### Summary of Risks and Recommendations

**Groton Municipal Building**

**295 Meridian Street**

**Groton**

| Description of current flood risk  
* (all elevations are in feet, NAVD88) | - The Municipal Building is mapped in an X zone adjacent to a 0.2% annual chance floodplain along Birch Plain Creek, indicating an assumption of minimal or negligible flood risk.  
- The Public Works building is mapped in the 0.2% annual chance floodplain along Birch Plain Creek, indicating as assumption of relatively low flood risk.  
- The Municipal Building and adjacent parking areas undergo nuisance site flooding which occurs on average once a year, per anecdotal reports. The Public Works building has not been flooded.  
- MMI determined that the approximate 0.2% annual chance flood elevation associated with Birch Plain Creek is 52.8’.  
- The lowest adjacent grade at the Municipal Building is 49.54’, with the lowest floor elevation at 49.62’. However, the ground surface between the 0.2% annual chance floodplain and the Municipal Building rises to 54.7’, which is two feet higher than the 0.2% flood elevation of 52.8’. Therefore, Birch Plain Creek does not contribute flood risk to the Municipal Building. |
| Description of future flood risk  
* (all elevations are in feet, NAVD88) | - Climate change is believed to be increasing the intensity of precipitation events and may also lead to greater overall precipitation in the state, which could increase risks along Birch Plain Creek and in the vicinity of the Municipal Building. |
| Description of municipal capabilities to address risks | - The City addresses heavy snow buildup, strong wind forecasts, and flood watches and warnings as needed. |
| Description of flood risk reduction design criteria  
* (all elevations are in feet, NAVD88) | - **FFRMS** = Federal Flood Risk Management Standard  
- **FVA** = Freeboard Value Approach  
- **CISA** = Climate Informed Science Approach  
- The FFRMS flood risk based on the 0.2% is 52.8’.  
- The alternative FRFMS approaches (FVA and the CISA) are not appropriate for this setting, as there is no 1% annual chance flood elevation associated with Birch Plain Creek. |
| Recommendations for building-specific flood risk reduction such as floodproofing, building elevation, elevation of utilities, sealing of openings, etc. | - Short-Term: Drainage improvements are recommended to decrease nuisance flooding at the Municipal Building. These improvements should be designed for increasing precipitation intensities.  
- Long-Term: climate change will create slightly increased flood risks to the Public Works facilities. A combination of wet and dry floodproofing for the main building may be prudent in the future. Outbuildings could be made floodable, including the garage building located immediately north of Birch Plain Creek. |
| Planning-level cost estimates | • Short-Term: $50,000 - $100,000 (Municipal Building)  
• Long-Term: $5/sf + $3,000 for flood vents (Public Works buildings) |
| Recommendations for on or off-site flood risk reduction such as flood walls, berms, raising grade, etc. | • The site likely has sufficient space for flood walls, berms, or raising grade. Specifically, a flood wall could be constructed along the southern edge of the Public Works site, running between the garage outbuilding and Birch Plain Creek, turning north at each end to meet higher grade. |
| Planning-level cost estimates | • $500 per linear foot for Public Works site |
• FEMA P-936, Floodproofing Non-Residential Buildings (July 2013), [https://www.fema.gov/media-library/assets/documents/34270](https://www.fema.gov/media-library/assets/documents/34270)  
• FEMA P-1037, Reducing Flood Risk to Residential Buildings That Cannot Be Elevated (September 2015), [https://www.fema.gov/media-library/assets/documents/109669](https://www.fema.gov/media-library/assets/documents/109669)  
## Summary of Risks and Recommendations

