Lessons Learned: Mitigation Project Benefit-Cost Analyses in Riverside County, California
Project Location

Riverside County
Lakeland Village, CA
Hazards Addressed

Flooding: Special Flood Hazard Areas
Flooding due to Zone AE designations associated with Lake Elsinore
› BCA Model Used: Full Flood
   › Based on Flood Insurance Rate Maps (FIRM) and Flood Insurance Study (FIS)
     › Recurrence Intervals: 10, 50, 100, and 500

Flooding: Rainfall
Flooding due to Rainfall occurrences (both low and high-intensity)
› BCA Model Used: Damage Frequency Assessment (DFA)
   › Based on historical rainfall data
     › Recurrence Intervals: 1, 2, 5, and 100

Wildfire
This hazard was not addressed, but decreased access to wildfire risk areas during a hazard occurrence can create significant damages to the community
Project Details

Project Type:
› Full Flood: Elevation
› Damage Frequency Assessment (DFA): Drainage Improvement

Project Useful Life: 50 Years (FEMA Standard Value)

Level of Effectiveness: 100-year rainfall and flooding recurrence interval

Mitigation Project Cost: $2,259,663
› Based on construction cost estimate (from Riverside County Flood Control and Water Conservation District)
Combination of Two BCA Models

Why were 2 BCA Models used?

› Various damages for two different flood sources:
  › Structures - Full Flood (SFHA Flooding)
  › Loss of Service
  › DFA (Rainfall)
  › DFA (SFHA)
Damages

Flooding: Special Flood Hazard Areas

› Structure Damages
› Based on:
  › First-Floor Elevation (FFEs)
  › Total Area of Structures
  › Building Replacement Values
Damages

Flooding: Rainfall

› Loss of Service
› Roads
   › Road Damage
   › Road Closures
   › Landscaping
   › Lost Wages

<table>
<thead>
<tr>
<th>Type</th>
<th>Recurrence Intervals</th>
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<tbody>
<tr>
<td>Rainfall</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>25</td>
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<tr>
<td>SFHA</td>
<td>10</td>
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<tr>
<td></td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>100</td>
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</table>
Damages: Full Flood Module

Full Flood Damage Resources
Structure Damages
› First Floor Elevations
› USGS Contour Maps
› Estimated Slab Heights (based on structure photos)
   › Structures with FFE higher than the 100-year RI were not included in the Full Flood estimation

<table>
<thead>
<tr>
<th>Structures</th>
<th>Amount</th>
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<tr>
<td>Homes in Project</td>
<td>61</td>
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<tr>
<td>Homes in SFHA</td>
<td>49</td>
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<td>Homes above the BFE</td>
<td>18</td>
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<tr>
<td>Total Homes that can receive damage</td>
<td>31</td>
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Damages: Full Flood Module

Full Flood Damage Resources

Structure Damages

- Total Areas of Structures
- Based on: realtor websites such as Trulia and Zillow
- Tax Cards (where available)

Home Details

Overview

Single-Family Home
4 Beds
3 Baths
Built in 1993

Address

4 beds • 3 baths • 2,833 sqft • 1.1 acres lot size • Single-Family Home
Damages: Full Flood Module

Full Flood Damage Resources
Structure Damages
› Building Replacement Values
› RS Means
Damages: Damage Frequency Assessment (DFA)

Damage Frequency Assessment Resources

Road Damages
› Road Damages
› Road Closure
› Landscaping
› Lost Wages
Damage Frequency Assessment Resources

Road Damages
› Road Damages
› Costs associated with:
   › Road Sour
   › Road Preservation
   › Filling of Potholes
   › Asphalt Repair
   › Debris Clearing

Assume labor overtime = time and a half
equip rates form CalTran book
Damages: Damage Frequency Assessment (DFA)

Damage Frequency Assessment Resources

Road Damages
  › Road Closures
    › Costs associated with:
      › Time Closed
Damages: Damage Frequency Assessment (DFA)

Damage Frequency Assessment Resources

Road Damages
› Landscaping
› Costs associated with:
   › Removal of Sediment and Silt
   › Repair of Sediment and Silt
   › Lawn Restoration: supplemental nutrient treatments
Damages: Damage Frequency Assessment (DFA)

Damage Frequency Assessment Resources

Road Damages
› Lost Wages
› Costs associated with:
  › Loss of Public Bus Transportation

CA Minimum Wage (2017): $10.50
Combination of Two BCA Models

To correctly assess the damage, 2 BCA Models were used:

- Full Flood
- Damage Frequency Assessment (DFA)
- Aggregate Benefits was used to estimate Benefit Cost Ratio (BCR)
Project Results

Full Flood Model: Benefits
› Structure Damages

DFA Model: Benefits
› Loss of Service
   › Roads
      › Road Damage
      › Road Closures
      › Landscaping
      › Lost Wages

BCA Benefits

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<th>Type</th>
<th>Benefits</th>
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<tr>
<td>SFHA structural</td>
<td>$798,062</td>
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<tr>
<td>SFHA roads</td>
<td>$337,055</td>
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<td>Rainfall roads</td>
<td>$1,152,322</td>
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<td>TOTAL</td>
<td>$2,287,439</td>
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## Project Results

### Aggregate BCR

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<td><strong>Benefits</strong></td>
<td><strong>$2,287,439</strong></td>
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<tr>
<td><strong>Cost</strong></td>
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<tr>
<td><strong>BCR</strong></td>
<td><strong>1.0122921</strong></td>
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**Final BCR: 1.01**
Lessons Learned

Organization

› Compose a memo/short document describing the BCA Methodology
  › Include citation of:
    › Data Used
    › Reason for data
    › Resource, guidance, data, etc.

DFA Assumptions

Loss of Service Type: Roads: Adelfa Street and Grand Avenue – both for rainfall events and flood hazard occurrences within the Special Flood Hazard Area.

Estimated Number of One-Way Traffic Trips per Day: Riverside County Annual Daily Traffic counts.
- Grand Avenue – 15,532 trips per day (2013)
- Adelpha Street – 1,780 trips per day (2009)

Additional Time per One-Way Trip:
- Adelfa Street: 29 minutes (see attached)
- Grand Ave: 29 minutes (see attached)

Number of Additional Miles:
- Adelfa Street: 15.9 miles (see attached)
- Grand Ave: 15.4 minutes (see attached)
Lessons Learned

Documentation

› Include Pictures of Flooding: Structures and Infrastructure
› Picture documentation
Lessons Learned

Comprehensive

› What problems does that particular community/project area face?
› Work with Planning Commission
› State Agencies
› Economic Departments
› Certain requirements regarding landscaping, buildings, infrastructures

*Know the community, think holistically*
Lessons Learned

Communication

› FEMA Region
› State
› Community
   › Staff
   › Other Agencies/Positions within community
      › Everyone has knowledge to bring to the table
› Adjacent Communities
› Communities who have had similar issues
Contacts

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Questions?