without approved programs.

"**Levee**" means a man-made structure, usually an earthen embankment, designed and constructed in accordance with sound engineering practices to contain, control or divert the flow of water so as to provide protection from temporary flooding.

"**Levee system**" means a flood protection system which consists of a levee, or levees, and associated structures, such as closure and drainage devices, which are constructed and operated in accord with sound engineering practices.
"**Lowest floor**" means the lowest floor of the lowest enclosed area, including basement (see **"Basement"** definition).

1. An unfinished or flood resistant enclosure below the lowest floor that is usable solely for parking of vehicles, building access or storage in an area other than a basement area, is not considered a building's lowest floor provided it conforms to applicable non-elevation design requirements, including, but not limited to:

   a. The flood openings standard in **Section 5.1.C.3**;

   b. The anchoring standards in **Section 5.1.A**;

   c. The construction materials and methods standards in **Section 5.1.B**; and

   d. The standards for utilities in **Section 5.2**.

2. For residential structures, all subgrade enclosed areas are prohibited as they are considered to be basements (see **"Basement"** definition). This prohibition includes below-grade garages and storage areas.

"**Manufactured home**" means a structure, transportable in one or more sections, which is built on a permanent chassis and is designed for use with or without a permanent foundation when attached to the required utilities. The term "manufactured home" does not include a "recreational vehicle".

"**Manufactured home park or subdivision**" means a parcel (or contiguous parcels) of land divided into two or more manufactured home lots for rent or sale.

> **"**Market value**" is defined in the** {name of county or municipality} **substantial damage/improvement procedures. See** Section 4.2.B.1**.**

"**Mean sea level**" means, for purposes of the National Flood Insurance Program, the National Geodetic Vertical Datum (NGVD) of 1929, North American Vertical Datum (NAVD) of 1988, or other datum, to which base flood elevations shown on a community's Flood Insurance Rate Map are referenced.

"**New construction**", for floodplain management purposes, means structures for which the "start of construction" commenced on or after **{insert date your first floodplain management ordinance was adopted}**, and includes any subsequent improvements to such structures.

"**New manufactured home park or subdivision**" means a manufactured home park or subdivision for which the construction of facilities for servicing the lots on which the manufactured homes are to be affixed (including at a minimum, the installation of utilities, the construction of streets, and either final site grading or the pouring of concrete pads) is completed on or after **{insert date your first floodplain management ordinance was adopted}**.

"Non-agricultural structure" means a structure that is not an agricultural structure.

"**Obstruction**" includes, but is not limited to, any dam, wall, wharf, embankment, levee, dike, pile, abutment, protection, excavation, channelization, bridge, conduit, culvert, building, wire, fence, rock, gravel, refuse, fill, structure, vegetation or other material in, along, across or projecting into any watercourse which may alter, impede, retard or change the direction and/or velocity of the flow of water, or due to its location, its propensity to snare or collect debris carried by the flow of water, or its likelihood of being carried downstream.

"**One-hundred-year flood**" or "100-year flood" - see "**Base flood**."

"**Program deficiency**" means a defect in a community's floodplain management regulations or administrative procedures that impairs effective implementation of those floodplain management regulations.

"**Public safety and nuisance**" as related to **Section 6** of this ordinance, means that the granting of a variance must not result in anything which is injurious to safety or health of an entire community or neighborhood, or any considerable number of persons, or unlawfully obstructs the free passage or use, in the customary manner, of any navigable lake, or river, bay, stream, canal, or basin.

"**Recreational vehicle**" means a vehicle which is:

1. Built on a single chassis;

2. 400 square feet or less when measured at the largest horizontal projection;

3. Designed to be self-propelled or permanently towable by a light-duty truck; and

4. Designed primarily not for use as a permanent dwelling but as temporary living quarters for recreational, camping, travel, or seasonal use.

"**Regulatory floodway**" means the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than one foot.

"**Remedy a violation**" means to bring the structure or other development into compliance with State or local floodplain management regulations, or if this is not possible, to reduce the impacts of its noncompliance. Ways that impacts may be reduced include protecting the structure or other affected development from flood damages, implementing the enforcement provisions of the ordinance or otherwise deterring future similar violations, or reducing State or Federal financial exposure with regard to the structure or other development.

"Relief Cut" means temporary removal or lowering of a levee segment to reduce depth, extent, and/or duration of floodwaters following an upstream levee failure or overtopping.

"**Riverine**" means relating to, formed by, or resembling a river (including tributaries), stream, brook, etc.

"**Sheet flow area**" - see "**Area of shallow flooding**."

"**Special flood hazard area (SFHA)**" means an area in the floodplain subject to a 1 percent or greater chance of flooding in any given year. It is shown on an FHBM or FIRM as Zone A, AO, A1-A30, AE, A99, or, AH.

"**Start of construction**" includes substantial improvement and other proposed new development and means the date the building permit was issued, provided the actual start of construction, repair, reconstruction, rehabilitation, addition, placement, or other improvement was within 180 days from the date of the permit. The actual start means either the first placement of permanent construction of a structure on a site, such as the pouring of slab or footings, the installation of piles, the construction of columns, or any work beyond the stage of excavation; or the placement of a manufacture home on a foundation. Permanent construction does not include land preparation, such as clearing, grading, and filling; nor does it include the installation of streets and/or walkways; nor does it include excavation for a basement, footings, piers, or foundations or the erection of temporary forms; nor does it include the installation on the property of accessory buildings, such as garages or sheds not occupied as dwelling units or not part of the main structure. For a substantial improvement, the actual start of construction means the first alteration of any wall, ceiling, floor, or other structural part of a building, whether or not that alteration affects the external dimensions of the building.

"**Structure**" means a walled and roofed building that is principally above ground; this includes a gas or liquid storage tank or a manufactured home.

"**Substantial damage**" means damage of any origin sustained by a structure whereby the cost of restoring the structure to its before damaged condition would equal or exceed 50 percent of the market value of the structure before the damage occurred.

"**Substantial improvement**" means any reconstruction, rehabilitation, addition, or other improvement of a structure, the cost of which equals or exceeds 50 percent of the market value of the structure before the "start of construction" of the improvement. This term includes structures which have incurred "substantial damage", regardless of the actual repair work performed. The term does not, however, include either:

1. Any project for improvement of a structure to correct existing violations or state or local health, sanitary, or safety code specifications which have been identified by the local code enforcement official and which are the minimum necessary to assure safe living conditions; or

2. Any alteration of a "historic structure," provided that the alteration will not preclude the structure's continued designation as a "historic structure."

"**Variance**" means a grant of relief from the requirements of this ordinance which permits construction in a manner that would otherwise be prohibited by this ordinance.

"**Violation**" means the failure of a structure or other development to be fully compliant with this ordinance. A structure or other development without the elevation certificate, other certifications, or other evidence of compliance required in this ordinance is presumed to be in violation until such time as that documentation is provided.

"**Water surface elevation**" means the height, in relation to the National Geodetic Vertical Datum (NGVD) of 1929, North American Vertical Datum (NAVD) of 1988, or other datum, of floods of various magnitudes and frequencies in the floodplains of coastal or riverine areas.

"**Watercourse**" means a lake, river, creek, stream, wash, arroyo, channel or other topographic feature on or over which waters flow at least periodically. Watercourse includes specifically designated areas in which substantial flood damage may occur.

"**Zone D local flood hazard area due to a relief cut**" means a federally defined Zone D area of undetermined flood risk behind a levee system not identified as a special flood hazard area on the FIRM due to the planned use of a relief cut to reduce the extent of the inundation area. A Zone D local flood hazard area due to a relief cut is not identified as a special flood hazard area or as Zone X (Shaded) on the FIRM because the relief cut will reduce the BFE to be below the elevation of natural ground, but the relief cut is a planned temporary condition and not as reliable as a permanent structure. Floodplain management regulations for the Zone D local flood hazard area due to a relief cut are similar to the regulations for a special flood hazard area, with the exception of regulations for agricultural structures.

"**Zone X (Shaded) local flood hazard area due to a relief cut**" means a federally defined Zone X (Shaded) area of moderate flood risk behind a levee system not identified as a special flood hazard area on the FIRM due to the planned use of a relief cut to reduce the extent of the inundation area. A Zone X (Shaded) local flood hazard area due to a relief cut is not identified as a special flood hazard area on the FIRM because the relief cut will reduce the BFE to be below the elevation of natural ground. But it is managed through the floodplain management ordinance as Zone X (Shaded) local flood hazard area due to a relief cut, instead of Zone X (Shaded), because the relief cut is a planned temporary condition and not as reliable as a permanent structure. Floodplain management regulations for the Zone X (Shaded) local flood hazard area due to a relief cut are similar to the regulations for a special flood hazard area, with the exception of regulations for agricultural structures.

SECTION 3.0
GENERAL PROVISIONS

3.1 LANDS TO WHICH THIS ORDINANCE APPLIES.

This ordinance shall apply to all areas of special flood hazards within the jurisdiction of **{name of county or municipality}**.

3.2 BASIS FOR ESTABLISHING THE AREAS OF SPECIAL FLOOD HAZARD.

The areas of special flood hazard identified by the Federal Emergency Management Agency (FEMA) in the "Flood Insurance Study (FIS) for **{name of county or municipality (exact title of study)}"** dated **{date}**, with accompanying Flood Insurance Rate Maps (FIRM's) and Flood Boundary and Floodway Maps (FBFM's), dated **{date}**, and all subsequent amendments and/or revisions, are hereby adopted by reference and declared to be a part of this ordinance. This FIS and attendant mapping is the minimum area of applicability of this ordinance and may be supplemented by studies for other areas which allow implementation of this ordinance and which are recommended to the **{community governing body}** by the Floodplain Administrator. The study, FIRM's and FBFM's are on file at **{department, address}**. Zone D local flood hazard area due to a relief cut and Zone X (Shaded) local flood hazard area due to a relief cut are identified as Zone D and Zone X (Shaded) on a FIRM and on maps on file in the Office of the Floodplain Administrator.

3.3 COMPLIANCE.

No structure or land shall hereafter be constructed, located, extended, converted, or altered without full compliance with the terms of this ordinance and other applicable regulations. Violation of the requirements (including violations of conditions and safeguards) shall constitute a misdemeanor. Nothing herein shall prevent the **{community governing body}** from taking such lawful action as is necessary to prevent or remedy any violation.