### Groton Municipal Building
295 Meridian Street
Groton

| Description of current wind risk | • Strong winds are experienced during nor’easters, tropical storms, and other storm events.  
• Future wind events can damage the facility’s structure or roof if the wind speed exceeds the older codes in place when the building was last upgraded.  
• Wind can also damage accessory structures and create windborne debris. |
| Description of future wind risk¹ | • Climate change may amplify the frequency and intensity of wind events like hurricanes, but it is not known whether higher wind speeds will be more commonplace. |
| Description of municipal capabilities to address risks and operate backup facilities | • The City addresses heavy snow buildup, strong wind forecasts, and flood watches and warnings as needed. |
| Description of wind risk reduction design criteria | • Connecticut Building Code Appendix N, 145 mph ultimate/112 mph nominal.  
• Connecticut is located in FEMA Zone II relative to maximum expected wind speed. The maximum expected wind speed for a three-second gust is 160 miles per hour. This wind speed could occur as a result of either a hurricane or a tornado  
• Climate change may amplify the frequency and intensity of wind events like hurricanes, but it is not known whether higher wind speeds will be more commonplace to the degree that current building codes are insufficient. |
| Recommendations for wind risk reduction such as load path projects, shutters, etc. | • Shutters are recommended for the most at-risk windows.  
• When the roof is next replaced or upgraded, the 160 mph criteria (or future building code) should be considered. |
| Planning-level cost estimates | • Nominal |
[https://www.fema.gov/media-library/assets/documents/8811](https://www.fema.gov/media-library/assets/documents/8811)  
## Summary of Risks and Recommendations

**Groton Municipal Building**

295 Meridian Street

**Groton**

| Description of current snow load risk | • Heavy snow events in 2011, 2013, and 2015 have necessitated monitoring and/or removing snow from buildings.  
• Future snow events can damage the facility’s structure or roof if heavy buildup occurs without melting. |
<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Description of future snow load risk¹</td>
<td>• Climate change studies have projected a shorter winter season for Connecticut with a decreased overall snowpack. In addition, climate models have indicated that fewer but more intense precipitation events will occur during the winter period with more precipitation falling as rain rather than snow. This change in winter precipitation could result in less frequent but more intense snow storms with heavier snow.</td>
</tr>
<tr>
<td>Description of municipal capabilities to address risks and operate backup facilities</td>
<td>• The City addresses heavy snow buildup, strong wind forecasts, and flood watches and warnings as needed.</td>
</tr>
</tbody>
</table>
| Description of snow load risk reduction design criteria | • Connecticut Building Code Appendix N, Ground Snow Load, 30 psf.  
• Climate change may decrease overall snow accumulations but could result in wet, dense, heavier snowfalls. It is not known whether current building codes are insufficient. The maximum ground snow load specified in the code is 40 psf for northwest Connecticut. |
| Recommendations for snow load risk reduction | • Procedures should be developed for removing snow from the roof. |
| Planning-level cost estimates | • Nominal  

¹ Climate change may decrease overall snow accumulations but could result in wet, dense, heavier snowfalls. It is not known whether current building codes are insufficient. The maximum ground snow load specified in the code is 40 psf for northwest Connecticut.

1. Connecticut Hazard Mitigation Plan Update, 2014; and State Water Plan, 2017
TO: File

FROM: James C. Murac, P.E., CFM

DATE: April 25, 2017

RE: Critical Facilities Assessment
    Location: Groton Municipal Building and Public Works Garages

Local Contact: Timothy Umrysz, City of Groton Director of Public Works
MMI Team: Nirdosh Patel
            James Murac

Description of Flooding Risk

The Groton Municipal Building (MB) is a two story brick structure which shares property with multiple Public Works (PW) garages and a sand storage (SS) shed located to the south. The complex is located on at 295 Meridian Street, in Groton, CT. Collectively, the structures are vulnerable to two types of flooding.

The Municipal Building and adjacent parking areas undergo nuisance site flooding which occurs on average once a year, per anecdotal reports. Stormwater runoff from roof gutters and impervious parking areas flow to catch basins in low points in the parking lot, which discharge at multiple points to wetland systems to the south and east. These wetland systems are associated with an unnamed brook. Reports of the flooding indicate that water levels rise in the brook, causing the drainage structures to surcharge. The drive-in basement/garage area beneath the City Hall structure is then subject to flooding from this surcharged stormwater.

