Critical Facilities Assessment for SCCOG Communities

Southeastern Connecticut Council of Governments
Southeastern Connecticut Council of Governments

Presented by: David Murphy, P.E., CFM, Milone & MacBroom, Inc.
September 29, 2017
Agenda

- Project Background
- Critical Facilities Included
- Key Questions
- Design Criteria
- Flood-Related Findings and Recommendations for Each Facility
- Wind-Related Findings and Recommendations
- Snow-Related Findings and Recommendations
- Key Conclusions
- Next Steps
Southeastern Connecticut Hazard Mitigation Plan (2012) recommends conducting an assessment of critical facility vulnerabilities and risks

SCCOG received a grant from the Connecticut Institute for Resilience and Climate Adaptation (CIRCA) for this assessment

Project will help advance resilience of critical facilities

Project will demonstrate progress in the HMP Update (under review with DEMHS)
## Critical Facilities Included

### Which Critical Facilities are Included?

<table>
<thead>
<tr>
<th>Municipality</th>
<th>Facility</th>
<th>Address</th>
<th>FEMA Zone</th>
<th>Adjacent Zone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stonington Borough</td>
<td>Fire House and EOC</td>
<td>100 Main St</td>
<td>AE</td>
<td>VE-14</td>
</tr>
<tr>
<td></td>
<td>Borough Hall and Public Works</td>
<td>26 Church St</td>
<td>AE</td>
<td>500-yr</td>
</tr>
<tr>
<td>Stonington Town</td>
<td>Old Mystic FD</td>
<td>21 North Stonington Rd</td>
<td>500-yr</td>
<td>AE</td>
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<tr>
<td></td>
<td>Quiambaug FD</td>
<td>50 Old Stonington Rd</td>
<td>AE</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Mystic FD</td>
<td>34 Broadway</td>
<td>AE</td>
<td>X</td>
</tr>
<tr>
<td>Groton Town</td>
<td>GLP Police and Fire</td>
<td>5 Atlantic Ave</td>
<td>AE</td>
<td>X</td>
</tr>
<tr>
<td></td>
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<td>45 Fort Hill Road</td>
<td>X</td>
<td>500-yr</td>
</tr>
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<td>Municipal Building</td>
<td>295 Meridian St</td>
<td>X</td>
<td>500-yr</td>
</tr>
<tr>
<td></td>
<td>Public Works</td>
<td>295 Meridian St</td>
<td>X</td>
<td>AE</td>
</tr>
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<td>New London</td>
<td>Fire HQ and EOC</td>
<td>289 Bank St</td>
<td>500-yr</td>
<td>AE/VE</td>
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<tr>
<td>Waterford</td>
<td>Quaker Hill Fire Co.</td>
<td>17 Old Colchester Rd</td>
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<td>AE</td>
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<tr>
<td>Montville</td>
<td>Chesterfield Fire Co.</td>
<td>1606 Hartford New London Tpke</td>
<td>X</td>
<td>AE</td>
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<tr>
<td>Norwich</td>
<td>Yantic Fire Co. No. 1</td>
<td>151 Yantic Rd</td>
<td>AE</td>
<td>Floodway</td>
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<tr>
<td></td>
<td>Occum FD</td>
<td>44 Taftville Occum Rd</td>
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<td>500-yr</td>
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<tr>
<td></td>
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<td>50 Clinton Ave</td>
<td>500-yr</td>
<td>AE</td>
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<td>Public Works</td>
<td>423 Route 2</td>
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<td>A</td>
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<td>Sprague</td>
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<td>AE</td>
<td>Floodway</td>
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<tr>
<td></td>
<td>Public Works</td>
<td>1 Main St</td>
<td>AE</td>
<td>Floodway</td>
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</table>
Key Questions

- Has the facility experienced a flood?
- Is the facility in the 1% annual chance flood zone (Special Flood Hazard Area) or the 0.2% annual chance flood zone?
- Is the facility’s lowest floor below or above the base flood elevation?
- Is the facility’s lowest floor below or above the future high tide level?
- Does the use pose challenges? For example, fire station garage doors and emergency access cannot be blocked.
- Are there any situations where a flood wall is advisable?
- What about other circumstances?
Design Criteria

