San Bernardino County Essential Facilities Risk Assessment (SBEFRA) Project

Second Community Executive Committee (CEC) Meeting

July 23, 2008

FEMA   MAP IX-Mainland   MMI ENGINEERING   ABS Consulting

Introductions

- Community Executive Committee
- FEMA Region IX
- Project Team
- Guests

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Meeting Agenda & Objectives

- Data Collection Status Update
- Earthquake Hazards
- Earthquake Scenario Selection
- Flood Hazards
- Next Steps
- Open Discussion

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Project Overview

- Effort guided by a Community Executive Committee led by San Bernardino County
- Essential Facilities Data Collection and HAZUS Incorporation
- Incorporation of County Assessor's data
- Earthquake Hazard Scenario Selection (2) and Risk Assessment
- Incorporation of DFIRM data into HAZUS
- Flood Risk Assessment (Two 100 yr events, w/ & w/out levees & one 500 yr event)
- Risk Assessment Report
- One year schedule

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Project Phases

- 4 Phases:
  - 1 – Initial Coordination, Establishment of Community Exec. Committee, Identify points of contact
  - 2 - Data Collection & Review (*CEC meeting upon completion)
  - 3 - HAZUS Analyses - EQ & Flood (*CEC meeting upon completion)
  - 4 - Risk Assessment Report (*Community Roll-Out upon completion)

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SBEFRA Data Collection Status
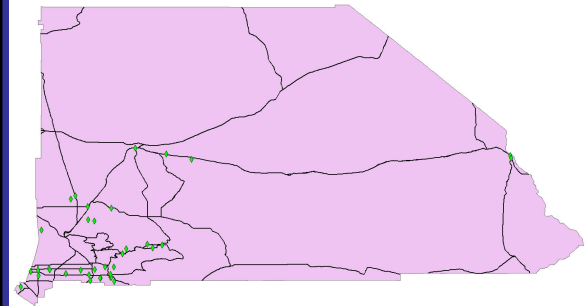
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Inventory Data

- Essential Facilities inventory data is stored two ways:
  - Data common to all hazards
    - Address
    - Geographic Location
    - Contact Info, etc.
  - Hazard-specific data
    - EQ – model building type, quality, design level, site-specific EQ hazard data
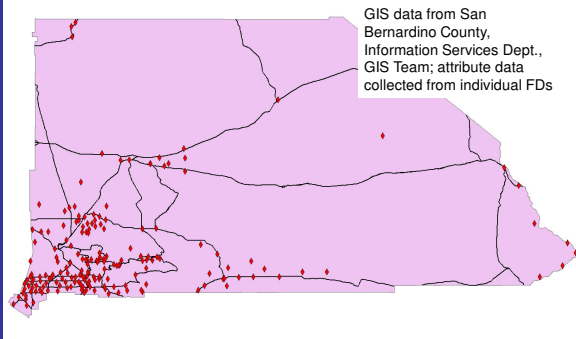   - Flood – Pre-FIRM/Post-FIRM, foundation type, first floor elevation, flood protection

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HAZUS Default data for Fire Facilities

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SBEFRA Fire Facilities

GIS data from San Bernardino County, Information Services Dept., GIS Team; attribute data collected from individual FDs
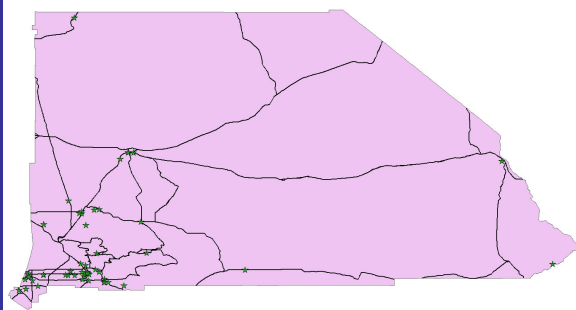
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Fire Departments That Provided Data

- San Bernardino County Fire
- Apple Valley FD
- Barstow Fire Protection District
- Big Bear City CSD
- Big Bear Lake FD
- Chino Valley Independent Fire District
- Colton FD
- Highland FD
- Montclair FD

