Advisory Committee Meeting
December 5, 2012
MEETING PURPOSE

- Review Municipality Meetings and Capabilities
- Review Hazard Identification and Hazard Analysis
- Hurricane Sandy Review
- Mitigation Funding

Project Timeline
MUNICIPAL MEETINGS: COMMON THEMES

- Hazards
  - Trees
    - Too many along roadways, can block roads and take out power, can block neighborhoods and make travel to schools difficult
  - Flooding
    - Many places experience flooding during heavy rain or high tide
  - Power Outages
- Staffing
  - Understaffed Town governments pull together in times of disaster
- EOC’s in Town Halls, Police Station or Fire Station depending on where generator is located
- Communicate with residents through Everbridge or Reverse 911
- Shelter capacity is limited
COMMON QUESTIONS FROM MUNICIPAL MEETINGS

- Historical Preservation as it relates to mitigation
  - FEMA Historic Preservation Program
  - Creative Mitigation [www.achp.gov/fema.html](http://www.achp.gov/fema.html)
    - Creative mitigation can result in better project and historic preservation outcomes, and has greater public benefit than standard approaches. Examples of creative mitigation include assisting in the development of local historic preservation plans and ordinances, developing educational materials and web sites, purchasing properties containing historic properties, or developing historic property management plans as a supplement to, or even in lieu of, standard mitigation

- Dam Removal Resources
  - Resources posted on the SCRCOG website

- Generator Funding
  - Pump stations: Installation of camlocks, transfer switches, and electrical panels to facilitate the connection of portable emergency generators.
  - Hazard Mitigation Funding Under Section 406 of the Stafford Act (public assistance) provides funding for repair and rebuilding of disaster-damaged public facilities...
HAZARD IDENTIFICATION AND HAZARD ANALYSIS

- Review Hazard Identification
- Review Hazard Analysis
  - Hazard Profiles and Mapping
  - Preliminary Priority Risk Index (PRI) Results
- Update on GIS Data Collection
  - Community Assets
- Next Steps
Plan Outline – Chapter 4 (Natural Hazard Risk Assessment)

- Introduction
- Hazard Identification
  - Documents process/reasoning for hazards included or excluded
- Hazard Analysis
  - Complete hazard profiles for 12 hazards:
    - Description
    - Location
    - Extent
    - Previous Occurrences
    - Probability of Future Events
- Community Assets
- Risk Analysis
  - Jurisdiction-specific subsections summarizing exposure, loss estimates, etc.
# HAZARD IDENTIFICATION

## Hazards for Initial Consideration

<table>
<thead>
<tr>
<th>Atmospheric</th>
<th>Hydrologic</th>
<th>Geologic</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extreme Temperatures</td>
<td>Coastal Erosion</td>
<td>Earthquake</td>
<td>Wildfire</td>
</tr>
<tr>
<td>Hurricane/Tropical Storm</td>
<td>Dam Failure</td>
<td></td>
<td>Landslide</td>
</tr>
<tr>
<td>Nor’easter</td>
<td>Drought</td>
<td></td>
<td>Soil Hazards (includes expansion, subsidence, and sinkholes)</td>
</tr>
<tr>
<td>Severe Thunderstorm (includes high winds, hail, and lightning)</td>
<td>Flood (includes coastal, riverine and flash flooding. Also includes ice jams and storm surge)</td>
<td>Tsunami</td>
<td></td>
</tr>
<tr>
<td>Severe Winter Storm (includes snow and ice)</td>
<td>Sea Level Rise</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tornado</td>
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</tr>
</tbody>
</table>

*Climate change will be addressed in terms of its potential effects on the frequency and intensity of natural hazards.*
# Hazard Identification

- **Significant Hazards for Further Analysis (12)**

<table>
<thead>
<tr>
<th>Atmospheric</th>
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<td>Flood</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tornado</td>
<td>Sea Level Rise</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
HAZARD ANALYSIS