3.4 ABROGATION AND GREATER RESTRICTIONS.

This ordinance is not intended to repeal, abrogate, or impair any existing easements, covenants, or deed restrictions. However, where this ordinance and another ordinance, easement, covenant, or deed restriction conflict or overlap, whichever imposes the more stringent restrictions shall prevail.

3.5 INTERPRETATION.

In the interpretation and application of this ordinance, all provisions shall be:

A. Considered as minimum requirements;

B. Liberally construed in favor of the governing body; and

C. Deemed neither to limit nor repeal any other powers granted under state statutes.

3.6 WARNING AND DISCLAIMER OF LIABILITY.

The degree of flood protection required by this ordinance is considered reasonable for regulatory purposes and is based on scientific and engineering considerations. Larger floods can and will occur on rare occasions. Flood heights may be increased by man-made or natural causes. This ordinance does not imply that land outside the areas of special flood hazards and local flood hazards or uses permitted within such areas will be free from flooding or flood damages. This ordinance shall not create liability on the part of

{community governing body}, any officer or employee thereof, the State of California, or the Federal Emergency Management Agency, for any flood damages that result from reliance on this ordinance or any administrative decision lawfully made hereunder.

3.7 SEVERABILITY.

This ordinance and the various parts thereof are hereby declared to be severable. Should any section of this ordinance be declared by the courts to be unconstitutional or invalid, such decision shall not affect the validity of the ordinance as a whole, or any portion thereof other than the section so declared to be unconstitutional or invalid.

SECTION 4.0
ADMINISTRATION

4.1 DESIGNATION OF THE FLOODPLAIN ADMINISTRATOR.

The **{e.g., City Manager, Director of Planning, Public Works, or Building Official, etc.}** is hereby appointed to administer, implement, and enforce this ordinance by granting or denying development permits in accord with its provisions.

4.2 DUTIES AND RESPONSIBILITIES OF THE FLOODPLAIN ADMINISTRATOR.

The duties and responsibilities of the Floodplain Administrator shall include, but not be limited to the following:

A. Permit Review.

Review all development permits to determine:

1. Permit requirements of this ordinance have been satisfied, including determination of substantial improvement and substantial damage of existing structures;

2. All other required state and federal permits have been obtained;

3. The site is reasonably safe from flooding;

4. The proposed development does not adversely affect the carrying capacity of areas where base flood elevations have been determined but a floodway has not been designated. This means that the cumulative effect of the proposed development when combined with all other existing and anticipated development will not increase the water surface elevation of the base flood more than 1 foot at any point within the **{name of county or municipality}**; and

5. All Letters of Map Revision (LOMR's) for flood control projects are approved prior to the issuance of building permits. Building Permits must not be issued based on Conditional Letters of Map Revision (CLOMR's). Approved CLOMR's allow construction of the proposed flood control project and land preparation as specified in the "start of construction" definition.

B. Development of Substantial Improvement and Substantial Damage Procedures.

1. Using FEMA publication FEMA 213, "Answers to Questions About Substantially Damaged Buildings," develop detailed procedures for identifying and administering requirements for substantial improvement and substantial damage, to include defining "Market Value."

2. Assure procedures are coordinated with other departments/divisions and implemented by community staff.

C. Review, Use and Development of Other Base Flood Data.

When base flood elevation data has not been provided in accordance with **Section 3.2**, the Floodplain Administrator shall obtain, review, and reasonably utilize any base flood elevation and floodway data available from a federal or state agency, or other source, in order to administer **Section 5**. For Zone D local flood hazard area due to a relief cut and Zone X (Shaded) local flood hazard area due to a relief cut, the Floodplain Administrator shall reasonably utilize any

base flood elevation and floodway data from the most recent Flood Insurance Study and FIRM that previously showed the area as a special flood hazard area; this base flood elevation information shall be used for construction and substantial improvements of non-agricultural structures.

NOTE: A base flood elevation may be obtained using one of two methods from the FEMA publication, FEMA 265, "Managing Floodplain Development in Approximate Zone A Areas – A Guide for Obtaining and Developing Base (100-year) Flood Elevations" dated July 1995.

D. Notification of Other Agencies.

1. Alteration or relocation of a watercourse:

   a. Notify adjacent communities and the California Department of Water Resources prior to alteration or relocation;

   b. Submit evidence of such notification to the Federal Emergency Management Agency; and

   c. Assure that the flood carrying capacity within the altered or relocated portion of said watercourse is maintained.

2. Base Flood Elevation changes due to physical alterations:

   a. Within 6 months of information becoming available or project completion, whichever comes first, the floodplain administrator shall submit or assure that the permit applicant submits technical or scientific data to FEMA for a Letter of Map Revision (LOMR).

   b. All LOMR's for flood control projects are approved prior to the issuance of building permits. Building Permits must not be issued based on Conditional Letters of Map Revision (CLOMR's). Approved CLOMR's allow construction of the proposed flood control project and land preparation as specified in the "start of construction" definition.

   Such submissions are necessary so that upon confirmation of those physical changes affecting flooding conditions, risk premium rates and floodplain management requirements are based on current data.

3. Changes in corporate boundaries:

   Notify FEMA in writing whenever the corporate boundaries have been modified by annexation or other means and include a copy of a map of the community clearly delineating the new corporate limits.

E. Documentation of Floodplain Development.

Obtain and maintain for public inspection and make available as needed the following:

1. Certification required by **Section 5.1.C.1 and Section 5.4** (lowest floor elevations);

2. Certification required by **Section 5.1.C.2** (elevation or floodproofing of nonresidential structures);

3. Certification required by **Sections 5.1.C.3** (wet floodproofing standard);

4. Certification of elevation required by **Section 5.3.A.3** (subdivisions and other proposed development standards);

5. Certification required by **Section 5.6.B** (floodway encroachments); and

6. Maintain a record of all variance actions, including justification for their issuance, and report such variances issued in its biennial report submitted to the Federal Emergency Management Agency.

F. Map Determination.

Make interpretations where needed, as to the exact location of the boundaries of the areas of special flood hazard, where there appears to be a conflict between a mapped boundary and actual field conditions. The person contesting the location of the boundary shall be given a reasonable opportunity to appeal the interpretation as provided in **Section 4.4**.

F. Remedial Action.

Take action to remedy violations of this ordinance as specified in **Section 3.3**.

G. Biennial Report.

Complete and submit Biennial Report to FEMA.

H. Planning.

Assure community's General Plan is consistent with floodplain management objectives herein.

4.3 DEVELOPMENT PERMIT.

A development permit shall be obtained before any construction or other development, including manufactured homes, within any area of special flood hazard established in **Section 3.2**. Application for a development permit shall be made on forms furnished by the **{name of community}**. The applicant shall provide the following minimum information:

A. Plans in duplicate, drawn to scale, showing:

1. Location, dimensions, and elevation of the area in question, existing or proposed structures, storage of materials and equipment and their location;
2. Proposed locations of water supply, sanitary sewer, and other utilities;
3. Grading information showing existing and proposed contours, any proposed fill, and drainage facilities;
4. Location of the regulatory floodway when applicable;
5. Base flood elevation information as specified in **Section 3.2 or Section 4.2.C**;
6. Proposed elevation in relation to mean sea level, of the lowest floor (including basement) of all structures; and
7. Proposed elevation in relation to mean sea level to which any nonresidential structure will be floodproofed, as required in **Section 5.1.C.2** of this ordinance and detailed in FEMA Technical Bulletin TB 3-93.

B. Certification from a registered civil engineer or architect that the nonresidential floodproofed building meets the floodproofing criteria in **Section 5.1.C.2**.

C. For a crawl-space foundation, location and total net area of foundation openings as required in **Section 5.1.C.3** of this ordinance and detailed in FEMA Technical Bulletins 1-93 and 7-93.

D. Description of the extent to which any watercourse will be altered or relocated as a result of proposed development.

E. All appropriate certifications listed in **Section 4.2.E** of this ordinance.

4.4 APPEALS.

The **{community governing body}** of **{name of county or municipality}** shall hear and decide appeals when it is alleged there is an error in any requirement, decision, or determination made by the Floodplain Administrator in the enforcement or administration of this ordinance.

SECTION 5.0
PROVISIONS FOR FLOOD HAZARD REDUCTION

5.1 STANDARDS OF CONSTRUCTION.

In all areas of special flood hazards the following standards are required:

A. Anchoring.

All new construction and substantial improvements of structures, including manufactured homes, and including non-agricultural structures in a Zone D local flood hazard area due to a relief cut and a Zone X (Shaded) local flood hazard areas due to a relief cut, shall be adequately anchored to prevent flotation, collapse or lateral movement of the structure resulting from hydrodynamic and hydrostatic loads, including the effects of buoyancy.

B. Construction Materials and Methods.

All new construction and substantial improvements of structures, including manufactured homes, and including non-agricultural structures in a Zone D local flood hazard area due to a relief cut and a Zone X (Shaded) local flood hazard area due to a relief cut, shall be constructed:

1. With flood resistant materials**,** and utility equipment resistant to flood damage for areas below the base flood elevation;

2. Using methods and practices that minimize flood damage;

3. With electrical, heating, ventilation, plumbing and air conditioning equipment and other service facilities that are designed and/or located so as to prevent water from entering or accumulating within the components during conditions of flooding; and

4. Within Zones AH or AO, so that there are adequate drainage paths around structures on slopes to guide flood waters around and away from proposed structures.

C. Elevation and Floodproofing.

1. **Residential construction.**

   All new construction or substantial improvements of residential structures shall have the lowest floor, including basement:

   a. In AE, AH, A1-30 Zones, elevated to or above the base flood elevation.

   b. In an AO zone, elevated above the highest adjacent grade to a height equal to or exceeding the depth number specified in feet on the FIRM, or elevated at least 2 feet above the highest adjacent grade if no depth number is specified.

   c. In an A zone, without BFE's specified on the FIRM [unnumbered A zone], elevated to or above the base flood elevation; as determined under **Section 4.2.C**.