- Ontario FD
- Rancho Cucamonga FD
- Redlands FD
- Rialto FD
- Running Springs FD
- San Bernardino FD
- Upland FD
- Victorville FD
- Crest Forest Fire
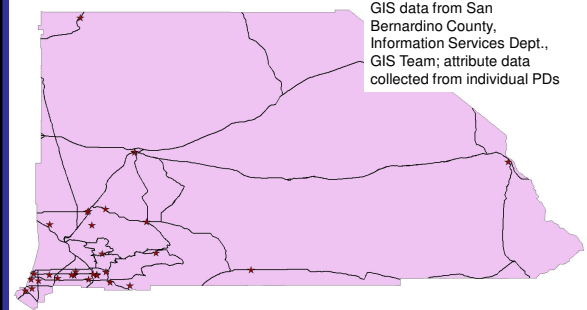- *In process: Loma Linda, Morongo Valley, Twentynine Palms*

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HAZUS Default Data for Police Facilities

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SBEFRA Police Facilities

GIS data from San Bernardino County, Information Services Dept., GIS Team; attribute data collected from individual PDs
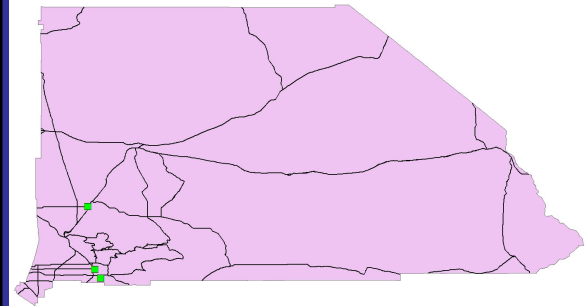
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Jurisdictions That Provided Police Facility Data

- Barstow PD
- Chino PD
- Colton PD
- Fontana PD
- Montclair PD
- Ontario PD
- Redlands PD
- San Bernardino PD
- Upland PD

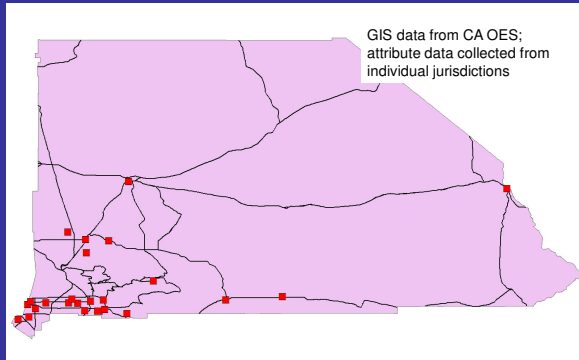- *In Process: San Bernardino County Sheriff, Rialto PD*

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HAZUS Default Data for EOCs

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SBEFRA EOCs

GIS data from CA OES; attribute data collected from individual jurisdictions

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Jurisdictions That Provided EOC Data

- Adelanto
- Apple Valley
- Barstow
- Big Bear City
- Big Bear Lake
- Chino
- Chino Hills
- Colton
- Fontana
- Grand Terrace
- Montclair
- Needles

- Rancho Cucamonga
- Redlands
- Rialto
- San Bernardino City
- San Bernardino County
- Twentynine Palms
- Upland
- Yucaipa
- Yucca Valley
- *In process: Hesperia, Loma Linda, Victorville*
- *Requested: Highland, Ontario*

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HAZUS Default data for Hospitals

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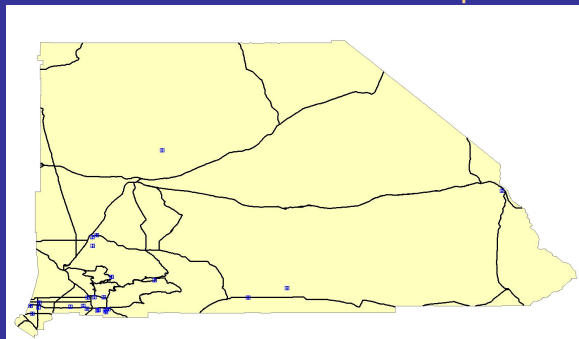
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Requested Hospital Data

Hospital Site Data	Hospital Building Data
Hospital Name	Building Name
OSHPD Facility number	SPC rating as reported to/by OSHPD
Street Address	Year Built
Number of Buildings	Number of Stories
Number of licensed (acute care) beds	Structural System/Construction Type
	Building Area (square footage)
	Replacement cost
	Back-up Power
	Foundation Type
	First Floor Elevation
	Flood protection