The Public Works garage buildings to the south of the Municipal Building are mapped within a freshwater FEMA X 500-year floodplain. The elevation of the zone is not indicated. Anecdotal reports indicate that flooding of the building has not been experienced.

Evaluate Current Vulnerability

- Building plans: Yes
- FEMA Flood Zone: Freshwater X Zone
- Site Grading: Primarily flat, impervious parking on all sides, drive-in basement/garage below grade
- Lowest Floor Use: Garage, utilities, storage
- Outbuildings: Public works garages

Municipal Building (MB)

The Municipal Building has a drive-under garage/basement which is used for storage, for training and cleaning exercises for the Police Department, and to house utilities. The basement is unfinished, with
critical facilities assessment

Date:

Concrete floors is and concrete block partitions into many different use areas, and contains bathrooms. A water heater, electrical panels, air handler, and the Millstone Emergency Alert System controls are located in the basement.

Public Works (PW) Garages

A diesel backup generator is located outside the main Public Works PW1 to the west, elevated approximately 2.5 feet above the Lowest Adjacent Grade (L.A.G.), located within the FEMA X zone. Other vulnerable utilities located within the FEMA X zone include multiple air conditioning condensers located at grade, and an electrical transformer located at grade. Equipment inside the garages include vehicle and equipment storage.

FEMA Flood Insurance Rate Map

FEMA Flood Insurance Rate Map

CH – CITY HALL
SS – SAND SHED
PW – PUBLIC WORKS
Utility System Descriptions – City Hall

<table>
<thead>
<tr>
<th>System</th>
<th>Description</th>
<th>Location(s)</th>
<th>Vulnerable</th>
</tr>
</thead>
<tbody>
<tr>
<td>A/C</td>
<td>Exterior</td>
<td>Exterior, roof</td>
<td></td>
</tr>
<tr>
<td>Water heater</td>
<td>Electric</td>
<td>Basement, at BF elev</td>
<td></td>
</tr>
<tr>
<td>Furnace</td>
<td>None</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Electrical: Panel (primary)</td>
<td>Transformer, underground</td>
<td>Exterior, southern face at grade</td>
<td></td>
</tr>
<tr>
<td>Communications Equipment 1</td>
<td>Satellite Dishes and Radio Towers</td>
<td>Exterior, southern face at grade</td>
<td></td>
</tr>
<tr>
<td>Communications Equipment 2</td>
<td>Radio equipment and Millstone Emergency Broadcast system</td>
<td>Basement, 0.75-ft above BF</td>
<td></td>
</tr>
<tr>
<td>Plumbing: Waste</td>
<td>Public Sewer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plumbing: Potable</td>
<td>Public Water</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fuel System: Primary</td>
<td>Concrete fuel storage tank used to fill onsite equipment</td>
<td>Exterior, southwestern corner of building at grade</td>
<td></td>
</tr>
<tr>
<td>Generator</td>
<td>Diesel generator</td>
<td>Exterior, southern face of building, 3.5 feet above grade</td>
<td></td>
</tr>
</tbody>
</table>

Utility System Descriptions – Public Works Garages

<table>
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<tbody>
<tr>
<td>A/C</td>
<td>Condenser</td>
<td>Exterior, western face, at grade</td>
<td></td>
</tr>
<tr>
<td>Water heater</td>
<td>Unk</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Furnace</td>
<td>Unk</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electrical into building</td>
<td>Underground, transformer</td>
<td>Exterior, western face, at grade</td>
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<td>Communications Equipment</td>
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<td>Diesel</td>
<td>Exterior, western face 3.5 feet above grade</td>
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Identification of Future Vulnerabilities

- Increasing precipitation intensities

Recommendations for Risk Reduction

Storm Drainage Deficiencies

- Installation of backflow prevention on storm drainage outfalls could help prevent surcharging drainage system from causing nuisance flooding of the building and parking area.
- Installation of stormwater pump to clear parking area or to clear basement of floodwater
- Regrading of driveway aprons to prevent flooding water from flowing towards the building basement