

## Voluntary Home Elevation



## Built to Grade



## Three Feet of Elevation





## Five Feet of Elevation



## Eight Feet of Elevation





## Three Feet of Elevation



## Juxtaposed Building Styles





# Juxtaposed Building Styles





## Elevation and Storage



# Elevation and Storage



# California Building Standards Code Update Project

Department of Water Resources  
Floodplain Management Branch  
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Presentation to the  
Floodplain Managers Association  
March 26<sup>th</sup>, 2009



# Health and Safety Code § 50465 Language

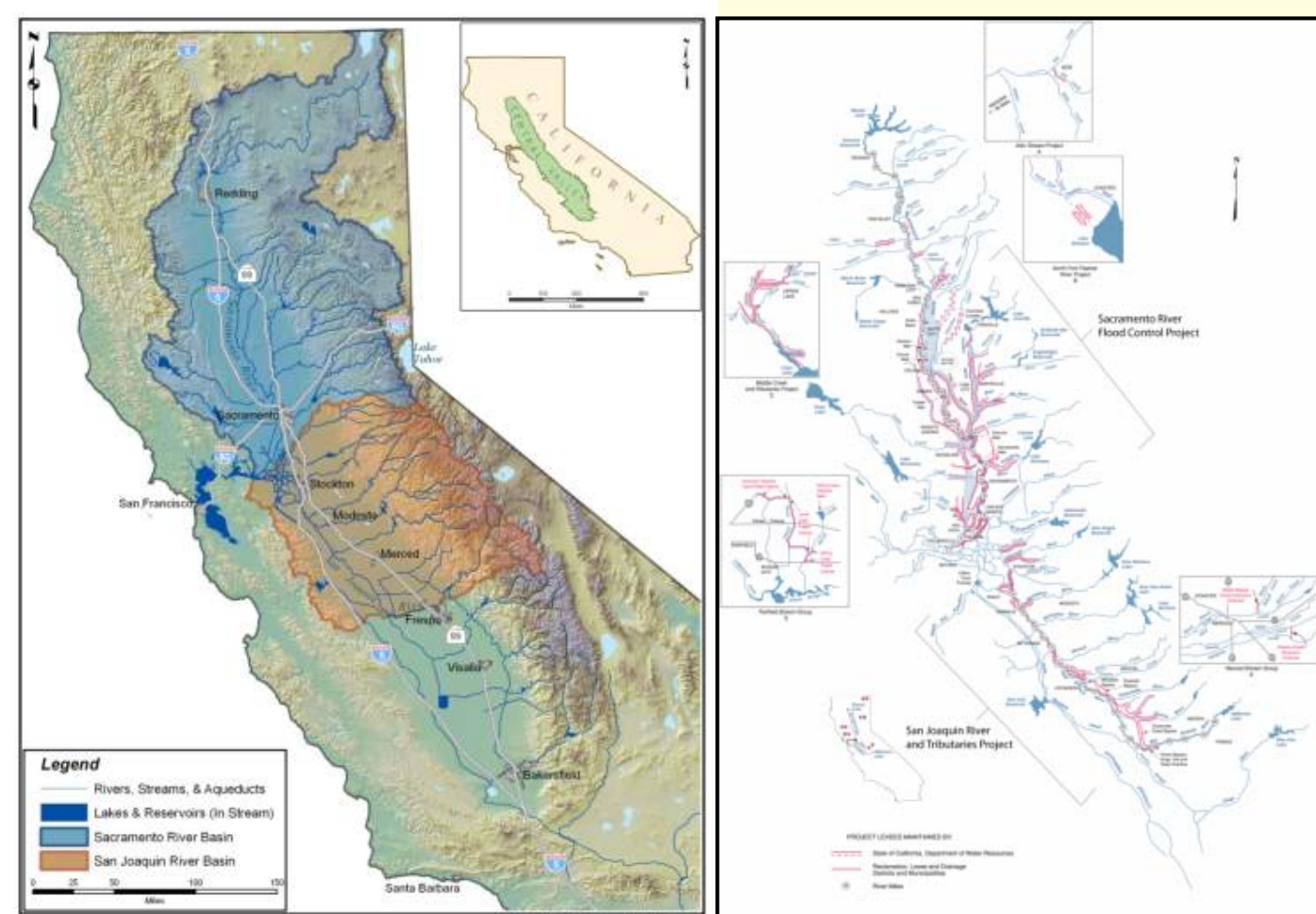
SEC 7. Section 50465 is added to the Health and Safety Code, to read:

50465. (a) On or before January 1, 2009, the Department of Water Resources shall propose for adoption and approval by the California Building Standards Commission updated requirements to the California Building Standards Code for construction in areas protected by the facilities of the Central Valley Flood Protection Plan where flood levels are anticipated to exceed three feet for the 200-year flood event. The amendments to the California Building Standards Code shall be sufficient to reduce the risk of flood damage and protect life, safety, and the construction in those areas.

