Thomas Fire and the 1-9 Debris Flow
December 2017 – January 2018

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Jon Frye, PE, CFM
Santa Barbara County Flood Control District

Floodplain Management Association
2018 Annual Conference
Thomas Fire – 281,893 acres
Santa Barbara & Ventura Counties
Challenge: Restore basins to full capacity after December fire and prior to onset of winter rains

- 11 Debris Basins cleared
- Work accomplished between 12-15-17 and 1-05-18
We Knew We Had a Problem

- Jan 5, 2018 - Press conference
- Jan 7 – Initial maps received; EOC active and evacuation areas identified
- Jan 8 – Evacuation announced
- Storm intensity in burn area
  - predicted up to an inch per hour
  - received .86 inches in 15 minutes
Radar Imagery of January 9, 2018 Storm

Legend: dBZ

- 75
- 70
- 65
- 60
- 55
- 50
- 45
- 40
- 35
- 30
- 25
- 20
- 15
- 10
- 5
- 0
- -5
- -10
- -15
- -20
- -25

RF
January 9, 2018
Rainfall Rates

- Summerland 5 minutes 0.47” @ 3:38:30
- Montecito 5 minutes 0.54” @ 3:38:10
- Daulton Tunnel 5 minutes 0.60” @ 3:49:51
- Jameson Reservoir** 5 minutes 0.60” @ 4:02:15
- Montecito Creek stream flow gauge in Montecito destroyed between 3:49 and 4:04

**USGS Thresholds:**
- 0.50 inches/one hour
- 0.30 inches/30 minutes
- 0.20 inches/15 minutes

** Major debris flow also on other side of mountain
1-9 Debris Flow

- Hundreds of rescues
- 23 Fatalities
- Hundreds of homes impacted, many total loss
Olive Mill Road
“The storm we got was not the storm we prepared for.”
- Rob Lewin, OEM Director
Home Security Video - Cold Springs Creek
Basins

All basins in Thomas Burn area filled

Montecito Basins built in ‘60’s and ‘70’s by USACE after Coyote and Romero Fires; Santa Monica Basin by SCS in ’70’s after 1969 floods
Channels

Cold Springs Creek

Upper reaches scour

Hot Springs Creek

All channels for most part natural, non-engineered, on private property. Exceptions are Santa Monica and Franklin

Arroyo Pardon Creek

Montecito Creek

Lower reaches deposition
Rebuilding in a known High Hazard Area

- Santa Barbara County has no “debris flow” building code
- Closest tool available is the floodplain management code
- FEMA Effective FIRM now not useful for base flood elevations
- FEMA provides Recovery Mapping on June 11, 2018
Memorandum of Agreement
Between Santa Barbara County, Public Works and Planning and Development Departments, and Federal Emergency Management Agency, Region IX

This Memorandum of Agreement (MOA) sets forth the terms and understanding between the Federal Emergency Management Agency (FEMA) and Santa Barbara County to complete hazard recovery mapping for coastal watersheds impacted by the Thomas Fire.

Parties
The parties are FEMA, Region IX and Santa Barbara County, Public Works and Planning and Development Departments.

Purpose
This MOA documents the path forward to meet the community hazard management and regulatory needs in a transparent, satisfactory, and timely manner.

Responsibilities
The goal of this MOA will be accomplished by undertaking the following activities:

1. FEMA will develop recovery mapping in areas impacted by the Thomas Fire and the January 9, 2018, debris flow event. FEMA Region IX will expedite this study work to the maximum extent practicable.
2. The hydrologic analyses for the hazard mapping are to reflect post-fire and existing conditions, as well as build upon work done by the BAER and WERT teams.
3. The hydraulic analyses for the flood recovery mapping shall use post-disaster light detection and ranging topographic data, and assume culverts and bridges are blocked. The accuracy for this mapping does not allow for field survey.
4. Santa Barbara County will use the recovery mapping to inform amendments to existing ordinances or adoption of new ordinances governing development in the study area.
5. FEMA will support public outreach meetings hosted by Santa Barbara County to communicate the results of this study to the public.
6. FEMA plans to subsequently contract to expand the hazard recovery mapping to produce modeling and mapping to revise the Flood Insurance Rate Map for Santa Barbara County.