   Upon the completion of the structure, the elevation of the lowest floor, including basement, shall be certified by a registered civil engineer or licensed land surveyor, and verified by the

community building inspector to be properly elevated. Such certification and verification shall be provided to the Floodplain Administrator.

2. **Nonresidential construction.**

   All new construction or substantial improvements of nonresidential structures, including non-agricultural structures in a Zone D local flood hazard area due to a relief cut and a Zone X (Shaded) local flood hazard area due to a relief cut, shall either be elevated to conform with **Section 5.1.C.1** or:

   a. Be floodproofed, together with attendant utility and sanitary facilities, below the elevation recommended under **Section 5.1.C.1**, so that the structure is watertight with walls substantially impermeable to the passage of water;

   b. Have structural components capable of resisting hydrostatic and hydrodynamic loads and effects of buoyancy; and

   c. Be certified by a registered civil engineer or architect that the standards of **Section 5.1 C.2.a & b** are satisfied. Such certification shall be provided to the Floodplain Administrator.

3. **Flood openings.**

   All new construction and substantial improvements of structures with fully enclosed areas below the lowest floor (excluding basements and excluding agricultural structures in a Zone D local flood hazard area due to a relief cut and a Zone X (Shaded) local flood hazard area due to a relief cut) that are usable solely for parking of vehicles, building access or storage, and which are subject to flooding, shall be designed to automatically equalize hydrostatic flood forces on exterior walls by allowing for the entry and exit of floodwater. Designs for meeting this requirement must meet the following minimum criteria:

   a. For non-engineered openings:

      1. Have a minimum of two openings on different sides having a total net area of not less than one square inch for every square foot of enclosed area subject to flooding;

      2. The bottom of all openings shall be no higher than one foot above grade;

      3. Openings may be equipped with screens, louvers, valves or other coverings or devices provided that they permit the automatic entry and exit of floodwater; and

      4. Buildings with more than one enclosed area must have openings on exterior walls for each area to allow flood water to directly enter; or

   b. Be certified by a registered civil engineer or architect.

4. **Manufactured homes**.

   a. See **Section 5.4**.

5. **Garages and low cost accessory structures.**

a. Attached garages.

1. A garage attached to a residential structure, constructed with the garage floor slab below the BFE, must be designed to allow for the automatic entry of flood waters. See Section 5.1.C.3. Areas of the garage below the BFE must be constructed with flood resistant materials. See Section 5.1.B.

2. A garage attached to a nonresidential structure must meet the above requirements or be dry floodproofed. For guidance on below grade parking areas, see FEMA Technical Bulletin TB-6.

b. Detached garages and accessory structures.

1. "Accessory structures" used solely for parking (2 car detached garages or smaller) or limited storage (small, low-cost sheds), as defined in Section 2, may be constructed such that its floor is below the base flood elevation (BFE), provided the structure is designed and constructed in accordance with the following requirements:

a) Use of the accessory structure must be limited to parking or limited storage;

b) The portions of the accessory structure located below the BFE must be built using flood-resistant materials;

c) The accessory structure must be adequately anchored to prevent flotation, collapse and lateral movement;

d) Any mechanical and utility equipment in the accessory structure must be elevated or floodproofed to or above the BFE;

e) The accessory structure must comply with floodplain encroachment provisions in Section 5.6; and

f) The accessory structure must be designed to allow for the automatic entry of flood waters in accordance with Section 5.1.C.3.

2. Detached garages and accessory structures not meeting the above standards must be constructed in accordance with all applicable standards in Section 5.1.

5.2 STANDARDS FOR UTILITIES.

A. All new and replacement water supply and sanitary sewage systems shall be designed to minimize or eliminate:

1. Infiltration of flood waters into the systems; and

2. Discharge from the systems into flood waters.

B. On-site waste disposal systems shall be located to avoid impairment to them, or contamination from them during flooding.

5.3 STANDARDS FOR SUBDIVISIONS AND OTHER PROPOSED DEVELOPMENT.

A. All new subdivisions proposals and other proposed development, including proposals for manufactured home parks and subdivisions, greater than 50 lots or 5 acres, whichever is the lesser, shall:

1. Identify the Special Flood Hazard Areas (SFHA) the Zone D local flood hazard areas due to relief cuts and Zone X (Shaded) local flood hazard areas due to relief cuts, and Base Flood Elevations (BFE).

2. Identify the elevations of lowest floors of all proposed structures and pads on the final plans.

3. If the site is filled above the base flood elevation, the following as-built information for each structure shall be certified by a registered civil engineer or licensed land surveyor and provided as part of an application for a Letter of Map Revision based on Fill (LOMR-F) to the Floodplain Administrator:

   a. Lowest floor elevation.

   b. Pad elevation.

   c. Lowest adjacent grade.

B. All subdivision proposals and other proposed development shall be consistent with the need to minimize flood damage.

C. All subdivision proposals and other proposed development shall have public utilities and facilities such as sewer, gas, electrical and water systems located and constructed to minimize flood damage.

D. All subdivisions and other proposed development shall provide adequate drainage to reduce exposure to flood hazards.

5.4 STANDARDS FOR MANUFACTURED HOMES.

A. All manufactured homes that are placed or substantially improved, on sites located: (1) outside of a manufactured home park or subdivision; (2) in a new manufactured home park or subdivision; (3) in an expansion to an existing manufactured home park or subdivision; or (4) in an existing manufactured home park or subdivision upon which a manufactured home has incurred "substantial damage" as the result of a flood, shall:

1. Within Zones A1-30, AH, AE, and Zone D local flood hazard areas due to relief cuts and Zone X (Shaded) local flood hazard areas due to relief cuts on the community's Flood Insurance Rate Map, be elevated on a permanent foundation such that the lowest floor of the manufactured home is elevated to or above the base flood elevation and be securely fastened to an adequately anchored foundation system to resist flotation, collapse, and lateral movement.

B. All manufactured homes to be placed or substantially improved on sites in an existing manufactured home park or subdivision within Zones A1-30, AH, and AE, and Zone D local flood hazard areas due to relief cuts and Zone X (Shaded) local flood hazard areas due to relief cuts on the community's Flood Insurance Rate Map that are not subject to the provisions of **Section 5.4.A** will be securely fastened to an adequately anchored foundation system to resist flotation,

collapse, and lateral movement, and be elevated so that either the:

1. Lowest floor of the manufactured home is at or above the base flood elevation; or

2. Manufactured home chassis is supported by reinforced piers or other foundation elements of at least equivalent strength that are no less than 36 inches in height above grade.

Upon the completion of the structure, the elevation of the lowest floor including basement shall be certified by a registered civil engineer or licensed land surveyor, and verified by the community building inspector to be properly elevated. Such certification and verification shall be provided to the Floodplain Administrator.

5.5 STANDARDS FOR RECREATIONAL VEHICLES.

A. All recreational vehicles placed in Zones A1-30, AH, ~~and~~ AE, and Zone D local flood hazard areas due to relief cuts and Zone X (Shaded) local flood hazard areas due to relief cuts will either:

1. Be on the site for fewer than 180 consecutive days; or

2. Be fully licensed and ready for highway use. A recreational vehicle is ready for highway use if it is on its wheels or jacking system, is attached to the site only by quick disconnect type utilities and security devices, and has no permanently attached additions; or

3. Meet the permit requirements of **Section 4.3** of this ordinance and the elevation and anchoring requirements for manufactured homes in **Section 5.4.A**.

5.6 FLOODWAYS.

Since floodways are an extremely hazardous area due to the velocity of flood waters which carry debris, potential projectiles, and erosion potential, the following provisions apply:

A. Until a regulatory floodway is adopted, no new construction, substantial development, or other development (including fill) shall be permitted within Zones A1-30 and AE, unless it is demonstrated that the cumulative effect of the proposed development, when combined with all other development, will not increase the water surface elevation of the base flood more than 1 foot at any point within the **{name of county or municipality}**.

B. Within an adopted regulatory floodway, the **{name of county or municipality}** shall prohibit encroachments, including fill, new construction, substantial improvements, and other development, unless certification by a registered civil engineer is provided demonstrating that the proposed encroachment shall not result in any increase in flood levels during the occurrence of the base flood discharge.

C. If **Sections 5.6.A & B** are satisfied, all new construction, substantial improvement, and other proposed new development shall comply with all other applicable flood hazard reduction provisions of **Section 5**.

5.7 RELIEF CUTS.

For certain leveed areas, levee relief cuts can be utilized to reduce BFEs, mitigate depth, extent, and/or duration of floodwaters and subsequent damages resulting from a catastrophic upstream levee breach or levee overtopping.

A. The following provisions apply to the use of relief cuts to lower BFEs in Zone A:

1. Reductions in BFEs through the use of relief cuts shall only apply to agricultural structures.

2. Any reductions in BFEs through the use of relief cuts shall be documented in engineering study(s) on file in the office of the Floodplain Administrator,

3. The execution of a relief cut relied upon for the reduction of BFEs, shall be documented in the Agency's Emergency Operation Plan – Basic Plan (EOP) and flood-specific Annex compliant with requirements within FEMA's Comprehensive Preparedness Guide 101 (CPG101).

B. Reduction of BFEs in Zones A1-30, AH, and AE shall be accomplished by revisions to the FIRMs using the LOMR process. The following provisions apply to the use of relief cuts to lower BFEs in Zones A1-30, AH, and AE.

1. BFEs reductions through the use of relief cuts shall only apply to agricultural structures.

2. The Floodplain Administrator shall use require all non-agricultural structures to conform to BFEs determined without reliance upon a relief cut.

3. The execution of a relief cut relied upon for the reduction of BFEs, shall be documented in the Agency's Emergency Operation Plan – Basic Plan (EOP) and flood-specific Annex compliant with requirements within FEMA's Comprehensive Preparedness Guide 101 (CPG101).

C. For Zone D local flood hazard area due to a relief cut and Zone X (Shaded) local flood hazard area due to a relief cut the following provisions apply:

1. The Zone D local flood hazard areas due to relief cuts and Zone X (Shaded) local flood hazard areas due to relief cuts shall only apply to agricultural structures.

2. The Floodplain Administrator shall require all non-agricultural structures to conform to BFEs determined without reliance upon a relief cut.