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## Hospitals That Have Provided Detailed Building Data

- Arrowhead Regional Medical Center
- Canyon Ridge Hospital
- Desert Valley Hospital
- Kaiser Permanente-Fontana (partial)
- Kindred Hospital-Ontario
- Mountains Community Hospital
- San Antonio Community Hospital
- Jerry L. Pettis Veterans Affairs Medical Center
- Chino Valley Medical Center
→ Total # licensed beds = 1,500 (28.5% of County)

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HAZUS Default data for Schools

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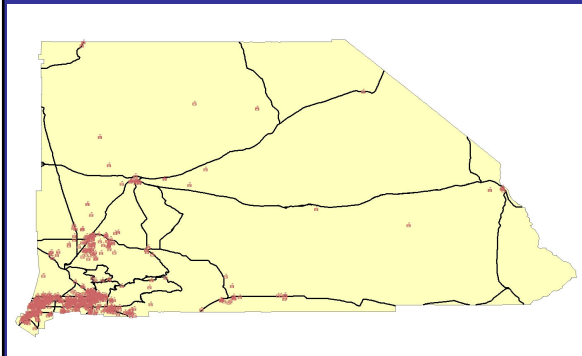
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School Data Collection

- Data required for HAZUS generally available within school insurance appraisal reports, including:
  - School district, School name, School location
  - Building name
  - Basic construction class (including portables)
  - Year Built
  - Number of stories
  - Building square footage/floor area
  - Presence of basement
  - Building & content replacement value

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San Bernardino Co. School Districts

Property Insurance Provider	School Districts	Data collection status
Alliance of Schools for Cooperative Insurance Programs (ASCIP) – 3	Chaffey, Colton, Upland	Data provided by ASCIP
Southern California Schools Risk Management Joint Powers Authority (SCSRM JPA) – 30	Adelanto, Alta Loma, Apple Valley, Baker Valley, Baldy View ROP, Barstow, Barstow CC, Bear Valley, Central, Chaffey CC, Chino Valley, Colton-Redlands-Yucaipa ROP, Copper Mountain CC, Cucamonga, Etiwanda, Helendale, Hesperia, Lucerne Valley, Morongo, Mountain View, Mt. Baldy, Needles, Ontario-Montclair, Oro Grande, Rim of the World, San Bernardino City, San Bernardino Co. SoS, Silver Valley, Victor, Yucaipa-Calimesa	Data provided by SCSRM JPA (>6,000 buildings)
Others – 4	Fontana, Redlands, Rialto, Victor Valley	Data requested
Others – 1	Trona	Contact pending

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Seismic Hazards Impacting San Bernardino County