- Existing FEMA BFE (1% annual chance) and 0.2% annual chance flood elevations
- For coastal properties, the MHW and SLR projections
- The State’s requirement that critical facilities be constructed per the 0.2% annual chance flood elevation when State authorizations are needed or State funding is used
- Federal Flood Risk Management Standard and local adopted versions such as NYC and NY & NJ Port Authority that are forward-looking relative to climate change
- Connecticut Building Code snow loads (30 psf) and assumption that heavy snow risks could increase with climate change
- Connecticut Building Code wind speeds (varies by town) and assumption that wind risks could increase with climate change
- Design wind speeds for critical facilities that exceed building codes (160 mph)
Flood-Related Findings and Recommendations

- Recommendations are generally divided into short-term and long-term.
- In a limited number of cases, alternate options are provided if appropriate.
- Options include wet floodproofing, dry floodproofing, elevating utilities, elevating interior floors, elevating buildings, flood barriers at openings, and flood walls.
Dry Floodproofing

Flood depth for which floodproofing is designed

Waterproof coatings and coverings to ensure water cannot soak through external walls

Movable barrier to seal openings such as doors

Other openings such as windows elevated above flood level

Source: Linham and Nicholls, 2010
Wet Floodproofing

First floor door

Ground

Openings provided to let floodwaters enter

Subgrade basement

Living area

Furnace and other utilities relocated to living area or utility room addition

BFE

FEMA Homeowner's Guide to Retrofitting, June 2014
Elevate Building

Elevate all activities which are not compatible with water above flood elevation.

Living area elevated above design flood.

Properly anchor all foundations to prevent flood water washing them out and also to avoid floatation of the structure if the flood waters get too high.

Provide openings or break-away wall sections to allow free passage of water.

Source: Linham and Nicholls, 2010
Barriers at Openings
Flood Walls (not for FEMA map revisions)

Miami Beach Sidewalk

Binghamton Hospital
Floodable First Floor

Photo: Designs Northwest Architects
Emergency Preparedness

Always recommended, but not part of this study. This is not a long term method of adapting.
Not Feasible for a Critical Facility

Source: Linham and Nicholls, 2010

FEMA Homeowner's Guide to Retrofitting, June 2014

www.reddit.com
## Acronym Key

<table>
<thead>
<tr>
<th>BFE</th>
<th>0.2% WSE</th>
<th>LAG</th>
<th>FFE</th>
<th>NFE</th>
<th>Utility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base Flood Elevation (1% annual chance WSE)</td>
<td>Flood elevation for the 500-year flood</td>
<td>Lowest Adjacent Grade</td>
<td>First floor elevation (not always the lowest occupied floor)</td>
<td>Next floor elevation (this may be the occupied floor, or what we call the “first floor”)</td>
<td>Elevation of lowest utility (sometimes the same as the FFE)</td>
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</table>
Stonington Borough

Borough Fire Department

<table>
<thead>
<tr>
<th>BFE</th>
<th>LAG</th>
<th>FFE</th>
<th>NFE</th>
<th>Utility</th>
</tr>
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<tbody>
<tr>
<td>11</td>
<td>8.34</td>
<td>8.78</td>
<td>24.98</td>
<td>4.78</td>
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</tbody>
</table>

- Floodproofing already present
- Short-Term: No action needed
- Long-Term: Increase height of interior dry floodproofing
Stonington Borough

Borough Hall
Stonington Borough

Borough Hall

<table>
<thead>
<tr>
<th></th>
<th>BFE</th>
<th>LAG</th>
<th>FFE</th>
<th>NFE</th>
<th>Utility</th>
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<tr>
<td>12</td>
<td>8.77</td>
<td>8.52</td>
<td>11.70</td>
<td>8.97</td>
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</table>

- Floodproofing not present
- Short-Term: Dry floodproof the utility room
- Long-Term: Wet floodproof the remaining lower areas such as the garage bays
Town of Stonington

Old Mystic Fire Department
Town of Stonington

Old Mystic Fire Department

• Property at risk of riverine and coastal floods
• Floodproofing not present
• Short-Term: No action needed
• Long-Term: Wet and dry floodproofing or low berm or flood wall