3. The execution of a relief cut relied upon for the reduction of BFEs, shall be documented in the Agency's Emergency Operation Plan – Basic Plan (EOP) and flood-specific Annex compliant with requirements within FEMA's Comprehensive Preparedness Guide 101 (CPG101).

For the use of relief cuts please refer to the *"Guide to Utilizing Levee Relief Cuts to Lower Base Flood Elevations"* (December 2016).

SECTION 6.0
VARIANCE PROCEDURE

6.1 NATURE OF VARIANCES.

The issuance of a variance is for floodplain management purposes only. Insurance premium rates are determined by statute according to actuarial risk and will not be modified by the granting of a variance.

The variance criteria set forth in this section of the ordinance are based on the general principle of zoning law that variances pertain to a piece of property and are not personal in nature. A variance may be granted for a parcel of property with physical characteristics so unusual that complying with the requirements of this ordinance would create an exceptional hardship to the applicant or the surrounding property owners. The characteristics must be unique to the property and not be shared by adjacent parcels. The unique characteristic must pertain to the land itself, not to the structure, its inhabitants, or the property owners.

It is the duty of the **{community governing body}** to help protect its citizens from flooding. This need is so compelling and the implications of the cost of insuring a structure built below flood level are so serious that variances from the flood elevation or from other requirements in the flood ordinance are quite rare. The long term goal of preventing and reducing flood loss and damage can only be met if variances are strictly limited. Therefore, the variance guidelines provided in this ordinance are more detailed and contain multiple provisions that must be met before a variance can be properly granted. The criteria are designed to screen out those situations in which alternatives other than a variance are more appropriate.

6.2 CONDITIONS FOR VARIANCES.

A. Generally, variances may be issued for new construction, substantial improvement, and other proposed new development to be erected on a lot of one-half acre or less in size contiguous to and surrounded by lots with existing structures constructed below the base flood level, providing that the procedures of **Sections 4 and 5** of this ordinance have been fully considered. As the lot size increases beyond one-half acre, the technical justification required for issuing the variance increases.

B. Variances may be issued for the repair or rehabilitation of "**historic structures**" (as defined in **Section 2** of this ordinance) upon a determination that the proposed repair or rehabilitation will not preclude the structure's continued designation as an historic structure and the variance is the minimum necessary to preserve the historic character and design of the structure.

C. Variances shall not be issued within any mapped regulatory floodway if any increase in flood levels during the base flood discharge would result.

D. Variances shall only be issued upon a determination that the variance is the "minimum necessary" considering the flood hazard, to afford relief. "Minimum necessary" means to afford relief with a minimum of deviation from the requirements of this ordinance. For example, in the case of variances to an elevation requirement, this means the **{community governing body}** need not grant permission for the applicant to build at grade, or even to whatever elevation the applicant proposes, but only to that elevation which the **{community governing body}** believes will both provide relief and preserve the integrity of the local ordinance.

E. Any applicant to whom a variance is granted shall be given written notice over the signature of a community official that:

1. The issuance of a variance to construct a structure below the base flood level will result in increased premium rates for flood insurance up to amounts as high as $25 for $100 of insurance coverage, and

2. Such construction below the base flood level increases risks to life and property. It is recommended that a copy of the notice shall be recorded by the Floodplain Administrator in the Office of the **{name of county}** Recorder and shall be recorded in a manner so that it appears in the chain of title of the affected parcel of land.

F. The Floodplain Administrator will maintain a record of all variance actions, including justification for their issuance, and report such variances issued in its biennial report submitted to the Federal Emergency Management Agency.

6.3 APPEAL BOARD.

A. In passing upon requests for variances, the **{community governing body}** shall consider all technical evaluations, all relevant factors, standards specified in other sections of this ordinance, and the:

1. Danger that materials may be swept onto other lands to the injury of others;

2. Danger of life and property due to flooding or erosion damage;

3. Susceptibility of the proposed facility and its contents to flood damage and the effect of such damage on the existing individual owner and future owners of the property;

4. Importance of the services provided by the proposed facility to the community;

5. Necessity to the facility of a waterfront location, where applicable;

6. Availability of alternative locations for the proposed use which are not subject to flooding or erosion damage;

7. Compatibility of the proposed use with existing and anticipated development;

8. Relationship of the proposed use to the comprehensive plan and floodplain management program for that area;

9. Safety of access to the property in time of flood for ordinary and emergency vehicles;

10. Expected heights, velocity, duration, rate of rise, and sediment transport of the flood waters expected at the site; and

11. Costs of providing governmental services during and after flood conditions, including maintenance and repair of public utilities and facilities such as sewer, gas, electrical, and water system, and streets and bridges.

B. Variances shall only be issued upon a:

1. Showing of good and sufficient cause;

2. Determination that failure to grant the variance would result in exceptional **"hardship"** to the applicant; and

3. Determination that the granting of a variance will not result in increased flood heights, additional threats to public safety, or extraordinary public expense, create a nuisance (see **"Public safety and nuisance"**), cause **"fraud and victimization**" of the public, or conflict with existing local laws or ordinances.

C. Variances may be issued for new construction, substantial improvement, and other proposed new development necessary for the conduct of a functionally dependent use provided that the provisions of **Sections 6.3.A through 6.3.D** are satisfied and that the structure or other development is protected by methods that minimize flood damages during the base flood and does not result in additional threats to public safety and does not create a public nuisance.

D. Upon consideration of the factors of **Section 6.2.A** and the purposes of this ordinance, the **{community governing body}** may attach such conditions to the granting of variances as it deems necessary to further the purposes of this ordinance.

APPENDIX

Appendices

1.0 ALLUVIAL FAN ADVISORY

Hazards of Alluvial Fan Development

Alluvial fans present a unique flood hazard environment where the combination of sediment, slope, and topography create an ultra hazardous condition for which elevation on fill will not provide reliable protection. Active alluvial fan flooding is characterized by flow path uncertainty combined with abrupt deposition and erosion. As a result, any area of an alluvial fan may be subject to intense flood hazards.

The technology of mathematically modeling the hydrodynamics of water and debris flows for alluvial fans is still in the early development stage. The Federal Emergency Management Agency (FEMA) has formulated a mapping procedure for the purpose of defining the likelihood of flood hazards on inundated alluvial fan zones to be used for flood insurance purposes and general floodplain regulation, referred to as the FEMA alluvial fan methodology.

An active alluvial fan flooding hazard is indicated by three related criteria:

a. Flow path uncertainty below the hydrographic apex;

b. Abrupt deposition and ensuing erosion of sediment as a stream or debris flow loses its competence to carry material eroded from a steeper, upstream source area; and

c. An environment where the combination of sediment availability, slope, and topography creates an ultra hazardous condition for which elevation on fill will not reliably mitigate the risk.

Inactive alluvial fan flooding is similar to traditional riverine flood hazards, but occurs only on alluvial fans. It is characterized by flow paths with a higher degree of certainty in realistic assessments of flood risk or in the reliable mitigation of the hazard. Counter to active alluvial fan flooding hazards, an inactive alluvial fan flooding hazard is characterized by relatively stable flow paths. However, areas of inactive alluvial fan flooding, as with active alluvial fan flooding, may be subject to sediment deposition and erosion, but to a degree that does not cause flow path instability and uncertainty.

An alluvial fan may exhibit both active alluvial fan flooding and inactive alluvial fan flooding hazards. The hazards may vary spatially or vary at the same location, contingent on the level of flow discharge. Spatially, for example, upstream inactive portions of the alluvial fan may distribute flood flow to active areas at the distal part of the alluvial fan. Hazards may vary at the same location, for example, with a flow path that may be stable for lower flows, but become unstable at higher flows.

More detailed information can be found at FEMA's website: "Guidelines for Determining Flood Hazards on Alluvial Fans" at http://www.fema.gov/fhm/ft_afgd2.shtm#1.

Alluvial Fans and LOMR's

The NFIP does not allow for the removal of land from the floodplain based on the placement of fill (LOMR-F) in alluvial fan flood hazard areas. The NFIP will credit a major structural flood control project, through the LOMR process, that will effectively eliminate alluvial fan flood hazards from the protected area. Details about map revisions for alluvial fan areas can be found in the Code of Federal Regulations at Title 44, Part 65.13.

Alluvial Fan Task Force

As stated in AB 2141 (Longville, Chapter 878, Statutes of 2004), the State of California Department of Water Resources will convene an Alluvial Fan Task Force (AFTF). The AFTF will produce an alluvial fan model ordinance for local communities and a recommendations report to the legislature. As of March 2006, the model ordinance and report are projected to be completed by 2007.

2.0 HIGHER STANDARDS RECOMMENDED BY THE STATE OF CALIFORNIA

This model ordinance meets the minimum standards required to participate in the National Flood Insurance Program. Community adoption of higher standards can be applied towards credit under the Community Rating System (CRS) program and result in reduced premiums for all flood insurance policy holders within the entire community. The State of California recommends:

A. Freeboard.

- To elevate at least 2 feet above the minimum required base flood elevation, make the following changes:

  1. Modify Sections 5.1.C.1.a, 5.1.C.1.c, and 5.4.A.1 by replacing "elevated to or above" with "elevated 2 feet above."

  2. Modify Section 5.4.B.1 by replacing "at or above" with "at least 2 feet above."

  3. Replace Section 5.1.C.1.b with:

     In an AO zone, elevated above the highest adjacent grade to a height 2 feet above the depth number specified in feet on the FIRM, or elevated at least 4 feet above the highest adjacent grade if no depth number is specified.

B. Determining BFE's in Unnumbered A Zones.

- Replace "may" with "shall" in the second paragraph of Section 4.2.C to read:

  "NOTE: A base flood elevation shall…."

C. Determining Market Value of Existing Structures.

- Replace the "Market value" definition in Section 2 with:

  "**Market value**" shall be determined by estimating the cost to replace the structure in new condition and adjusting that cost figure by the amount of depreciation which has accrued since the structure was constructed.

  1. The cost of replacement of the structure shall be based on a square foot cost factor determined by reference to a building cost estimating guide recognized by the building construction industry.

  2. The amount of depreciation shall be determined by taking into account the age and physical deterioration of the structure and functional obsolescence as approved by the floodplain administrator, but shall not include economic or other forms of external obsolescence.