Dr. Sally McGill

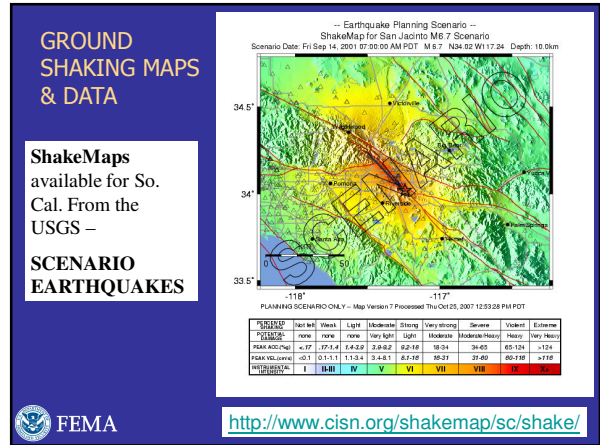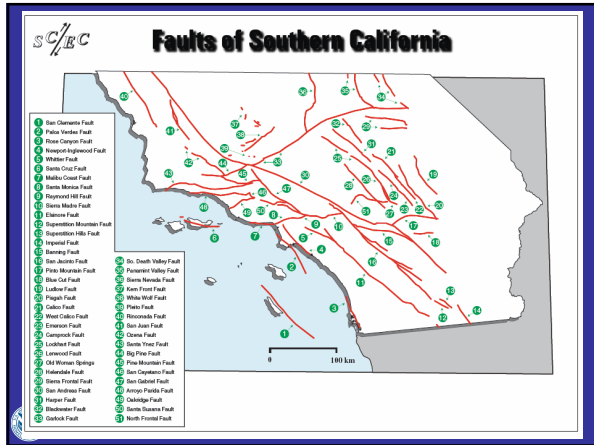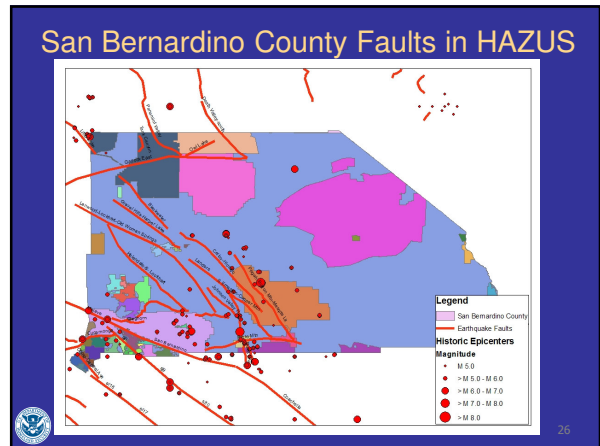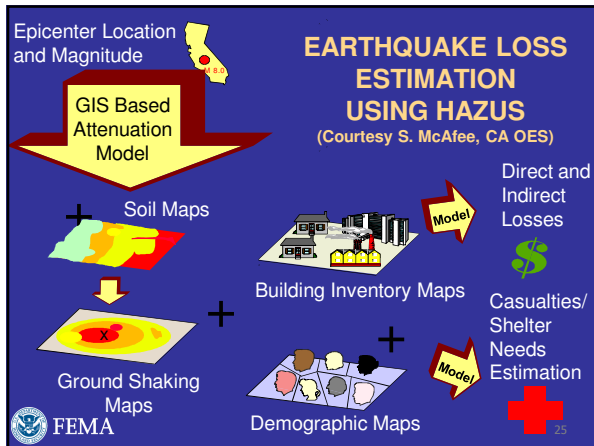California State University, San Bernardino
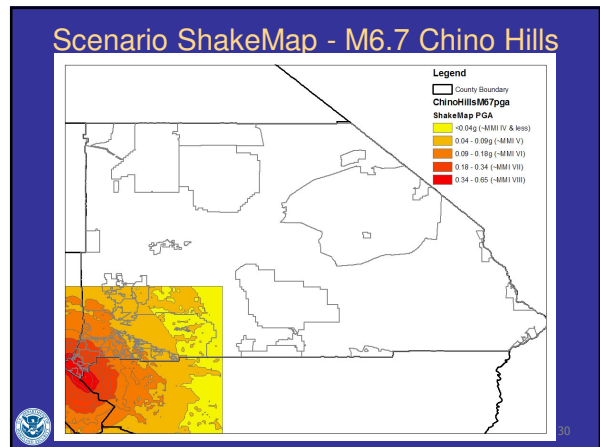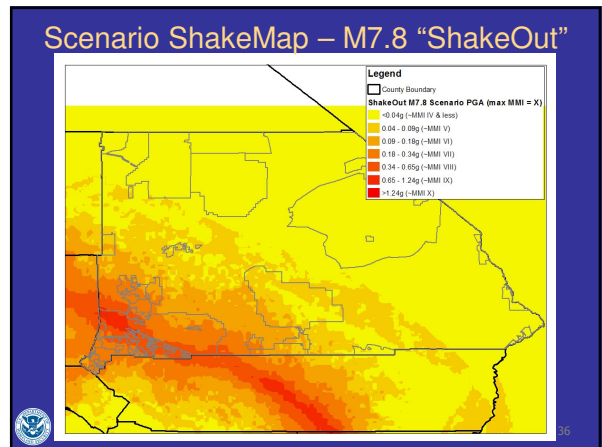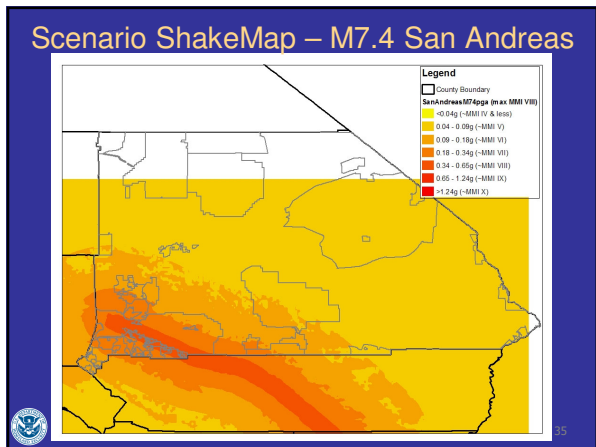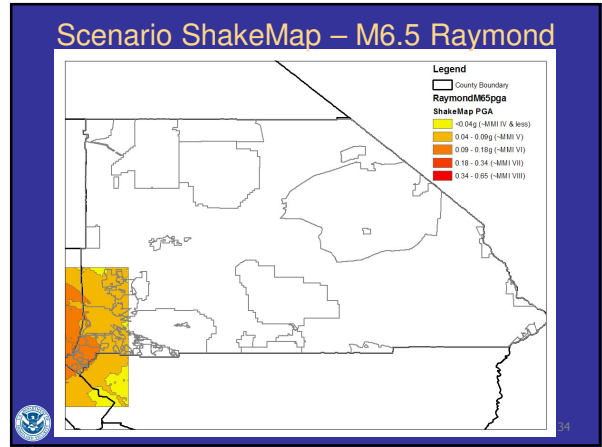Dept. of Geological Sciences