(b) Before the department proposes the amendments to the California Building Standards Code required pursuant to subdivision (a), the department shall consult with the Central Valley Flood Protection Board, the Division of the State Architect, and the Office of the State Fire Marshal.

# Project Study Area

Consistent with the Area in the Central Valley Flood Protection Plan



# Project Phases

## **PHASE 1 (of 4): Project Initiation/Initial Code Preparation**

*Fall-Winter 2008*

- (1) Conducted literature search to identify historic flood threats.
- (2) Developed initial provisional solutions (Provisions Under Consideration).
- (3) Wrote white paper to communicate project intent.
- (4) Chartered Technical Advisory Committee and held three TAC meetings.
- (5) Presented comprehensive Threat & Consequence document to TAC.
- (6) Requested TAC members be available for sub-committees.
- (7) Selected key threats and developed provisional solutions.



# Current Technical Advisory Committee (TAC) Participants

- **CVFPB** (Central Valley Flood Protection Board)
- **SWRCB** (State Water Resources Control Board)
- **CBIA** (California Building Industry Association)
- **FMA** (Floodplain Management Association)
- **SFM** (Office of the State Fire Marshal)
- **AIA** (American Institute of Architects California Council)
- **SEAOC** (Structural Engineers Association of California)
- **DSA** (Division of the State Architect)
- **HCD** (Department of Housing and Community Development)
- **OSHPD** (Office of Statewide Health Planning and Development)
- **USACE** (U.S. Army Corps of Engineers)
- **NFPC** (National Flood Proofing Committee)
- **BSC** (Building Standards Commission)
- **NFIP** (National Flood Insurance Program)
- **MWH** Consulting
- **PBS&J** Consulting
- **IWC** (Inter-West Consulting)
- **CSBC** (City of Stockton Building Division)
- **SJBD** (San Joaquin Building Department)
- Other organizations and agencies were contacted

## Project Phases (2)

### **PHASE 2 (of 4): Public Input & Code Update (Provisions Under Consideration) Development**

*Winter-Spring 2009*

- BC Team, with assistance from TAC members, conducted one of two rounds of public workshops on flood threats and code revisions with interested parties. The next round of public meetings will take place in April 2009.
- An additional TAC meeting was held to discuss public input and refine our Code revision recommendations.
- We held our Disabled Subcommittee meeting on March 12th and will hold one more TAC meeting, as well as our Economics Subcommittee meeting, both in April

## Project Phases (3)

### **PHASE 3: DWR / Resources Agency Executive Review**

*April-June 2009*

- Draft Code amendment package will be submitted to DWR FloodSAFE Executive Management Team
- Draft Code amendment package will be submitted to Resources Agency.
- Code amendment package will be revised incorporating agency edits/comments.

### **PHASE 4: Building Standards Commission Process**

*July 1, 2009 to Approximately 18 Months*

- In mid-June 2009 the BC Team will submit the final Code update recommendations package to the BSC.
- BC Team will continue being instrumental in the refinement of the Code update provisions during the BSC Code adoption process, which includes public hearings.



# Systematic Threat Identification and Prioritization

## Chief Threat Identification

- HSC §50465: requires Code update for public safety and structural property damage
- The chief threats for this first Code cycle have been selected based upon severity of consequence to **public safety**:
  - **Death, serious injury**, injury or trauma
  - **Acute** and chronic
  - **Likely**, Possible, or Unlikely occurrence
- Damage reduction is a secondary consideration for DWR's first Code update submittal

# Identified Chief Threat #1: Entrapment by Lack of an Evacuation Location and Path to that Location



Above: Lack of flood evacuation location or path to it.



Right: illustrative example of path to a potential safe evacuation location.

**Cause:** the lack of a safe temporary shelter or evacuation location above the flood water surface elevation (e.g., 200-year level) or clearly marked and functional egress facilities

**Demographics:** Dependent persons (elderly, children, disabled, etc.), and able-bodied persons

**Potential Facilities:** (a) residential structures, (b) school and preschool structures, (c) hospital and emergency care structures, and (d) nursing home and assisted living structures

**Potential Solution:** User-friendly egress accommodation and/or a safe temporary location above the predicted floodwaters until rescue can be provided

## Identified Chief Threat #2: Death and/or Serious Injury by Structural Collapse



**Cause:** structural failure due to standing water and water velocity forces on the walls

**Demographics:** dependent persons (elderly, children, disabled, etc.), and able-bodied persons

**Potential Facilities:** (a) residential structures, (b) school and preschool structures, (c) hospital and emergency care structures, and (d) nursing home and assisted living structures