<table>
<thead>
<tr>
<th>BFE</th>
<th>LAG</th>
<th>FFE</th>
<th>NFE</th>
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</table>

BFE = Base Flood Elevation
LAG = Lower Adjacent Grade
FFE = Flood Elevation
NFE = Normal Flood Elevation
Utility = Utility Grade
Town of Stonington

Quiambaug Fire Department
Town of Stonington

Quiambaug Fire Department

<table>
<thead>
<tr>
<th>BFE</th>
<th>LAG</th>
<th>FFE</th>
<th>NFE</th>
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<td>6.97</td>
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<td>6.97</td>
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- Current MHW is 0.84’
- Coastal Jurisdiction Line is 2.0’
- Future daily high tide is 2’-5’
- Floodproofing not present
- Short-Term: Wet and dry floodproofing
- Long-Term: Relocate facility
Town of Stonington

Mystic Fire Department
Plan indicates construction to FFE-11, but that was likely NVGD with prior FEMA map (pre-2010) so building is no longer above the BFE

- Floodproofing not present
- Short-Term: Dry floodproof the utility room
- Long-Term: Wet floodproof the remaining lower areas
Town of Groton

Groton Long Point Police & Fire
Some floodproofing already present (utility room is elevated)
Current MHW is 0.84’
Coastal Jurisdiction Line is 2.0’
Future daily high tide is 2’-5’
Short-Term: Additional utility room dry floodproofing and expanded wet floodproofing
Long-Term: Relocate facility
Town of Groton

Groton Town Hall
Town of Groton

Groton Town Hall

- Very complex building with various floor elevations, window wells, and many openings
- Floodproofing not present
- Short-Term: No action needed
- Long-Term: Low berm or flood wall may be prudent due to the relatively low flood risk, configuration of site, and complexities of the building

<table>
<thead>
<tr>
<th>BFE</th>
<th>LAG</th>
<th>FFE</th>
<th>NFE</th>
<th>Utility</th>
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<tr>
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<td>12.07</td>
<td>20.62</td>
<td>12.32</td>
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City of Groton

Municipal Building
City of Groton

Municipal Building

- Complex building with various floor elevations and many openings
- 0.2% elevation estimated from FEMA Publication 265
- The grade between the building and the 0.2% risk zone exceeds 52.8’, so there is no risk from Birch Plain Creek
- Drainage-related flooding has occurred
- Short-Term: Drainage improvements
- Long-Term: Upgrade drainage as needed to keep up with increasing precipitation intensities

<table>
<thead>
<tr>
<th>0.2% Elev.</th>
<th>LAG</th>
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<th>NFE</th>
<th>Utility</th>
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<td>52.80</td>
<td>49.54</td>
<td>49.62</td>
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City of Groton

Public Works
City of Groton

Public Works

<table>
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<th>0.2% Elev.</th>
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<th>Utility</th>
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<tr>
<td>52.80</td>
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</tbody>
</table>

- Building elevations were not measured (this was a bonus site)
- Floodproofing not present
- Short-Term: Wet and dry floodproofing
- Long-Term: Low berm or flood wall may be prudent due to the relatively low flood risk, configuration of site, and nature of the property use
City of New London

New London Fire Headquarters
City of New London

New London Fire Headquarters

<table>
<thead>
<tr>
<th>AE/VE</th>
<th>LAG</th>
<th>FFE</th>
<th>NFE</th>
<th>Utility</th>
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<tr>
<td>11/12</td>
<td>6.52</td>
<td>7.22</td>
<td>22.11</td>
<td>7.22</td>
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</table>

- Property is protected by a flood protection system (levee, berm, or flood wall) at the Thames River and mapped in the 0.2% floodplain
- Floodproofing not present
- Short-Term: Stormwater improvements and backflow prevention; dry floodproof utility room
- Long-Term: Wet floodproof remaining first floor areas
Town of Waterford

Quaker Hill Fire Company

Stream located beneath road in a long culvert
Property at risk of riverine and coastal floods

Tidal flood waters have reached the property in recent memory, where water levels were approximately ten feet away from the eastern building.

The secondary garage has undergone flooding originating from the brook overtopping the culvert.