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Earthquake Scenario Selection

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EARTHQUAKE LOSS ESTIMATION USING HAZUS
(Courtesy S. McAfee, CA OES)

Epicenter Location and Magnitude → GIS Based Attenuation Model + Soil Maps + Ground Shaking Maps + Building Inventory Maps + Demographic Maps → Model → Direct and Indirect Losses, Casualties/Shelter Needs Estimation

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San Bernardino County Faults in HAZUS

Legend: San Bernardino County, Earthquake Faults, Historic Epicenters, Magnitude: M 5.0, > M 5.0 - M 6.0, > M 6.0 - M 7.0, > M 7.0 - M 8.0, > M 8.0

Faults of Southern California

GROUND SHAKING MAPS & DATA

ShakeMaps available for So. Cal. From the USGS –

SCENARIO EARTHQUAKES

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http://www.cisn.org/shakemap/sc/shake/

Shaking & Potential Damage

Intensity	Acceleration (%g)	Perceived Shaking	Potential Damage
I	< 0.2	Not Felt	None
II-III	0.2 - 1.5	Weak	None
IV	1.5 - 4	Light	None
V	4 - 9	Moderate	Very Light
VI	9 - 18	Strong	Light
VII	18 - 34	Very Strong	Moderate
VIII	34 - 65	Severe	Mod. to Heavy
IX	65 - 124	Violent	Heavy
X+	> 124	Extreme	Very Heavy

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Adapted from http://pasadena.wr.usgs.gov/shake/pubs/shake/shake.html

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Scenario ShakeMap - M6.7 Chino Hills

Legend: County Boundary, ChinoHillsM67pga, ShakeMap PGA: <0.04g (~MMI IV & less), 0.04 - 0.09g (~MMI V), 0.09 - 0.18g (~MMI VI), 0.18 - 0.34 (~MMI VII), 0.34 - 0.65 (~MMI VIII)

Scenario ShakeMap – M7.1 Coachella

Scenario ShakeMap - M6.8 Elsinore

Scenario ShakeMap – M7.1 Puente Hills

Scenario ShakeMap – M6.5 Raymond

Scenario ShakeMap – M7.4 San Andreas

Scenario ShakeMap – M7.8 "ShakeOut"