- Summary of Major Disaster and Emergency Declarations
- Hazard Profiles
  - **Description** – Brief descriptions of the hazard, its characteristics, and potential effects
  - **Location** – Geographic area within the planning area that are susceptible to occurrences of the hazard
  - **Extent** – Potential strength or magnitude of the hazard
  - **Previous Occurrences** – Brief summaries of notable occurrences
  - **Probability of Future Events** – Likelihood of future hazard occurrences in the planning area.
    * Includes any anticipated effects of climate change
**Priority Risk Index (PRI)**

- Helps evaluate and prioritize hazards based on five factors:
  - **Location** (geographic area affected)
  - **Probability of future events**
  - **Impact** (potential casualties, damage or loss)
  - **Warning time**
  - **Duration of event**

- Will be used in combination with Risk Analysis results to identify and prioritize hazard risks
# Extreme Temperatures

- #1 weather-related killer in the U.S.
- Only 1 reported fatality (heat related) in Connecticut since 1995, but none in the planning area
- Highest recorded ambient temperature for the region = 103°F
- Lowest recorded ambient temperature for the region = -24°F

### Anticipated effects of climate change:
Increase in the frequency, duration and intensity of extreme heat events; decrease in the frequency of extreme cold events.
Hurricane/Tropical Storm

- 36 storm tracks within 75 miles since 1851
  - 23 Tropical Storms
  - 7 Category 1 Hurricanes
  - 5 Category 2 Hurricanes
  - 1 Category 3 Hurricane
- Most intense storm to make landfall in CT was 1938 “Long Island Express” with gusts of 130mph, storm surge of 18 ft. and 17” of rain
  - 564 fatalities and 1,700 injuries
  - $624 million in damages (2012 dollars)
- Annual probability of named storm = 23%

### Anticipated effects of climate change:
Cannot be determined due to insufficient evidence.
HISTORICAL STORM TRACKS

SOURCE OF HURRICANE DATA:
National Oceanic and Atmospheric Administration, Tropical Prediction Center/National Hurricane Center

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Emergency Management Services
SEVERE THUNDERSTORM

- Classified as "severe" when it contains one or more of the following effects:
  - Winds gusting in excess of 50 knots
  - Hail measuring at least 3/4 of an inch
  - A tornado
- 326 events since 1955
  - 2 fatalities, 16 injuries
  - $1.47 million in damages
- Annual recurrence interval

Anticipated effects of climate change:
Cannot be determined due to insufficient evidence.
SEVERE WINTER STORM/NOR’EASTER

- 21 historical events since 1996
  - No recorded fatalities
  - $2.3 million in damages
  - Heavy snowpack has resulted in multiple roof collapses
  - Major impacts to electric utilities, transportation, and communications networks
  - Coastal flooding associated with Nor’easters
- Annual recurrence interval

Anticipated effects of climate change:
Shorter winters with fewer cold days and more precipitation (but less precipitation falling as snow and more as rain). Will result in reduced snowpack, earlier breakup of winter ice on lakes and rivers, and earlier spring snowmelt resulting in earlier peak river flows.
# Tornado

- 13 tornado events in New Haven County since 1955
  - 1 fatality, 87 injuries
  - $375 million in property damages
- July 31, 2009 – EF-1 tornado in Madison
- July 10, 1989 – F4 tornado in Hamden
- Estimated annual probability = 5%

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<table>
<thead>
<tr>
<th>PRI Category</th>
<th>Risk Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
<td>Small</td>
</tr>
<tr>
<td>Probability</td>
<td>Occasional</td>
</tr>
<tr>
<td>Potential Impact</td>
<td>Catastrophic</td>
</tr>
<tr>
<td>Warning Time</td>
<td>Less than 6 hours</td>
</tr>
<tr>
<td>Duration</td>
<td>Less than 6 hours</td>
</tr>
</tbody>
</table>

Anticipated effects of climate change: Cannot be determined due to insufficient evidence.
PREVIOUS TORNADO OCCURRENCES

SOURCE OF TORNADO DATA:
National Weather Service,
Storm Prediction Center
Most shoreline areas in Branford, Madison and West Haven are susceptible to the occurrence of long-term and storm-induced coastal erosion. According to CT DEEP, no spatial data on erosion rates or erosion hazard areas available – will need to rely on input from local input from municipalities. Left unmitigated, erosion significantly increases vulnerability to coastal flooding.