  Use of replacement costs or accrued depreciation factors different from those contained in recognized building cost estimating guides may be considered only if such factors are included in a report prepared by an independent professional appraiser and supported by a written explanation of the differences.

D. Increased Cost of Compliance (ICC) Coverage—Repetitive Loss Provisions.

This provision allows communities the opportunity for flood insurance policy holders to have ICC coverage made available in repetitive loss situations.

- Modify the definition of "Substantial damage" as follows:

  "**Substantial damage**" means:

  1. Damage of any origin sustained by a structure whereby the cost of restoring the structure to its before damaged condition would equal or exceed 50 percent of the market value of the structure before the damage occurred; or

  2. Flood-related damages sustained by a structure on two separate occasions during a 10-year period for which the cost of repairs at the time of each such event, on the average, equals or exceeds 25 percent of the market value of the structure before the damage occurred. This is also known as "repetitive loss."

E. Non-conversion of Enclosed Areas Below the Lowest Floor.

- Insert/add the following section as Section 4.2.J.

  A. Non-conversion of Enclosed Areas Below the Lowest Floor.

  To ensure that the areas below the BFE shall be used solely for parking vehicles, limited storage, or access to the building and not be finished for use as human habitation without first becoming fully compliant with the floodplain management ordinance in effect at the time of conversion, the Floodplain Administrator shall:

  1. Determine which applicants for new construction and/or substantial improvements have fully enclosed areas below the lowest floor that are 5 feet or higher;

  2. Enter into a "NON-CONVERSION AGREEMENT FOR CONSTRUCTION WITHIN FLOOD HAZARD AREAS" or equivalent with the **{name of county or municipality}**. The agreement shall be recorded with the **{name of county}** County Recorder as a deed restriction. The non-conversion agreement shall be in a form acceptable to the Floodplain Administrator and County Counsel; and

  3. Have the authority to inspect any area of a structure below the base flood elevation to ensure compliance upon prior notice of at least 72 hours.

3.0 SPECIAL REQUIREMENTS

A. Crawlspace Construction.

Communities with construction practices that result in crawl spaces with interior floors up to 2 feet below grade have historically been in violation of the NFIP requirements. FEMA Technical Bulletin 11-01 now provides accommodation for these practices.

- Remove the following from "Lowest floor" definition in Section 2:

  2. For residential structures, all subgrade enclosed areas are prohibited as they are considered to be basements (see **"Basement"** definition). This prohibition includes below-grade garages and storage areas.

- Add the following section into your ordinance at Section 5.1.C:

  5.1.C.{X} Crawlspace Construction.

  This sub-section applies to buildings with crawl spaces up to 2 feet below grade. Below-grade crawl space construction in accordance with the requirements listed below will not be considered basements.

  a. The building must be designed and adequately anchored to resist flotation, collapse, and lateral movement of the structure resulting from hydrodynamic and hydrostatic loads, including the effects of buoyancy. Crawl space construction is not allowed in areas with flood velocities greater than 5 feet per second unless the design is reviewed by a qualified design professional, such as a registered architect or professional engineer;

  b. The crawl space is an enclosed area below the BFE and, as such, must have openings that equalize hydrostatic pressures by allowing for the automatic entry and exit of floodwaters. For guidance on flood openings, see FEMA Technical Bulletin 1-93;

  c. Crawl space construction is not permitted in V zones. Open pile or column foundations that withstand storm surge and wave forces are required in V zones;

  d. Portions of the building below the BFE must be constructed with materials resistant to flood damage. This includes not only the foundation walls of the crawl space used to elevate the building, but also any joists, insulation, or other materials that extend below the BFE; and

  e. Any building utility systems within the crawl space must be elevated above BFE or designed so that floodwaters cannot enter or accumulate within the system components during flood conditions.

  f. Requirements for all below-grade crawl space construction, in addition to the above requirements, to include the following:

     1. The interior grade of a crawl space below the BFE must not be more than 2 feet below the lowest adjacent exterior grade (LAG), shown as D in figure 3

of Technical Bulletin 11-01;

2. The height of the below-grade crawl space, measured from the interior grade of the crawl space to the top of the crawl space foundation wall must not exceed 4 feet (shown as L in figure 3 of Technical Bulletin 11-01) at any point;

3. There must be an adequate drainage system that removes floodwaters from the interior area of the crawl space within a reasonable period of time after a flood event, not to exceed 72 hours; and

4. The velocity of floodwaters at the site should not exceed 5 feet per second for any crawl space. For velocities in excess of 5 feet per second, other foundation types should be used.

B. Mudslide (i.e., Mudflow) Prone Areas. (Zone M)

- Communities with mudslide prone areas shall insert the following:

1. Definitions to Section 2:

"**Area of special mudslide (i.e., mudflow) hazard**" is the area subject to severe mudslides (i.e., mudflows). The area is designated as Zone M on the Flood Insurance Rate Map (FIRM).

"**Mudslide**" describes a condition where there is a river, flow or inundation of liquid mud down a hillside, usually as a result of a dual condition of loss of brush cover and the subsequent accumulation of water on the ground, preceded by a period of unusually heavy or sustained rain.

"**Mudslide** (i.e., mudflow) **prone area**" means an area with land surfaces and slopes of unconsolidated material where the history, geology, and climate indicate a potential for mudflow.

2. Section "**5.{X} Mudslide (i.e., Mudflow) Prone Areas**":

5.{X} Mudslide (i.e., Mudflow) Prone Areas.

A. The Floodplain Administrator shall review permits for proposed construction of other development to determine if it is proposed within a mudslide area.

B. Permits shall be reviewed to determine that the proposed site and improvement will be reasonably safe from mudslide hazards. Factors to be considered in making this determination include, but are not limited to:

1. The type and quality of soils;

2. Evidence of ground water or surface water problems;

3. Depth and quality of any fill;

4. Overall slope of the site; and

5. Weight that any proposed development will impose on the slope.

C. Within areas which may have mudslide hazards, the Floodplain Administrator shall require:

1. A site investigation and further review by persons qualified in geology and soils engineering;

2. The proposed grading, excavation, new construction, and substantial improvement be adequately designed and protected against mudslide damages;

3. The proposed grading, excavations, new construction, and substantial improvement not aggravate the existing hazard by creating either on-site or off-site disturbances; and

4. Drainage, planting, watering, and maintenance not endanger slope stability.

C. <u>Erosion-prone areas</u>. (Zone E)

- Communities with erosion prone areas shall insert the following:

1. Definitions into Section 2:

"**Area of special flood-related erosion hazard**" is the land within a community which is most likely to be subject to severe flood-related erosion losses. The area may be designated as Zone E on the Flood Insurance Rate Map (FIRM).

"**Flood-related erosion**" means the collapse or subsidence of land along the shore of a lake or other body of water as a result of undermining caused by waves or currents of water exceeding anticipated cyclical level or suddenly caused by an unusually high water level in a natural body of water, accompanied by a severe storm, or by an unanticipated force of nature, such as a flash flood or an abnormal tidal surge, or by some similarly unusually and unforeseeable event which results in flooding.

"**Flood-related erosion area**" or "**Flood-related erosion prone area**" means a land area adjoining the shore of a lake or other body of water, which due to the composition of the shoreline or bank and high water levels or wind-driven currents, is likely to suffer flood-related erosion damage.

"**Flood-related erosion area management**" means the operation of an overall program of corrective and preventive measures for reducing flood-related erosion damage,

including but not limited to emergency preparedness plans, flood-related erosion control works, and floodplain management regulations.

2. Section "**5.{X} FLOOD-RELATED EROSION-PRONE AREA**" into Section 5:

5.{X} FLOOD-RELATED EROSION-PRONE AREA

A. The Floodplain Administrator shall require permits for proposed construction and other development within all flood-related erosion-prone areas known to the community.

B. Permit applications shall be reviewed to determine whether the proposed site alterations and improvements will be reasonably safe from flood-related erosion, and will not cause flood-related erosion hazards or otherwise aggravate the existing hazard.

C. If a proposed improvement is found to be in the path of flood-related erosion or would increase the erosion hazard, such improvement shall be relocated or adequate protective measures shall be taken to avoid aggravating the existing erosion hazard.

D. Within Zone E on the Flood Insurance Rate Map, a setback is required for all new development from the ocean, lake, bay, riverfront or other body of water to create a safety buffer consisting of a natural vegetative or contour strip. This buffer shall be designated according to the flood-related erosion hazard and erosion rate, in relation to the anticipated ″useful life″ of structures, and depending upon the geologic, hydrologic, topographic, and climatic characteristics of the land. The buffer may be used for suitable open space purposes, such as for agricultural, forestry, outdoor recreation and wildlife habitat areas, and for other activities using temporary and portable structures only.

Appendix F. Example Calculation of Premium Savings for Recognizing a Non-Accredited Levee

The following example is taken from FEMA's *Technical Documentation of NFIP Actuarial Assumptions and Methods Supporting Rates Effective October 1, 2013*, updated October 2014. This example shows how total expected loss to the National Flood Insurance Fund, with contingency load, for all ranges of flooding is calculated to be $10,002.38. The example also shows the additional fees that are added to the total expected loss with contingency to arrive at the annual premium of $15,871. This example can be used to calculate the reduction, or savings, in the total expected loss with contingency. The calculation of savings follows after the excerpted example from FEMA's document.

"Technical Summary of Assumptions and Methods

I. Illustrative Rating Example

Before providing the detailed assumptions and methods used in the NFIP's annual rate setting process, we begin with an example to help the reader understand the methodology used to set rates.

Brief description of the rate model

In general, the model starts with a probabilistic estimate of the expected damage to the insured structure. First, the model estimates the probability of various depths of flood water entering the structure. Then it determines the amount of damage from that depth of flood water, on average, would cause. The probabilities come from hydrologic/hydraulics study of the community performed by engineers/scientists, and the expected amount of damage is based on a review of NFIP claims for similar depths of flood water in the structure.

These estimated damage amounts are then adjusted to expected claims payout after accounting for deductibles, capping damage not to exceed the amount of insurance purchased, and adding loss adjustment expenses. These adjustments are not made on a property-by-property basis, but instead are made based on Program-wide averages.

Finally, the premium is determined by adding to these expected claims payouts operating expenses and other standard insurance techniques such as contingency loadings and under-insurance adjustments.

