Harvey Recovery & Flood Resilience Update

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Chief Resilience Officer
Resilience Office

Flood Resilience Goals

• Increase channel conveyance & detention through large-scale, transformative projects
• Address local urban drainage challenges
• Advance innovate approaches for flood management
Hurricane Harvey Summary

$125 B in Harvey damages statewide according to National Hurricane Center

Bayou Flooding

Reservoir Releases

Highway Inundation – U.S. 59
Comparing Rainfall Amounts

- **Average Annual Rainfall**: 49.77 inches in a year
- **Memorial Day (2015)**: 11 inches in a 10-hr period
- **Tax Day (2016)**: 17 inches in a 24-hr period
- **Harvey (2017)**: 51.88 inches in a 5-day period
Harvey Rainfall

Estimated Rainfall
8/24/17 8P - 8/27/17 8P EDT
Harvey Impacts

- 311,859 housing units affected
- 135,000 FEMA Individual Assistance claims
- $2.4 billion in damaged city facilities and infrastructure
- 650,000 HPD overtime hours
- 2 million cubic yards of debris
Federal Disaster Relief

1\textsuperscript{st} Disaster Supplemental: September 8, 2017 - Initial emergency appropriations for Harvey disaster relief

2\textsuperscript{nd} Disaster Supplemental: October 10, 2017 - Hurricane Harvey, Irma, Maria and other hurricanes and wildfires occurring in 2017

3\textsuperscript{rd} Disaster Supplemental: February 9, 2018 - Hurricane Harvey, Irma, Maria and other hurricanes and wildfires occurring in 2017

\textcolor{blue}{{\$89.3\text{ Billion}}}

\textcolor{blue}{{\$36.5\text{ Billion}}}

\textcolor{blue}{{\$15.25\text{ Billion}}}

1st Supplemental
$15.25 B
- $7.4 Billion for FEMA Disaster Relief Fund
- $7.4 Billion for Community Development Block Grant Disaster Recovery (CDBG-DR) - Texas received a $5 Billion allocation
- $450 Million for SBA Disaster Loan Program

2nd Supplemental
$36.5 B
- $18.7 Billion for FEMA Disaster Relief Fund
- $16 Billion for National Flood Insurance Program (NFIP)

3rd Supplemental
$89.3 B
- $23.5 Billion for FEMA Disaster Relief Fund
- $17.9 Billion for U.S. Army Corps of Engineers for repairs and maintenance of current and ongoing projects
- $810 Million for Flood Control and Coastal Emergencies
- $135 Million to expedite high-priority studies
- $28 Billion for HUD CDBG-DR program
- $1.65 Billion for SBA Disaster Loan Program
- $2.79 Billion for Department of Education
- $1.87 Billion Department of Defense and Homeland Security
- $1.374 Billion for Department of Transportation
Harvey Recovery Team

- Housing
- Infrastructure
- Resilience
Harvey Recovery Team

- Housing
- Infrastructure
- Resilience
Housing

Master Program Manager

- Case Manager
- Construction Manager

- Direct Lease - Rental payments for up to 18 months post-Harvey
- Direct Assistance for Limited Home Repair - $17K-$60K
- Mobile Home Units
*Technical Mitigation:
  * Significant structural change
  * Examples are demolition, relocation, elevation, consolidation

**Standard Mitigation:
  * Inside or located at facility
  * No significant structural change
  * Examples: floodwalls, gates, elevating utilities

***BCA developed if warranted
Harvey Estimated Maximum Riverine Inundation
Estimates include data through August 31 at 7:00 AM
Project Brays
Project Brays: Keegan’s Bayou & Ruffino
North Canal

- Realign I-10 & add new Express Lanes (pass-thru)
- Realign I-69 & depress from Commerce to Spur 527
- Downtown Connectors replace Pierce Elevated
- Pierce Elevated no longer needed
- Potential Open Space (Lamar to Commerce) (Private Funding and Development)
North Canal: Downstream
North Canal: Upstream
Impact of Harvey on WWTPs & Preliminary Conceptual Long-term 12 Targeted WWTPs

<table>
<thead>
<tr>
<th>No.</th>
<th>Facility ID</th>
<th>Wastewater Treatment Plant (WWTP) Name</th>
<th>Harvey Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>402</td>
<td>Acqua Vista</td>
<td>No Flooding</td>
</tr>
<tr>
<td>2</td>
<td>6</td>
<td>Almeda武汉市</td>
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<tr>
<td>3</td>
<td>312</td>
<td>Beltway</td>
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<td>Crockett Bayou</td>
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<td>Galleria Park</td>
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<tr>
<td>7</td>
<td>63</td>
<td>Eastham</td>
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<tr>
<td>8</td>
<td>555</td>
<td>Forest Cove</td>
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<tr>
<td>9</td>
<td>832</td>
<td>H thing 432</td>
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<td>Intercontinental Airport</td>
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<td>322</td>
<td>Kemah Bay</td>
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<tr>
<td>15</td>
<td>518</td>
<td>Kingwood Centre</td>
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<td>307</td>
<td>Astoria Central</td>
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<td>17</td>
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<td>NUD 222</td>
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<td>NUD 441 (Kingwood West)</td>
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<td>222</td>
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<td>Tidwell Timber</td>
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<td>WUD-B-65</td>
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<td>Westway WUD</td>
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<td>39</td>
<td>958</td>
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<tr>
<td>40</td>
<td>527</td>
<td>West Lake Houston</td>
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</tbody>
</table>

Note: The flooding information is based on preliminary damage assessment done by AECOM for the City of Houston after Hurricane Harvey. Twelve (12) wastewater treatment plants enclosed within circles are targeted to remain in service after the implementation of the preliminary conceptual long-term WWTP consolidation plan.
REAL, TANGIBLE BENEFITS

Public Safety
Diverting floodwater to tunnels keeps it off the streets and away from people. This results in better and safer mobility when evacuation may be necessary.

Property Benefits
Tunnels provide more conveyance, reducing the size of floodplains, decreasing the potential for damage, and reducing insurance premiums. Less risk of damage encourages re-investment.

Jobs
Although large-diameter tunnel construction requires specialized expertise, it will create hundreds of local jobs and opportunities for local businesses to be involved.

TEXAN FLOOD TUNNELS
- San Antonio - 4+ miles of tunnel 24 feet in diameter
- Austin - 1+ mile of tunnel 20-26 feet in diameter
- Dallas - 5+ miles of tunnel 30-35 feet in diameter
Contact

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Questions?