### **Potential Solution:**

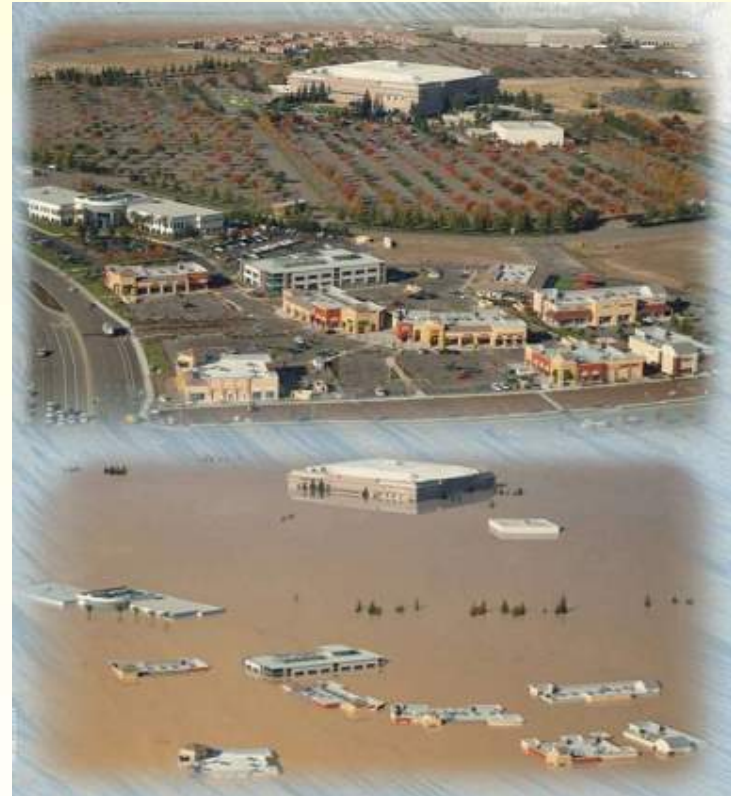
Code update for structures in a flood zone to reduce the chance of collapse in a reasonable timeframe (for example, until persons are rescued)

## Identified Chief Threat #3: Loss of Emergency Response Functions

**Cause:** facilities being inundated or damaged by floodwater

**Potential Facilities:** (a) emergency care facilities (hospitals and medical clinics), particularly emergency rooms and (b) emergency responder facilities (police, fire stations, ambulance dispatch centers, and 911 call centers)

**Potential Solution:** Keep essential operations functional at emergency facilities. In particular, Code update would supplement other efforts after experts define what critical functions are for each region



Lower 'photo' is of same deep floodplain area shown above under a simulated flood. Unless planned for operation during flood, all functions cease.



## Identified Chief Threat #4: Serious Public Health Threat from Industrial Facilities Hazardous Chemical/Content Release

**Cause:** release of hazardous chemicals and/or hazardous contents into floodwater

**Potential Facilities:**  
industrial facilities

**Potential Solution:** reduce public exposure to harmful or fatal hazardous contamination by better preparing industry for major floods



Above: hazardous contaminants float above flood waters  
Left: Individuals directly exposed to flood waters

## What are the Current Recommendations?

The DWR “Building Code Team” has opted to:

- Have a long-term strategy (e.g., multiple Code cycles)
- Address Chief Threats 1 and 2 only in upcoming Code cycle
- Focus on “dependant persons” in upcoming Code cycle (children, some elderly, persons with physical disabilities, and persons in assisted living facilities)

## What are the Current Recommendations? (2)

- Focusing on “dependant persons” translates to focusing on specific building types, or occupancy groups, where people are most likely to be
  - Educational, Institutional, Residential and perhaps commercial
- Proposed solution:
  - Require an evacuation location and a route to that location.
  - Require that evacuation locations be safe from structural collapse during predicted 200-year flood environment, not including water velocity.



Some are concerned about option, above.



Preferred approaches





Interior spaces of upper floors above the 200-year water surface elevation are ideal Evacuation Locations from floods (outside of regional evacuation)

## Issues to Resolve

- **COST:** Finding an affordable option for Evacuation Locations since requiring them above the “WSEL200” for single story structures in deep floodplains will have significant implications and be costly
- **MAPPING:** The 200-year Central Valley floodplain maps are not slated for completion until 2012 (earliest)

Public meeting will be on April 13<sup>th</sup> and April 14<sup>th</sup>

**Questions?**

[www.water.ca.gov/BuildingCodeUpdate](http://www.water.ca.gov/BuildingCodeUpdate)