Scenario ShakeMap – M6.7 San Jacinto

Legend
County Boundary
SanJacintoM67pga
ShakeMap PGA
<0.04g (~MMI IV & less)
0.04 - 0.09g (~MMI V)
0.09 - 0.18g (~MMI VI)
0.18 - 0.34 (~MMI VII)
0.34 - 0.65 (~MMI VIII)
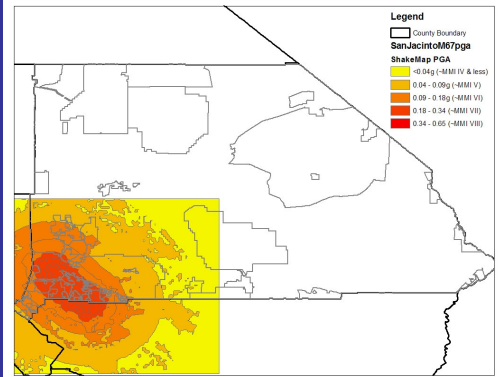
Scenario ShakeMap - M6.7 Verdugo

Legend
County Boundary
VerdugoM67pga
ShakeMap PGA
<0.04g (~MMI IV & less)
0.04 - 0.09g (~MMI V)
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0.18 - 0.34 (~MMI VII)
0.34 - 0.65 (~MMI VIII)
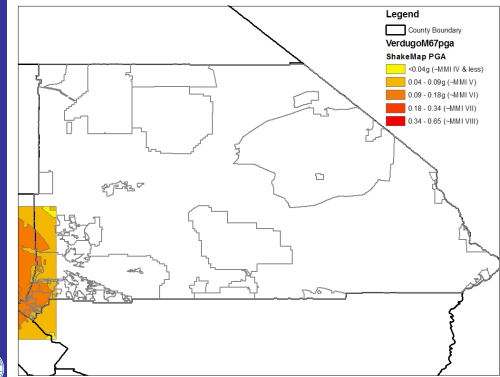
Scenario ShakeMap – M6.8 Whittier

Legend
County Boundary
WhittierM68pga
ShakeMap PGA
<0.04g (~MMI IV & less)
0.04 - 0.09g (~MMI V)
0.09 - 0.18g (~MMI VI)
0.18 - 0.34 (~MMI VII)
0.34 - 0.65 (~MMI VIII)
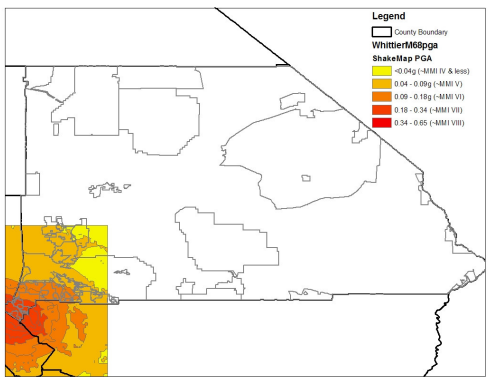
Scenario Selection Discussion

- Need to select 2 earthquake scenarios for inclusion in the risk assessment…

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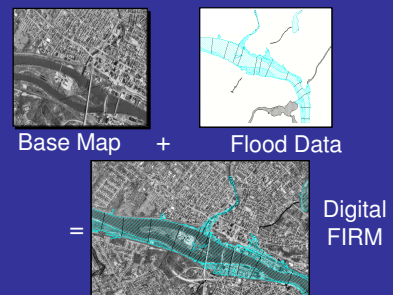# Flood Hazards

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Digital FIRM

Base Map   +   Flood Data

=   Digital FIRM

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Flood Hazard Data

- DFIRM effective 08/28/2008
- 26 streams with levee systems in the county that are in the process of accreditation. Some of these are:
  - Santa Ana River
  - Mojave River
  - Mill Creek
  - Lytle Creek
  - Etiwanda and San Sevaine Channel
  - East Twin Creek
  - Cucamonga Creek
  - City Creek
  - Twenty-nine Palms Creek
  - Cajon Wash
  - Cable Creek Channel

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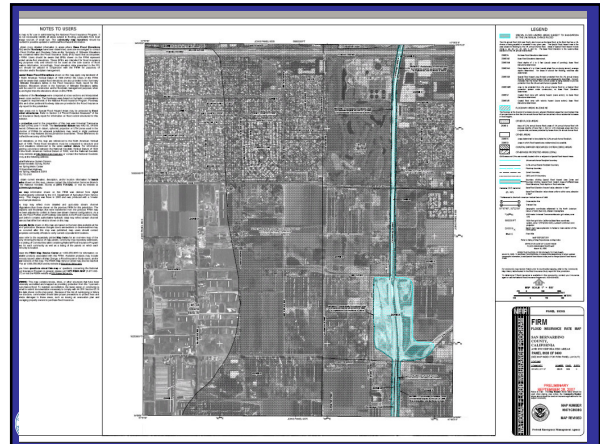
Part of the levee system for Cucamonga Creek

