Vulnerability and Adaptation

Kevin Walsh
AASHTO
Extreme Weather Symposium
May 2013
Vulnerability & Adaptation

- Flood Inventory – Learn From The Past

- FHWA/MassDOT Climate Change Pilot for the Central Artery
March 2010
## Findings: Causes

<table>
<thead>
<tr>
<th>Potential Cause</th>
<th>Times Cited</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insufficient Drainage</td>
<td>40</td>
</tr>
<tr>
<td>Flooding Water Body</td>
<td>29</td>
</tr>
<tr>
<td>Low Elevation/ High Water Table</td>
<td>7</td>
</tr>
<tr>
<td>High Tides</td>
<td>6</td>
</tr>
<tr>
<td>Debris Clogging</td>
<td>6</td>
</tr>
<tr>
<td>Beavers</td>
<td>6</td>
</tr>
<tr>
<td>Runoff from Development</td>
<td>5</td>
</tr>
</tbody>
</table>

Note: Multiple causes possible. Causes not verified.
2010 Survey

Locations of Repeat Flooding

LEGEND
Flood Locations
Frequency/yr
- 6-10x
- 3-5x
- 2
- 1
- 1/3-1/2
- 1/5
- 1/8
- <1/8
Good Night “Irene”

- Hurricane downgraded to Tropical Storm
- 10 inches in 18 hours
- Deerfield River, Millers River and Cold River stages broke records.
- Particularly wet months in July and August prior to Irene.
River Stage about 20 feet!
Wall Failures due to Scour
Luckily, No Injuries!
DRAINAGE!
Adaptation Strategies

- **Complete Mapping**
  (Maximo)

- **Designs for future events**

- **Prioritize Maintenance**
MassDOT-FHWA Pilot Project: Climate Change and Extreme Weather Vulnerability Assessments and Adaptation Options of the Central Artery

Steven Miller, MassDOT
Katherin McArthur, MassDOT
Ellen Douglas, UMass Boston
Paul Kirshen, UNH
How it all began
What if it happened here?
PHASE 1: Initial Determination of Geographical Scope

PHASE 2: Detailed Surveys of Assets within the Project Area

PHASE 3: Surveys of Critical Areas of Central Artery

PHASE 4: Hydrodynamic Analysis (December. 2013)
PHASE 5: Vulnerability Assessment

- **Exposure**: what features, assets, properties will be impacted under each scenario.
- **Sensitivity**: how much effect will the impacts have on current and future operations.
- **Adaptive capacity**: how quickly can the system recover from impacts. Evaluate alternative routes, costs of restoring service, and other metrics.

PHASE 6: Adaptation Strategy

- Mix of local and regional actions – coordinated with other organizations.
- **Here and now**: Adaptation action implemented now as presently vulnerable or new infrastructure.
- **Prepare and monitor**: implemented when climate and /or socio-economic thresholds or trigger points reached.
- Periodic re-evaluation and progressive adaptation

Anticipated completion: Jun 30, 2014
PHASE 7: Present Results and Prepare Final Report to MassDOT Senior Management

- Results will be available to other stakeholders (ie., BWSC, Massport, MBTA, Cambridge and others).

Contacts

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