Illustrative example overview

The final rates per $100 of insurance shown in the Rate Manual and the Specific Rate Guidelines are the weighted average of many rate calculations, each of which uses average assumptions about buildings and losses. To help the reader understand the premium resulting from the rate model, the following illustrative example applies the conceptual methodology of the rate model to a specific structure. An example was selected that results in a premium similar to what would be charged based on the rate in the Specific Rate Guidelines.

Example building Characteristics:

- $250,000 of building insurance purchased, building is insured to 85% of value (value of $294,118)
- Single story, single family home without a basement
- Standard $1,000 deductible is selected

- Building is located in an A18 zone with a 9 ft. difference between the 1% and 10% event (10 yr. and 100 yr. return period depth).
- The top of the lowest floor is 8 feet below the BFE
- CRS class 8

Illustrative example frequency of flooding

The example begins with calculation of the frequency of flooding for ranges of depths of water in the structure. These probabilities and return period calculations are based on the PELV formulas described later.

We begin by looking at a specific row, the row associated with flooding 3 feet to 2 feet below the BFE (the ninth row down). Because the structure is 8 ft. below the BFE, there will be 5 to 6 feet of water in the structure when floodwaters are 3 to 2 feet below BFE. Based on the PELV formula, the annual chance of floodwaters reaching or exceeding 3 feet below BFE is 2.1% (47.6 year return period), and the annual chance of floodwaters reaching or exceeding 2 feet below BFE is 1.7% (60.2 year return period). The annual chance of floodwaters in the range from 3 feet below BFE to 2 feet below BFE is 2.1% - 1.7% = 0.4%

Rating Example - Frequency (Probability) of Flooding

Depth relative to BFE (ft)			Depth in Structure (ft)			Return Period (yrs)			Probability range			Probability in range
4.5	and	up	12.5	and	up	501.3	and	up	0.2%	and	less	0.2%
4.0	to	4.5	12.0	to	12.5	399.9	to	501.3	0.3%	to	0.2%	0.1%
3.0	to	4.0	11.0	to	12.0	266.8	to	399.9	0.4%	to	0.3%	0.1%
2.0	to	3.0	10.0	to	11.0	187.6	to	266.8	0.5%	to	0.4%	0.2%
1.0	to	2.0	9.0	to	10.0	137.4	to	187.6	0.7%	to	0.5%	0.2%
0.0	to	1.0	8.0	to	9.0	99.3	to	137.4	1.0%	to	0.7%	0.3%
-1.0	to	0.0	7.0	to	8.0	76.8	to	99.3	1.3%	to	1.0%	0.3%
-2.0	to	-1.0	6.0	to	7.0	60.2	to	76.8	1.7%	to	1.3%	0.4%
-3.0	to	-2.0	5.0	to	6.0	47.6	to	60.2	2.1%	to	1.7%	0.4%
-4.0	to	-3.0	4.0	to	5.0	36.2	to	47.6	2.8%	to	2.1%	0.7%
-5.0	to	-4.0	3.0	to	4.0	28.5	to	36.2	3.5%	to	2.8%	0.7%
-6.0	to	-5.0	2.0	to	3.0	22.4	to	28.5	4.5%	to	3.5%	1.0%
-7.0	to	-6.0	1.0	to	2.0	17.5	to	22.4	5.7%	to	4.5%	1.2%
-8.0	to	-7.0	0.0	to	1.0	13.1	to	17.5	7.6%	to	5.7%	1.9%
-8.5	to	-8.0	-0.5	to	0.0	11.5	to	13.1	8.7%	to	7.6%	1.0%
-8.5	and	below	-0.5	and	below	12.0	and	under	100.0%	to	8.7%	91.3%

Illustrative example severity of flooding

Next we examine the damages expected in each range of flooding. The percent damages shown below are the weighted average damages in the DELV damage tables, which will be described later.

Continuing with the example of the ninth row down, damages are expected to average 48.9% of the structure's value, or $143,936.04, when there are 5 to 6 feet of water in the structure. The damage amount is reduced $1,000 due to the deductible, resulting in average claim payment of $142,936.04 when there are 5 to 6 feet of water in the structure. The claims adjuster would be paid $3,716.34 for the Allocated Loss Adjustment Expense (ALAE) and Unallocated Loss Adjustment Expenses (ULAE) and Special Allocated Loss Adjustment Expenses (SALAE) are expected to be $2,429.91, resulting in a total paid loss and all Loss Adjustment Expenses (LAE) of $149,082.29.

Rating Example - Severity (Damage), Paid Loss, and Adjustment Expenses

Depth in Structure (ft)			Percent Damage	Damage Amount	Less Deductible	ALAE	ULAE and SALAE	Paid Loss and LAE
12.5	and	up	78.4%	$ 230,701.57	$ 229,701.57	$ 5,972.24	$ 3,904.93	$ 239,578.74
12.0	to	12.5	73.8%	$ 217,073.69	$ 216,073.69	$ 5,617.92	$ 3,673.25	$ 225,364.86
11.0	to	12.0	73.1%	$ 215,103.73	$ 214,103.73	$ 5,566.70	$ 3,639.76	$ 223,310.19
10.0	to	11.0	70.5%	$ 207,347.61	$ 206,347.61	$ 5,365.04	$ 3,507.91	$ 215,220.56
9.0	to	10.0	68.0%	$ 199,856.35	$ 198,856.35	$ 5,170.27	$ 3,380.56	$ 207,407.18
8.0	to	9.0	63.5%	$ 186,841.53	$ 185,841.53	$ 4,831.88	$ 3,159.31	$ 193,832.71
7.0	to	8.0	59.6%	$ 175,328.49	$ 174,328.49	$ 4,532.54	$ 2,963.58	$ 181,824.61
6.0	to	7.0	54.2%	$ 159,315.80	$ 158,315.80	$ 4,116.21	$ 2,691.37	$ 165,123.38
5.0	to	6.0	48.9%	$ 143,936.04	$ 142,936.04	$ 3,716.34	$ 2,429.91	$ 149,082.29
4.0	to	5.0	41.9%	$ 123,200.58	$ 122,200.58	$ 3,400.00	$ 2,077.41	$ 127,677.99
3.0	to	4.0	33.2%	$ 97,648.74	$ 96,648.74	$ 3,286.06	$ 1,643.03	$ 101,577.83
2.0	to	3.0	28.6%	$ 83,979.90	$ 82,979.90	$ 2,821.32	$ 1,410.66	$ 87,211.87
1.0	to	2.0	23.3%	$ 68,505.15	$ 67,505.15	$ 2,295.18	$ 1,147.59	$ 70,947.91
0.0	to	1.0	16.6%	$ 48,966.01	$ 47,966.01	$ 1,640.00	$ 815.42	$ 50,421.43
-0.5	to	0.0	3.5%	$ 10,294.12	$ 9,294.12	$ 970.00	$ 158.00	$ 10,422.12
-0.5	and	below	0.0%	$ -	$ -	$ -	$ -	$ -

Illustrative example expected paid loss

Next we calculate the expected paid loss by considering the probability of flooding with each range and the expected paid loss and LAE within each range.

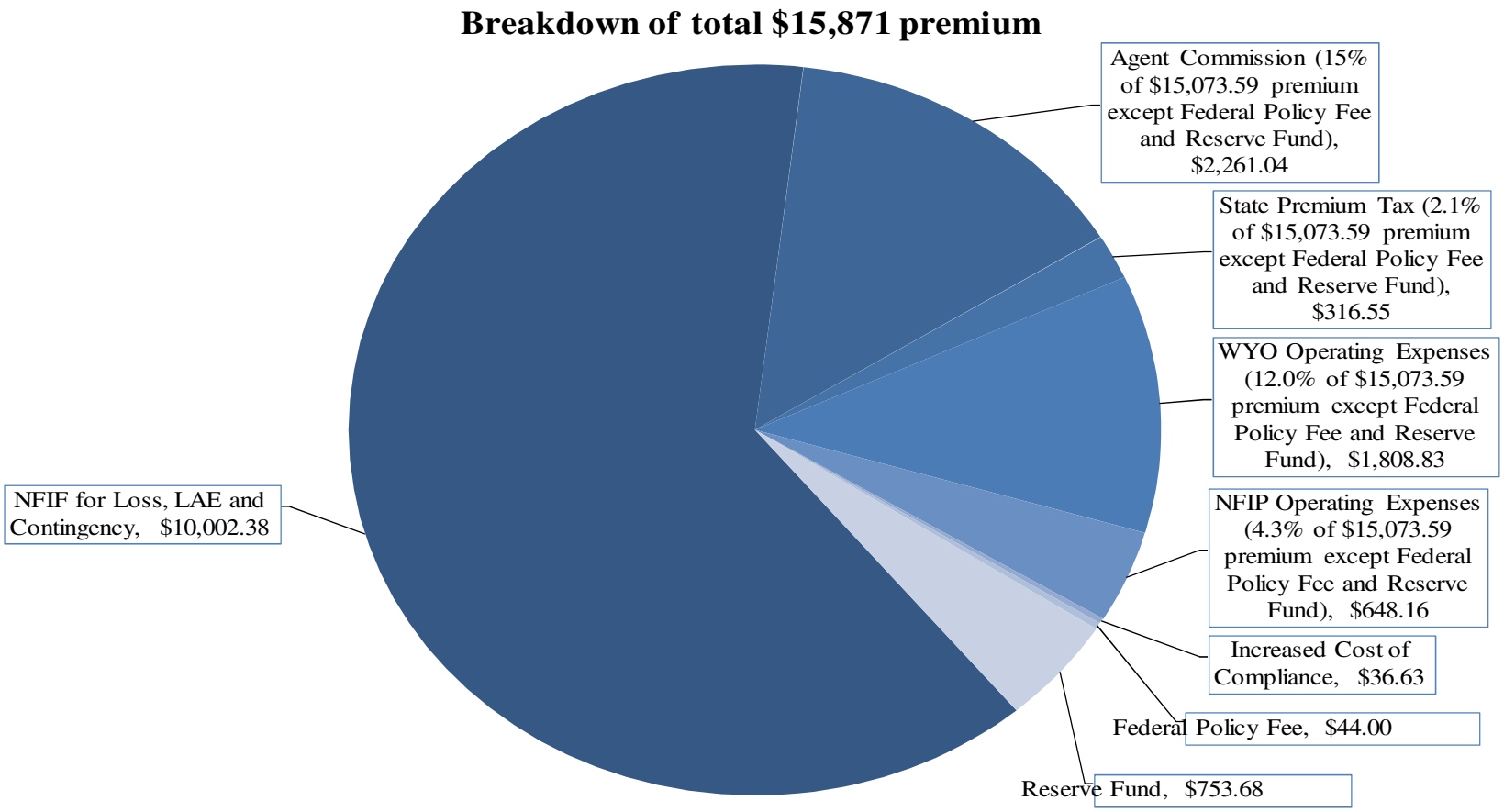
In the example of the ninth row down, there is a 0.4% probability of water being within the range and an average paid loss and LAE of $149,082.29. The probability weighted expected paid loss for this row is $660.29 (0.4% probability times $149,082.29). Finally a 20% contingency load is added. The total expected loss to the National Flood Insurance Fund, with contingency load, for all ranges of flooding is $10,002.38.