Levee Protected Area

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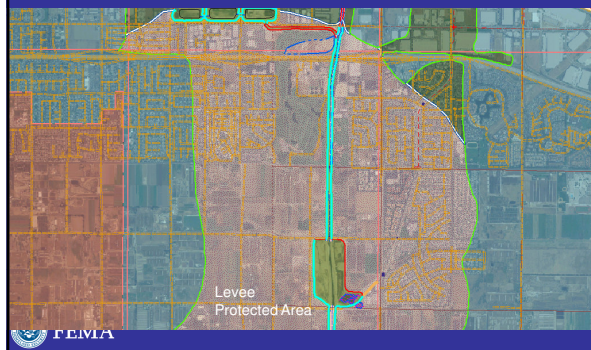
HAZUS Flood Scenarios

- Scenarios
  - 1 % Annual Chance Event – With Levees
  - 1 % Annual Chance Event – Without Levees
  - 0.2 % Annual Chance Event
- Requires DFIRM & FIS data to generate a Surface Water Elevation Depth of Flooding Grid for each scenario type
- Requires Terrain Surface

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HAZUS Depth Grid Methodology

- Challenges
  - BFEs below ground with USGS topo
  - Shaded X 500 year is really 198 year event and not split on map from X < 1 ft and X protected by levee
  - 500 year really not shown on map but in profiles
  - Zone D areas need to be estimated

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HAZUS Depth Grids

- With Levee Scenario Depth Grid
  - Zones AE, AH, VE DFIRM data and FIS profiles for areas with BFE need correct topo
  - Zone AO - Use depth
  - Zone A & V – Coordinate with community for standard depth or LDS of available with BFEs
  - Exclude Zone D, X, Shaded X

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HAZUS Depth Grids

- Without Levee Scenario Depth Grid
  - Cannot assume a single depth for Levee Fail areas (e.g. treat like a Zone A)
  - Use results from PM 34 /43 analysis to get boundary for WSEL elevation
  - Create WSEL elevation by running back to Profile baseline & interpolate in Zone D areas
  - Subtract from terrain corrected in With Levee Scenario
  - Confirm with previous FIRM that showed Levee Fail areas

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HAZUS Depth Grids

- 0.2% Scenario Depth Grid
  - Cannot use shaded X from DFIRM data
  - USACE and Community may have performed some limited area restudy for 500 year
  - Majority of Profiles show 500 year depth
  - Going to run this depth out to terrain to get extent of boundary at that WSEL
  - Subtract surface from terrain to get Depth Grid

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HAZUS Depth Grids

- Validation
  - FEMA, USACE, and Community review of all three Depth Grids
  - Spot check against depths shown in profiles from FIS
  - Compare against existing 500 year studies
  - CEC buy-in

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Next Steps …

- Data processing for all essential facilities
- Data processing of Assessor's data
- Earthquake risk assessment
- DFIRM development → Flood hazard data processing
- Flood risk assessment
- Next meeting – to discuss preliminary EQ & Flood risk assessment results…

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Current & Future Use of HAZUS & SBEFRA Data

- CEC to determine central SBEFRA Project HAZUS data storage repository
- CEC to agree on data distribution policy & associated limitations
- Who is using/will use HAZUS?
- How will HAZUS be used?
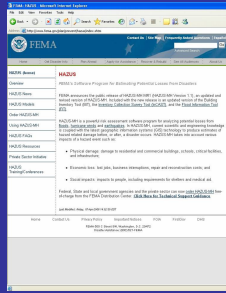
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Questions & Discussion

- FEMA is excited to work with San Bernardino County on this important project, to blaze a new trail in emergency preparedness and risk assessment!
- This project has unlimited potential for future applications…this project is for you…
- Questions?

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FEMA Resources

- HAZUS-MH Overview
- Resources
- Conference Information
- FAQs

http:// www.fema.gov/plan/prevent/hazus/index.shtm

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Contact Information

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www.sbcfire.org/oes/index.asp

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