Other Provisions
a. This MOA is not a fiscal or funds obligation document.

b. Nothing in this MOA is intended to conflict with current law or regulation or the directives of FEMA or Santa Barbara County. If a term of this agreement is inconsistent with such authority, then that term shall be invalid, but the remaining terms and conditions of this agreement shall remain in full force and effect.

c. This Agreement, upon execution, contains the entire agreement of the parties and no prior written or oral agreement, express or implied, shall be admissible to contradict the provisions of this MOA.

d. FEMA Region IX and Santa Barbara County Public Works Department will hold at least monthly conference calls to monitor progress on each of the aforementioned commitments.

Effective Date
The terms of this agreement will become effective on the date of signature of the authority representatives of both parties.

Modification
This MOA may be modified by mutual written consent of authorized officials from FEMA and Santa Barbara County.

Termination
This MOA terminates on December 31, 2020, upon the accomplishment of its purpose, or upon agreement of the parties. Either party, upon 30 days written notice to the other party, may terminate this agreement.

Points of Contact
FEMA Region IX
Juliette Hayes
Risk Analysis Branch Chief
1111 Broadway, Suite 1200
Oakland, CA 94607
Telephone: (510) 627-7211
E-mail: juliette.hayes@fema.dhs.gov

Santa Barbara County
Jonathan Frye
Engineering Manager
130 East Victoria Street, Suite 200
Santa Barbara, CA 93101
Telephone: (805) 968-9444
E-mail: jfrye@co.sbc.ca.us

Approved By
The following persons are authorized to sign this MOA on behalf of their respective parties.

On Behalf of FEMA:

[Signature]

Date: 01/12/2018

On Behalf of Santa Barbara County:

[Signature]

Date: 01/12/2018
County Guidance for Rebuilds

Guidance to Property Owners
Montecito Debris Flow Rebuilds

March 13, 2018

County staff is working to assist property owners in the rebuild process following the January 9th debris flow in Montecito which occurred after a very significant rainfall event in the Thomas burn area. Unlike rebuilding after a fire, the current situation poses unique challenges. Property owners are encouraged to meet with their Planning and Development Case Manager who is assigned to their damaged or destroyed property. This will ensure the property owner has an understanding of the processes and challenges unique to recovery for their specific property.

The landforms have changed significantly, including property elevations and at some locations, the width and depths of creeks. Many survey monuments have been displaced, and many property boundaries cannot be verified without professional surveys. The County’s Floodplain Management Ordinance is based in large part on the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM). However, the current FIRM maps are no longer representative of on-the-ground conditions due to the land-changing debris flow. The base flood elevations on the current FIRM maps do not reflect current topography and are of little use in the rebuilding process where topography has changed. FEMA will be developing new FIRM maps that is expected to take from two to five years.

Additionally, according to the U.S. Forest Service Burned Area Emergency Response Team and the State of California Watershed Emergency Response Team reports, the area is subject to ongoing threats of debris flows during significant rain events (a half inch of rain or more in an hour) for the next two to five years. In order to prevent potential damage to rebuilt structures and other structures in the community, any improvements that occur during this timeframe should be done with proper attention to changes in topography and new creek profiles.

To address the information deficiency in the short term, staff is working with FEMA on a flood hazard/recovery mapping analysis. Staff is also working with private consultants to conduct land surveys and engineering studies to reflect the current conditions and be used for rebuilding. These studies are expected to be complete in three months. The Recovery Mapping will be used to make prudent technical decisions regarding rebuilding in this immediate, and two to five year time frame. The studies will also inform any changes that may be required to Chapter 15A, the County’s Flood Plain Management Ordinance.