### COASTAL EROSION

- **Anticipated effects of climate change:**
  Climate change and sea level rise will result in an increase in the extent of coastal erosion.

<table>
<thead>
<tr>
<th>PRI Category</th>
<th>Risk Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
<td>Small</td>
</tr>
<tr>
<td>Probability</td>
<td>Highly Likely</td>
</tr>
<tr>
<td>Potential Impact</td>
<td>Limited*</td>
</tr>
<tr>
<td>Warning Time</td>
<td>More than 24 hours</td>
</tr>
<tr>
<td>Duration</td>
<td>More than 1 week</td>
</tr>
</tbody>
</table>

* Assumes existing mitigation practices continue to prevent or minimize potential impact to people, property and critical facilities.
**DAM FAILURE**

- No history of any damages, fatalities or injuries associated with dam failure in the planning area
- 1 recorded failure event (Disbrow Pond in Bethany, 2007)
- 267 state-regulated dams within the South Central Region, and another 56 within 1 mile
  - 32 with high hazard potential (Class C)
  - 44 with significant hazard potential (Class B)

**Anticipated effects of climate change:**
Will not increase the probability of dam failure events, though projections for increased heavy rainfall events should continue to be considered in the regulation of dam repair and/or construction.
# Classification of Hazard Potential for Connecticut Dams

<table>
<thead>
<tr>
<th>Class</th>
<th>Hazard Potential</th>
<th>Description of Impacts <em>(if dam were to fail)</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>AA</td>
<td>Negligible</td>
<td>No measurable damage to roadways; no measurable damage to land and structures; negligible economic loss.</td>
</tr>
<tr>
<td>A</td>
<td>Low</td>
<td>Damage to agricultural land; damage to unimproved roadways; minimal economic loss.</td>
</tr>
<tr>
<td>BB</td>
<td>Moderate</td>
<td>Damage to normally unoccupied storage structures; damage to low volume roadways; moderate economic loss.</td>
</tr>
<tr>
<td>B</td>
<td>Significant</td>
<td>Possible loss of life; minor damage to habitable structures, residences, hospitals, convalescent homes, schools, etc.; damage to or interruption of the use of service of utilities; damage to primary roadways and railroads; significant economic loss.</td>
</tr>
<tr>
<td>C</td>
<td>High</td>
<td>Probable loss of life; major damage to habitable structures, residences, hospitals, convalescent homes, schools, etc.; damage to main highways; great economic loss.</td>
</tr>
</tbody>
</table>

*Source: State of Connecticut, Department of Energy and Environmental Protection*
STATE REGULATED DAMS

SOURCE OF DAM INFORMATION AND HYDROLOGY:
The State of Connecticut, Department of Energy and Environmental Protection
Drought

- 19 periods of severe to extreme drought in the region since 1895
- Most severe droughts occurred in 1910-1911, 1929-1932, 1965-1967
- Most recent severe drought occurred in 2002
- Impacts mostly related to social, economic and environmental concerns
  - Have led to increased numbers and sizes of wildfires across the region
- Annual probability of severe to extreme drought = 8.5% (6.2% for coastal areas)

<table>
<thead>
<tr>
<th>PRI Category</th>
<th>Risk Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
<td>Large</td>
</tr>
<tr>
<td>Probability</td>
<td>Occasional</td>
</tr>
<tr>
<td>Potential Impact</td>
<td>Minor</td>
</tr>
<tr>
<td>Warning Time</td>
<td>More than 24 hours</td>
</tr>
<tr>
<td>Duration</td>
<td>More than 1 week</td>
</tr>
</tbody>
</table>

Anticipated effects of climate change:
Increase in the frequency, duration and intensity of droughts.
FLOOD