Rating Example - Probability Weighted Expected Paid Loss

Depth in Structure			Probability in range	Paid Loss and LAE	Expected NFIF Loss	with Contingency Load
12.5	and	up	0.2%	$239,578.74	$ 477.92	$ 573.50
12.0	to	12.5	0.1%	$225,364.86	$ 113.98	$ 136.78
11.0	to	12.0	0.1%	$223,310.19	$ 278.57	$ 334.29
10.0	to	11.0	0.2%	$215,220.56	$ 340.65	$ 408.78
9.0	to	10.0	0.2%	$207,407.18	$ 403.90	$ 484.68
8.0	to	9.0	0.3%	$193,832.71	$ 542.10	$ 650.52
7.0	to	8.0	0.3%	$181,824.61	$ 534.85	$ 641.81
6.0	to	7.0	0.4%	$165,123.38	$ 591.91	$ 710.29
5.0	to	6.0	0.4%	$149,082.29	$ 660.29	$ 792.35
4.0	to	5.0	0.7%	$127,677.99	$ 845.47	$ 1,014.57
3.0	to	4.0	0.7%	$101,577.83	$ 750.23	$ 900.27
2.0	to	3.0	1.0%	$ 87,211.87	$ 832.23	$ 998.68
1.0	to	2.0	1.2%	$ 70,947.91	$ 881.15	$ 1,057.38
0.0	to	1.0	1.9%	$ 50,421.43	$ 974.96	$ 1,169.96
-0.5	to	0.0	1.0%	$ 10,422.12	$ 107.10	$ 128.52
-0.5	and	below	91.3%	$ -	$ -	$ -
	Total		100.0%		$ 8,335.32	$ 10,002.38

Illustrative example Premium

Finally, the $10,002.38 expected paid loss with contingency is converted to a total premium by first adding the Increased Cost of Compliance premium (Total ICC premium including expenses is $55, of which $36.63 is available after premium related expenses and taxes). Next agent commission (15% of final premium), State Premium Taxes (2.1% of final premium), WYO Allowance administrative expenses (12.0% of final premium), and NFIP operating expenses (4.3% of final premium) are added. Finally, a 5% reserve fund assessment and a Federal Policy fee are added. For this example, the CRS load and discount are assumed to roughly offset."



Illustrative example of Premium Savings realized by recognizing a non-accredited levee that provides 28.5-year flood protection

The information above came directly from FEMA's publication. This information can be used to estimate premium savings for a rated level of flood protection for a levee system. To simplify the calculation, a rated level of flood protection of 28.5 years is selected, because it is already identified in the tables above and is a reasonably appropriate rating that can be achieved by many non-accredited levees.

If the structure is protected by a levee rated as providing 28.5-year flood protection, and there are no other sources of flooding for the structure in the 28.5-year flood event, then all of the highlighted information in the table below would no longer apply.

Rating Example - Frequency (Probability) of Flooding

Depth relative to BFE (ft)			Depth in Structure (ft)			Return Period (yrs)			Probability range			Probability in range
4.5	and	up	12.5	and	up	501.3	and	up	0.2%	and	less	0.2%
4.0	to	4.5	12.0	to	12.5	399.9	to	501.3	0.3%	to	0.2%	0.1%
3.0	to	4.0	11.0	to	12.0	266.8	to	399.9	0.4%	to	0.3%	0.1%
2.0	to	3.0	10.0	to	11.0	187.6	to	266.8	0.5%	to	0.4%	0.2%
1.0	to	2.0	9.0	to	10.0	137.4	to	187.6	0.7%	to	0.5%	0.2%
0.0	to	1.0	8.0	to	9.0	99.3	to	137.4	1.0%	to	0.7%	0.3%
-1.0	to	0.0	7.0	to	8.0	76.8	to	99.3	1.3%	to	1.0%	0.3%
-2.0	to	-1.0	6.0	to	7.0	60.2	to	76.8	1.7%	to	1.3%	0.4%
-3.0	to	-2.0	5.0	to	6.0	47.6	to	60.2	2.1%	to	1.7%	0.4%
-4.0	to	-3.0	4.0	to	5.0	36.2	to	47.6	2.8%	to	2.1%	0.7%
-5.0	to	-4.0	3.0	to	4.0	28.5	to	36.2	3.5%	to	2.8%	0.7%
-6.0	to	-5.0	2.0	to	3.0	22.4	to	28.5	4.5%	to	3.5%	1.0%
-7.0	to	-6.0	1.0	to	2.0	17.5	to	22.4	5.7%	to	4.5%	1.2%
-8.0	to	-7.0	0.0	to	1.0	13.1	to	17.5	7.6%	to	5.7%	1.9%
-8.5	to	-8.0	-0.5	to	0.0	11.5	to	13.1	8.7%	to	7.6%	1.0%
-8.5	and	below	-0.5	and	below	12.0	and	under	100.0%	to	8.7%	91.3%

In turn, the losses contributed by the highlighted events would not apply. There are the events that correspond to the 28.5-year flood and smaller floods as indicated by using the same depth in structure (2.0 to 3.0 feet) as in the previous table. Therefore, the highlighted losses in the table below would be removed.

Rating Example - Severity (Damage), Paid Loss, and Adjustment Expenses

Depth in Structure (ft)			Percent Damage	Damage Amount	Less Deductible	ALAE	ULAE and SALAE	Paid Loss and LAE
12.5	and	up	78.4%	$ 230,701.57	$ 229,701.57	$ 5,972.24	$ 3,904.93	$ 239,578.74
12.0	to	12.5	73.8%	$ 217,073.69	$ 216,073.69	$ 5,617.92	$ 3,673.25	$ 225,364.86
11.0	to	12.0	73.1%	$ 215,103.73	$ 214,103.73	$ 5,566.70	$ 3,639.76	$ 223,310.19
10.0	to	11.0	70.5%	$ 207,347.61	$ 206,347.61	$ 5,365.04	$ 3,507.91	$ 215,220.56
9.0	to	10.0	68.0%	$ 199,856.35	$ 198,856.35	$ 5,170.27	$ 3,380.56	$ 207,407.18
8.0	to	9.0	63.5%	$ 186,841.53	$ 185,841.53	$ 4,831.88	$ 3,159.31	$ 193,832.71
7.0	to	8.0	59.6%	$ 175,328.49	$ 174,328.49	$ 4,532.54	$ 2,963.58	$ 181,824.61
6.0	to	7.0	54.2%	$ 159,315.80	$ 158,315.80	$ 4,116.21	$ 2,691.37	$ 165,123.38
5.0	to	6.0	48.9%	$ 143,936.04	$ 142,936.04	$ 3,716.34	$ 2,429.91	$ 149,082.29
4.0	to	5.0	41.9%	$ 123,200.58	$ 122,200.58	$ 3,400.00	$ 2,077.41	$ 127,677.99
3.0	to	4.0	33.2%	$ 97,648.74	$ 96,648.74	$ 3,286.06	$ 1,643.03	$ 101,577.83
2.0	to	3.0	28.6%	$ 83,979.90	$ 82,979.90	$ 2,821.32	$ 1,410.66	$ 87,211.87
1.0	to	2.0	23.3%	$ 68,505.15	$ 67,505.15	$ 2,295.18	$ 1,147.59	$ 70,947.91
0.0	to	1.0	16.6%	$ 48,966.01	$ 47,966.01	$ 1,640.00	$ 815.42	$ 50,421.43
-0.5	to	0.0	3.5%	$ 10,294.12	$ 9,294.12	$ 970.00	$ 158.00	$ 10,422.12
-0.5	and	below	0.0%	$ -	$ -	$ -	$ -	$ -

Likewise, the highlighted losses in the table below would no longer be counted as contributing to the total expected paid loss with contingency load. These removed losses total to $3,354.54, which is a 33.5% saving from the $10,002.38 total expected loss with contingency.

Finally, the premium is calculated by adding various percentages and some fees. The example provided by FEMA did not show how all of the fees were determined, so it is not possible to exactly determine the premium savings. But, most of the premium is based on the total expected loss with contingency, increased by various percentages. Therefore, for this example, the premium savings would be expected to be around 33%.