Until these studies are complete, the County is advising property owners to temporarily delay making any significant expenditure on design plans so their decisions and permit applications can be informed by this work (expected to be complete in three months).

For those property owners who choose not to wait, the County recommends meeting with your Planning and Development case manager and Flood Control staff upfront to determine the submittal requirements to facilitate the permit review process. Requirements will depend on the situation of individual properties and may include:

1. Current topographic survey of project site and adjacent parcels.
2. Property line survey.
3. Hydrologic analyses of the project site to reflect post-burn (Thomas) conditions.
   a. Calculation of the current base flood elevations, inundation limits and possibly the floodway.
   b. Key design elements include channel geomorphology, foundation considerations, and hydraulic capacity.
4. Preparation of plans may require utilization of experts in geotechnical, civil and hydraulic engineering, soil erosion, hydrology, and engineering geology.

As property owners consider the best method of rebuilding or repairing their properties, talking with your own experts about how to incorporate the debris deposited on your property may be very helpful. Maintaining some or all of the debris may reduce the overall costs of rebuilding by eliminating the removal of all debris.
Jon Frye, Santa Barbara County Flood Control engineering manager, speaks during a community meeting Thursday in Santa Barbara about new recovery flood maps released for the Montecito debris flow areas. (Brooke Holland / Noozhawk)

County Deputy Public Works Director Tom Fayram (left) addresses county supervisors with (from left) Office of Emergency Management Director Rob Lewin, the U.S. Forest Service’s Kevin Cooper, Drew Coe of CAL FIRE, and Jeremy Lancaster of the CA Geological Survey. (Paul Wellman, Independent)
## Structure Damages

<table>
<thead>
<tr>
<th>Damage Level</th>
<th>Number of Structures</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-1%</td>
<td>60</td>
</tr>
<tr>
<td>10-60%</td>
<td>100</td>
</tr>
<tr>
<td>1-10%</td>
<td>40</td>
</tr>
<tr>
<td>Total</td>
<td>445</td>
</tr>
</tbody>
</table>

### Within existing FEMA FIRM special flood hazard area (A, AE, AO, AH, & VE Zones)
- 60-100% Damaged: 70
- 10-60% Damaged: 62
- 1-10% Damaged: 52
- Total: 184

### Within FEMA Recovery Mapping hazard area
- 60-100% Damaged: 141
- 10-60% Damaged: 122
- 1-10% Damaged: 89
- Total: 352

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**Legend**
- Damaged Structures
  - 0-1%
  - 10-60%
  - 30-60%
  - 60-100%
  - Total: 0-100%
- Special Flood Hazard Area
- High Hazard Area

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*Source: Esri, HERE, DeLorme, USGS, iMap, INCREMENT in NH, and OpenStreetMap contributors. © OpenStreetMap contributors and the GIS User Community.*
USGS / CGS
Debris Flow Inundation Limits

Legend
- Inundation Depth Points (in feet)
- Debris Field

USGS/CGS FLOW DEPTH POINTS
& DEBRIS FIELD - APRIL 2018
County Planning and Development Department
Interactive Map
Montecito Neighborhoods Affected
SB County / AIA Technical Support Team
Purpose/Mission of the AIASB-CRT

The AIASB-Community Recovery Team has a simple mission: To assist the affected property owners in Montecito get home in the most effective and resilient manner possible. We will accomplish this mission by nurturing a sense of neighborhood and applying our design talents to help solve the complex issues of rebuilding a community. This handout provides a few conceptual solutions to mitigate the effects of flood or debris flows.