- Classified by 3 types:
  - Riverine Flood
  - Coastal Flood
  - Urban Flood

- $26 million in insured flood losses under NFIP since late 1970s
  - Nearly 2,500 claims
  - Average claim payment = approx. $10,500

Anticipated effects of climate change:
Increase in the extent and frequency of storm surge and coastal flooding. Severe urban flooding due to more precipitation and heavy downpours is also likely to occur more frequently.
# NFIP Statistics on Flood Losses and Claims Payments

<table>
<thead>
<tr>
<th>Jurisdiction</th>
<th>NFIP Entry Date</th>
<th>Total Flood Losses</th>
<th>Total Claims Payments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bethany</td>
<td>08/23/1977</td>
<td>3</td>
<td>$7,226</td>
</tr>
<tr>
<td>Branford</td>
<td>12/15/1977</td>
<td>526</td>
<td>$7,011,132</td>
</tr>
<tr>
<td>Hamden</td>
<td>06/15/1979</td>
<td>536</td>
<td>$3,331,391</td>
</tr>
<tr>
<td>Madison</td>
<td>09/15/1978</td>
<td>470</td>
<td>$8,207,421</td>
</tr>
<tr>
<td>North Branford</td>
<td>07/03/1978</td>
<td>68</td>
<td>$457,504</td>
</tr>
<tr>
<td>North Haven</td>
<td>09/17/1980</td>
<td>150</td>
<td>$1,547,692</td>
</tr>
<tr>
<td>Orange</td>
<td>03/18/1980</td>
<td>130</td>
<td>$1,244,981</td>
</tr>
<tr>
<td>Wallingford</td>
<td>09/15/1978</td>
<td>124</td>
<td>$888,218</td>
</tr>
<tr>
<td>West Haven</td>
<td>01/17/1979</td>
<td>387</td>
<td>$2,805,162</td>
</tr>
<tr>
<td>Woodbridge</td>
<td>03/16/1981</td>
<td>67</td>
<td>$509,909</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>2,461</strong></td>
<td></td>
<td><strong>$26,010,636</strong></td>
</tr>
</tbody>
</table>

*Source: FEMA*
FLOOD

SOURCE OF FLOOD DATA:
Federal Emergency Management Agency

SOURCE OF HYDROLOGY:
The State of Connecticut, Department of Energy and Environmental Protection

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Emergency Management Services
STORM SURGE

SOURCE OF STORM SURGE DATA AND HYDROLOGY: The State of Connecticut, Department of Energy and Environmental Protection
SEA LEVEL RISE

- Adaption Subcommittee to CT Governor’s Steering Committee on Climate Change used New York Panel on Climate Change (NPCC) as best available SLR projections:
  - 12-13 inches by end of century
  - 41-55 inches by end of century with “Rapid Ice-Melt Sea Level Rise” scenario
- Most significant hazard risk is associated with \textit{increased frequency and severity} of coastal flooding events
- We will use data provided by TNC for risk analysis

\textbf{Anticipated effects of climate change:}
Increase in the rate and severity of sea level rise.
History of earthquakes in Northeast
  • 140 centered in CT since 1638
  • Vast majority are not felt (magnitude < 3.0)
Planning area is in “low risk zone” (PGA value of 2-3%g)
Even the most significant historical earthquakes in CT have resulted in only minor ground shaking and minimal damages

Anticipated effects of climate change:
None
Peak Ground Acceleration & Significant Earthquake Epicenters

SOURCE OF EARTHQUAKE DATA:
U.S. Geological Survey

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Emergency Management Services
Wildfire

- 330 reported incidents in the planning area since 1991
  - Most are very small (less than one acre)
  - Average fire size = 3.36 acres
  - Most have occurred in Hamden (263)
  - No reports of casualties or property damages
- Statistics rely heavily on reporting by local fire departments

**Anticipated effects of climate change:**
Increase in the frequency and intensity of wildfire events, primarily due to more frequent and prolonged drought conditions.
## Statistics on Wildfire Occurrences