Rating Example - Probability Weighted Expected Paid Loss

Depth in Structure			Probability in range	Paid Loss and LAE	Expected NFIF Loss	with Contingency Load
12.5	and	up	0.2%	$239,578.74	$ 477.92	$ 573.50
12.0	to	12.5	0.1%	$225,364.86	$ 113.98	$ 136.78
11.0	to	12.0	0.1%	$223,310.19	$ 278.57	$ 334.29
10.0	to	11.0	0.2%	$215,220.56	$ 340.65	$ 408.78
9.0	to	10.0	0.2%	$207,407.18	$ 403.90	$ 484.68
8.0	to	9.0	0.3%	$193,832.71	$ 542.10	$ 650.52
7.0	to	8.0	0.3%	$181,824.61	$ 534.85	$ 641.81
6.0	to	7.0	0.4%	$165,123.38	$ 591.91	$ 710.29
5.0	to	6.0	0.4%	$149,082.29	$ 660.29	$ 792.35
4.0	to	5.0	0.7%	$127,677.99	$ 845.47	$ 1,014.57
3.0	to	4.0	0.7%	$101,577.83	$ 750.23	$ 900.27
2.0	to	3.0	1.0%	$ 87,211.87	$ 832.23	$ 998.68
1.0	to	2.0	1.2%	$ 70,947.91	$ 881.15	$ 1,057.38
0.0	to	1.0	1.9%	$ 50,421.43	$ 974.96	$ 1,169.96
-0.5	to	0.0	1.0%	$ 10,422.12	$ 107.10	$ 128.52
-0.5	and	below	91.3%	$ -	$ -	$ -
Total			100.0%		$ 8,335.32	$ 10,002.38

Appendix G. A Methodology for Rating a Non-Accredited Levee System's Flood Protection

Many of the levees in the Sacramento Valley and other rural/agricultural areas across the United States do not have sufficient data collected to determine if they can provide protection against the Base Flood, or the existing data indicates that the levees do not provide protection against the Base Flood. Yet these non-accredited levee systems are able to provide at least some flood protection and prevent flood damages for smaller floods such as flood events with 25-year or 50-year return periods (aka 25-year and 50-year floods). FIRMs and insurance rate tables do not reflect this fact. Consequently, the property owners in these areas pay the same insurance rates as if there was no levee at all. This results in property owners behind non-accredited levees paying more for their flood insurance than what should be required based on risk.

Two options for addressing this issue are:

- Create a new zone or modify an existing zone (e.g., Zone AR), that reflects the presence of the non-accredited levee system and the flood protection it provides, with accompanying rate tables, or
- Use the existing zone designation (e.g., Zone A or Zone AE) with rate tables that reflect the presence of the non-accredited levee system and the flood protection it provides.

As discussed previously, the first option would require new law and/or regulations. The second option may not require new law or regulations and may be handled administratively by FEMA. To utilize either option, it is necessary to develop a reasonable approach for determining how a non-accredited levee system can be rated as providing a specific level of flood protection. In most rural/agricultural areas, it would generally be unaffordable to perform the extensive investigations and engineering analyses that are usually required for levee certification and accreditation associated with the BFE. Another issue is that for traditional levee certification and accreditation by FEMA, the levee must be structurally adequate for loading at the BFE, with conventional safety factors, and flood fighting may not be used to make up for a structural inadequacy. Yet, flood fighting has saved many non-accredited levees from breaching and should be at least a consideration in risk management and for developing insurance rate tables for non-accredited levees. The use of flood fighting as a risk reduction measure has been accepted by USACE in quantifying and managing levee risk. Another consideration should be past performance of the non-accredited levee system during smaller flood events, which can sometimes demonstrate levee integrity without costly engineering investigations and evaluations.

There are currently two options for an engineer to certify to FEMA that a levee system provides protection against the Base Flood. The engineer needs to certify that for the Base Flood the levee system has either:

- 3 feet of freeboard above the BFE and structural integrity with standard factors of safety for seepage, under-seepage, and stability for loading at the BFE, or
- 2 feet of freeboard above the BFE that is justified with a risk analysis and structural integrity with standard factors of safety for seepage, under-seepage, and stability for loading at the BFE.

FEMA appears to currently have no requirements for how levee systems are to be certified for floods smaller than the Base Flood. The closest that FEMA comes to doing so is the Zone AR requirement that a federal agency with jurisdiction over the levee certify that the levee provides protection against the 3 percent annual chance flood (33-year flood). However, there are no specific requirements for the federal agency's certification or analysis.

General Requirements

For a non-accredited levee system to qualify for one of the three flood protection ratings (25-year, 50-year, and 75-year), an engineer needs to document that the levee has either:

- 3 feet of freeboard with respect to the flood stage for the flood protection rating and structural integrity for that flood stage, or
- 2 feet of freeboard justified with a risk analysis of the flood stage for the flood protection rating and structural integrity for that flood stage.

The flood stage for the flood protection rating should be developed using the same procedures as required for determining the BFE.

Structural integrity requirements are either:

- Meeting the 44 CFR 65.10 erosion requirement of no appreciable erosion expected in the selected flood and stability requirements (through-seepage, under-seepage, and slope stability) with standard factors of safety and standard flood fighting programs, or
- Meeting the 44 CFR 65.10 erosion requirement of no appreciable erosion expected in the selected flood and stability requirements (through-seepage, under-seepage, and slope stability) with factors of safety equal to or greater than approximately 1.0 to 1.1 for a 25-year flood protection rating, and higher pro-rated factors of safety for 50-year, and 75-year flood protection ratings (as shown in Table 1), accompanied by all of the following documents prepared by an engineer:
    - An operation and maintenance plan with a recent history of overall adequate maintenance as rated by an independent organization such as the California Department of Water Resources or USACE,
    - An emergency operations plan with a robust flood safety plan that meets standard requirements for flood fighting and levee patrolling that provides thorough visual inspection during high water at frequent intervals appropriate for the levee and the consequences of a levee failure, and
    - A history of performance of the levee system that is consistent with the flood protection rating (e.g., no levee breaches, near failures, or major distress associated with flood levels comparable to the flood protection rating, e.g. 25-year flood). Further, there should be no past major seepage or slope stability distress (e.g. boils or slumping) that has not been remediated with measures such as berms, cutoff walls, or relief wells. This documentation of history of performance should consider operations and maintenance ratings, levee rehabilitations or improvements since any previous levee breach or distress, any levee degradation, and flood fighting capabilities.

Table G-1. Stability Criteria

Flood Protection Rating	Through-Seepage	Under-seepage	Landside Slope Stability
25-Year (4 Percent Annual Chance)	No breakout on landside levee slope that would erode levee slope	i[1] = 0.8, (FS ~ 1.0 to 1.1)[2]	FS = 1.1
50-Year (2 Percent Annual Chance)	No breakout on landside levee slope that would erode levee slope	i = 0.7, (FS ~ 1.1 to 1.3)	FS = 1.2
75-Year (1.33 Percent Annual Chance)	No breakout on landside levee slope that would erode levee slope	i = 0.6, (FS ~ 1.3 to 1.5)	FS = 1.3
100-Year (1 Percent Annual Chance)	No breakout on landside levee slope that would erode levee slope	i = 0.5, (FS ~ 1.6 to 1.8)[3]	FS = 1.4[3]

Notes: 1. i is the average exit gradient for under-seepage across the landside top stratum or blanket layer
2. Approximate under-seepage factor of safety for soils with critical gradients between 0.8 and 0.9
3. Current USACE criteria

Furthermore, geotechnical exploration requirements for the engineer to document stability requirements would vary with the level of the flood protection rating – the higher the flood protection rating, the greater the exploration requirements. The exploration requirements are pro-rated from the exploration requirements associated with certification for the Base Flood. Solely for the purpose of calculating the pro-rated subsurface exploration requirements, the engineer may assume the following exploration requirements from USACE's ETL 1110-2-569 (2005) are associated with certification for the Base Flood:

> "A minimum target level of subsurface explorations should be a series of explorations approximately every 1,000 feet, consisting of an exploration at the riverside toe, at the landside toe, and a deep exploration at the levee crest. It is strongly recommended to use site appropriate geophysical procedures to interpolate between borings, to guide additional borings in anomalous areas, and as a basis to avoid unneeded borings."

The foregoing is comparable to approximately 15 borings or explorations per mile. So, to document seepage/stability requirements for a 25-year flood protection rating, the minimum target level of subsurface explorations would be a series of explorations equal to approximately 4 borings or explorations per mile [(15 explorations per mile x 25 years/100 years) ~ 4 explorations per mile]. For a 75-year flood protection rating, the minimum target level would be approximately 11 explorations per mile. The locations of any new explorations would be based on the locations of existing explorations, geomorphology, and past performance. Where possible, appropriate geophysical techniques should be used to interpolate between borings, guide additional borings in anomalous areas, and provide a basis to avoid unneeded borings.

Use of Past Performance to Document 25-year Flood Protection

In the absence of geotechnical information required to satisfy stability requirements (slope stability, through-seepage, and under-seepage) for a 25-year flood protection rating, levee geometry and performance history may serve in place of stability requirements for justifying a 25-year flood protection rating. The geometry and performance history requirements are:

- All levee reaches meet USACE minimum geometry requirements of 2h:1v waterside slope, 2h:1v landside slope, and 10-foot minimum crown width with all-weather crown roadway and access ramps (from USACE EM 1110-2-1913, 2000). If the levee does not strictly meet all of the geometry requirements, but a levee with the minimum geometry requirements could fit entirely inside the geometry of the levee in question, the levee can be considered as meeting the minimum geometry requirements.
- All reaches of the levee system have been loaded by at least one flood event with a stage that meets or exceeds the 25-year stage.
- All levee reaches that experienced appreciable distress during any past flood event, for any level of high water, have been identified and remediated, such as with berms, cutoff walls, or relief wells. If remediation was performed, it addressed the problem such that distress should not reoccur at that location.

The use of past performance cannot be used to justify a 25-year flood protection rating for levee systems with geotechnical information indicating that the levee system does not meet Table 1 stability requirements for through-seepage, under-seepage, or slope stability.

The use of past performance alone cannot be used to justify or document a flood protection rating higher than 25-year.

Use of 5-year or 10-year Flood Protection Ratings for Levees

For non-accredited levee systems that do not meet the requirements for a 25-year flood protection rating, a 5-year or 10-year flood protection rating may be available consistent with USACE Rehabilitation and Inspection Program (RIP) requirements as contained in EP 500-1-1:

- If the levee system is active in RIP, and provides 10-year flood protection with 2 feet of freeboard or provides 5-year flood protection with 1 foot of freeboard, the levee system is recognized as having a 10-year or 5-year flood protection rating, respectively.
- If the levee system is not active in RIP and an engineer documents that the levee provides 10-year flood protection with 2 feet of freeboard or 5-year flood protection with 1 foot of freeboard pursuant to the RIP requirements in EP 500-1-1, the levee system is recognized as having a 10-year or 5-year flood protection rating, respectively. To meet this requirement, the levee system must meet the requirements of the Initial Eligibility Inspection and the project condition must be rated as Acceptable or Minimally Acceptable according to the Inspection Guide for Flood Control Works.