AIASB-CRT Members: Andrew Prather, C. Elizabeth Allen, AIA, Ben Banez, Rob Stormin, FR, Bob Young, Bradley Goodall, Brian Gordon, AIA, Carl Price, Cim Eiseberg, FAIA, Chin Wang, Choonmei Parson, AIA, Christopher Horatio-Hamp, AIA, Clay Anderson, AIA, Dan Johnston, AIA, Dr. Peter Luper, AIA, Donna Rich, DLE, Ed Salter, Elise Hefley, AIA, Eric Abeytia, PE, Isabelle Greco, FAIA, Jeff Strogen, AIA, Jeffrey Hight, SE, Ken Linn, Tom Ryan, FE, Ken Plotz, Robert Osofsky, TASA, Leo Spilker, AIA, Lisa Reisman, Keith Renner, AIA, Lisa Schott, TASA, Louis Zambano, AIA, Lori Karl, AIA, Mark Cassidy, BFA, Herman Mnookin, AIA, Patsy Sibley, Paul Lawler, AIA, Robert Bolen, AIA, Ron Rice, PE, Susan Van Antu, FAIA, Steven Brandt, Torrance Gamelley, Peck Moody, Noyes, Troy Herdman, Torrey Powers, FE, Vinnie Poirier, AIA, William Goss.

Contacting the AIASB Community Recovery Team

The AIASB-CRT may be reached through the Montecito Center or via email CRT@AIASB.COM.

Montecito Center Hours
1283 Coast Village Circle
Montecito, CA 93109
Monday - Friday 10 a.m. to 3 p.m.
Saturday - 10 a.m. to 2 p.m.
No Appointment is required

AIASB Office
229 East Victoria Street
Santa Barbara, CA 93101
Monday - Friday 9 a.m. to 1 p.m.
805.966.4198

Conceptual Solutions Handout

--- A Starting Point ---
**Permit Paths**

Board of Supervisors: May 15, 2018

The County Board of Supervisors will be considering revisions to the existing Like-for-Like ordinance to allow more flexibility in the rebuilding process. AIASB-CRT encourages property owners to let the Board of Supervisors know that we support the staff recommendations.

**Steps to Rebuilding**

There are many steps to the rebuilding process. This will take some time to accomplish. We advise you to have a new survey completed for your property which includes locating the boundary, corners and contours at 24 inches. A soils report will also be important. Having architectural and engineering drawings prepared that illustrate the repaired building or rebuilt structure meets all the conditions of the current building code.

**Recovery Map Flood Elevations**

**Concept One:**

Removal of boulders and soils materials is proving to be very expensive, in some cases as much as $65/ton removal costs. In at least two examples this has cost an average of $457,000 with only ~40% removal completed. AIASB-CRT recommends you seriously consider NOT removing this material because you may just have to bring some back when the new BFE is established. Use this material in your landscape.

It is very likely that you will need to raise a reconstructed portion of your structure(s), if not the entire structure. Keep the deposited soil to avoid having to purchase fill as part of your rebuilding effort.

**Concept Two:**

Elevate your existing structure(s) above the ABEF. This may be possible to accomplished by a professional house moving company.

**Structure Locations**

**Concept Three:**

Relocate the existing structure away from drainage courses. This may be option with the help of a professional house moving company. Raising the structure at the same time will put you in a better position when the new BFE and FIRM Map is approved.

**Concept Four:**

If you are going to relocate or rebuild your structure(s), place the structure(s) parallel to the flow of drainage. Also explore flow diversion strategies that protect your structure while not negatively impacting your neighbors.

**Concept Five:**

Elevating the structure provides an opportunity to design a base to allow the flow of debris through/under the structure potentially reducing the risk of debris damage inside the structure.

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A neighborhood approach is vital to our collective success!
Case Study: 220 Olive Mill Road
FEMA Recovery Mapping 220 Olive Mill Road
220 Olive Mill Road
FEMA Recovery Mapping – depth grid
SITE PLAN
SCALE 1" = 10'

220 OLIVE MILL ROAD

SITE LEGEND
- HIGH BUILDING
- STEPS / PLANTING
- ELEVATION
- ROAD
- STREET LIGHTS
- POOL
- GATE
- FENCE
- SEWER LINE
- POTTERY

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Questions

San Sedro Creek at Hwy 192

Montecito Debris Basin

Approximate mud line