<table>
<thead>
<tr>
<th>Jurisdiction</th>
<th>Number of Fires</th>
<th>Total Acres Burned</th>
<th>Average Fire Size (Acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bethany</td>
<td>13</td>
<td>116.45</td>
<td>8.96</td>
</tr>
<tr>
<td>Branford</td>
<td>21</td>
<td>76.00</td>
<td>3.62</td>
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<tr>
<td>Hamden</td>
<td>263</td>
<td>482.28</td>
<td>1.83</td>
</tr>
<tr>
<td>Madison</td>
<td>8</td>
<td>101.50</td>
<td>12.69</td>
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<tr>
<td>North Branford</td>
<td>1</td>
<td>0.10</td>
<td>0.10</td>
</tr>
<tr>
<td>North Haven</td>
<td>6</td>
<td>19.70</td>
<td>3.28</td>
</tr>
<tr>
<td>Orange</td>
<td>9</td>
<td>23.00</td>
<td>2.56</td>
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<tr>
<td>Wallingford</td>
<td>6</td>
<td>1.10</td>
<td>0.18</td>
</tr>
<tr>
<td>West Haven</td>
<td>1</td>
<td>0.20</td>
<td>0.20</td>
</tr>
<tr>
<td>Woodbridge</td>
<td>2</td>
<td>0.30</td>
<td>0.15</td>
</tr>
</tbody>
</table>

| Total            | 330             | 820.63             | (Average) 3.36           |

*Source: State of Connecticut, Department of Energy and Environmental Protection*
Wildfire Urban Interface/Intermix Areas

SOURCE OF WILDFIRE DATA: SILVIS Lab

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Emergency Management Services
# Preliminary PRI Results

<table>
<thead>
<tr>
<th>HAZARD</th>
<th>LOCATION</th>
<th>PROBABILITY</th>
<th>POTENTIAL IMPACT*</th>
<th>WARNING TIME</th>
<th>DURATION</th>
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<tbody>
<tr>
<td>Extreme Temperatures</td>
<td>Large</td>
<td>Likely</td>
<td>Minor</td>
<td>More than 24 hours</td>
<td>1 to 7 days</td>
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<td>Catastrophic</td>
<td>More than 24 hours</td>
<td>6 to 24 hours</td>
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<td>Highly Likely</td>
<td>Critical</td>
<td>More than 24 hours</td>
<td>1 to 7 days</td>
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<tr>
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<td>Occasional</td>
<td>Catastrophic</td>
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<td>Less than 6 hours</td>
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<td>Highly Likely</td>
<td>Limited</td>
<td>More than 24 hours</td>
<td>More than 1 week</td>
</tr>
<tr>
<td>Dam Failure</td>
<td>Small</td>
<td>Unlikely</td>
<td>Critical</td>
<td>Less than 6 hours</td>
<td>6 to 24 hours</td>
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<tr>
<td>Drought</td>
<td>Large</td>
<td>Occasional</td>
<td>Minor</td>
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<td>Flood (3 Types):</td>
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<tr>
<td>Riverine Flood</td>
<td>Moderate</td>
<td>Occasional</td>
<td>Catastrophic</td>
<td>More than 24 hours</td>
<td>1 to 7 days</td>
</tr>
<tr>
<td>Coastal Flood</td>
<td>Moderate</td>
<td>Likely</td>
<td>Catastrophic</td>
<td>More than 24 hours</td>
<td>6 to 24 hours</td>
</tr>
<tr>
<td>Urban Flood</td>
<td>Small</td>
<td>Highly Likely</td>
<td>Minor</td>
<td>Less than 6 hours</td>
<td>Less than 6 hours</td>
</tr>
<tr>
<td>Sea Level Rise</td>
<td>Small</td>
<td>Highly Likely</td>
<td>Limited</td>
<td>More than 24 hours</td>
<td>More than 1 week</td>
</tr>
<tr>
<td>Earthquake</td>
<td>Large</td>
<td>Occasional</td>
<td>Minor</td>
<td>Less than 6 hours</td>
<td>Less than 6 hours</td>
</tr>
<tr>
<td>Wildfire</td>
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<td>Highly Likely</td>
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## Preliminary PRI Results