Short-Term: Wet floodproofing

Long-Term: Relocate facility (note that the expense of replacing the long culvert beneath the road would be significant)
Town of Montville

Chesterfield Fire Company
Town of Montville

Chesterfield Fire Company

<table>
<thead>
<tr>
<th>BFE</th>
<th>LAG</th>
<th>FFE</th>
<th>NFE</th>
<th>Utility</th>
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<tbody>
<tr>
<td>131</td>
<td>132.56</td>
<td>134.17</td>
<td>149.80</td>
<td>134.15</td>
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</table>

• Building is not in SFHA, and FFE is above the 0.2% flood elevation of 132’
• Short-Term & Long-Term: No actions needed
City of Norwich

Norwich Public Works
Floodproofing not present
• Short-Term: Dry floodproof the utility room
• Long-Term: Wet floodproof all remaining lower areas
City of Norwich

Occum Fire Department
City of Norwich

Occum Fire Department

<table>
<thead>
<tr>
<th>BFE</th>
<th>0.2% WSE</th>
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<th>FFE</th>
<th>NFE</th>
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<td>63.6</td>
<td>57.4</td>
<td>64.0</td>
<td>57.5</td>
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- Floodproofing not present
- Short-Term: Eliminate basement
- Long-Term: Relocate facility
City of Norwich

Yantic Fire Company No. 1
City of Norwich

Yantic Fire Company No. 1

<table>
<thead>
<tr>
<th>BFE</th>
<th>0.2% WSE</th>
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<td>101.80</td>
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</table>

- Floodproofing not present
- Short-Term: Eliminate basement
- Long-Term: Relocate facility
Town of Preston

Preston Public Works
## Preston Public Works

<table>
<thead>
<tr>
<th>BFE</th>
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<th>NFE</th>
<th>Utility</th>
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</thead>
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<td>125.79</td>
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<td>126.29</td>
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</table>

- BFE estimated from FEMA Publication 265
- Floodproofing not present
- Short-Term: No action needed
- Long-Term: Wet and dry floodproofing
Town Hall and Public Works

<table>
<thead>
<tr>
<th></th>
<th>BFE</th>
<th>LAG</th>
<th>FFE</th>
<th>NFE</th>
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<td>~94</td>
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<tr>
<td>DPW</td>
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<td>82.19</td>
<td>80.36</td>
<td>89.73</td>
<td>80.75</td>
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</table>

- Floodproofing not present
- Short-Term: Eliminate utility room basement
- Long-Term: Wet floodproof all remaining lower areas; or construct flood wall along the rear of the property that can extend around to the north side and meet grade without blocking access
Wind-Related Findings and Recommendations

- None of the occupied buildings (buildings occupied by people) appear to have deficient roofs relative to wind.
- If a roof is planned for replacement, higher design wind speeds should be considered.
- Many of the occupied buildings lack window protection.
- Hurricane shutters are recommended where window damage could hinder the ability of the facility to functions.
- Small outbuildings, equipment, and vehicles parked outdoors at the three public works facilities are at risk for damage during strong winds and should be secured when storms are forecast.

New London Fire HQ (above) and Norwich DPW Yard (below)
Snow-Related Findings and Recommendations

- None of the occupied buildings appear to have deficient roofs relative to snow loads, although many are flat
- Procedures should be developed for removing snow from roofs
- If a roof is planned for replacement, higher design loads should be considered
Key Conclusions

- The elevations of adjacent grade, first floor, second flood, and utilities are critical for characterizing the risks.
- Every combination of flood risk and building configuration is unique; there is low potential for “one size fits all” solutions to make sense.
- Beware of changing FEMA maps (think of Mystic Fire Company) and go higher when possible.
- Make moderate flood mitigation improvements when possible, and make them adaptable when possible.
- Local flood damage prevention regulations and the substantial damage/substantial improvement (SD/SI) clause always win; if an improvement meets the SD/SI threshold, then the building must be made NFIP-compliant.
Next Steps

- Check Elevation Certificates; if details appear appropriate, we will sign them
- If recommendations are acceptable, add planning-level cost estimates
- Recommendations are in the SCCOG Multi-Jurisdiction Hazard Mitigation Plan; there is time to revise these recommendations if appropriate
- Final materials to SCCOG and facility contacts