<table>
<thead>
<tr>
<th>HAZARD</th>
<th>PRI Value</th>
</tr>
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<tbody>
<tr>
<td>Severe Winter Storm/Nor’easter</td>
<td>3.3</td>
</tr>
<tr>
<td>Hurricane/Tropical Storm</td>
<td>3.2</td>
</tr>
<tr>
<td>Coastal Flood</td>
<td>3.0</td>
</tr>
<tr>
<td>Riverine Flood</td>
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</tr>
<tr>
<td>Tornado</td>
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</tr>
<tr>
<td>Coastal Erosion</td>
<td>2.7</td>
</tr>
<tr>
<td>Sea Level Rise</td>
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</tr>
<tr>
<td>Extreme Temperatures</td>
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<tr>
<td>Severe Thunderstorm</td>
<td>2.4</td>
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<tr>
<td>Urban Flood</td>
<td>2.4</td>
</tr>
<tr>
<td>Wildfire</td>
<td>2.3</td>
</tr>
<tr>
<td>Dam Failure</td>
<td>2.2</td>
</tr>
<tr>
<td>Drought</td>
<td>2.2</td>
</tr>
<tr>
<td>Earthquake</td>
<td>2.2</td>
</tr>
</tbody>
</table>
Update on Local GIS Data Collection

- Parcel data – collected for all towns
  - Attribute information still coming in

- Building footprint data – collected for Branford, Hamden, North Branford, West Haven, and Woodbridge

- Additional data on community assets collected via “GIS Data Wish List”
  - Existing gaps will be filled using FEMA’s Hazus-MH national inventory dataset
## Local GIS Data Inventory

<table>
<thead>
<tr>
<th>Data Description</th>
<th>Bethany</th>
<th>Branford</th>
<th>Hamden</th>
<th>Madison</th>
<th>North Branford</th>
<th>North Haven</th>
<th>Orange</th>
<th>Wallingford</th>
<th>West Haven</th>
<th>Woodbridge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Administrative / Political Boundaries</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tax parcels *</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<td>Acquired properties (FEMA buyouts, etc.)</td>
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HAZUS-MH ESSENTIAL FACILITIES

SOURCE OF ESSENTIAL FACILITIES DATA:
Hazus-MH
**Next Steps**

- **End Data Collection Phase**
- **Conduct Vulnerability Assessment (jurisdiction-specific)**
  - Exposure analysis
  - Potential impacts (inc. Hazus-MH loss estimation)
  - Risk summary
  - Key findings and conclusions
How did your municipality fare in terms of damages, response, and recovery?
Any mitigation successes?
Are you aware of mitigation actions that could be implemented to reduce future damages?
Funding Post Disaster

- Public Assistance and Individual Assistance available from FEMA
  - Provides money and services to people in Presidentially declared disaster area.
  - As of Monday, December 3, 2012 in CT
    - Total Individual Assistance (IA)
      - Applications Approved: 2,260
    - Total Individual & Households Program
      - Dollars Approved* $9,127,851.14
    - Total Housing Assistance
      - Dollars Approved* $8,655,256.27
    - Total Other Needs Assistance
      - Dollars Approved* $472,594.87
  - Includes emergency protective measures and debris removal
**HAZARD MITIGATION GRANT PROGRAM FUNDING**

- HMGP is 15% of the total amount approved for Public Assistance and Individual Assistance
  - This amount is set approximately 6 months after disaster strikes
  - Securing funding is a lengthy process – SCRCOG mitigation plan should be done in time
- FEMA’s hazard mitigation grant programs are not intended as a source of funding for repair, replacement or deferred maintenance activities, but are designed to assist sub-applicants in developing long-term, cost-effective improvements that will reduce or eliminate risk/damage to people and property from the effects of natural hazards.
DISCUSSION AND NEXT STEPS

- Public Opinion Survey – Last big push for participation.
  - Survey comes down mid-January

- Next Meeting:
  February 13, 2013 at 1:00pm
THANK YOU

Jamie Caplan and Darrin Punchard

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