

# Collaborative Flood Mitigation Solutions for a Multi-Jurisdictional Watershed



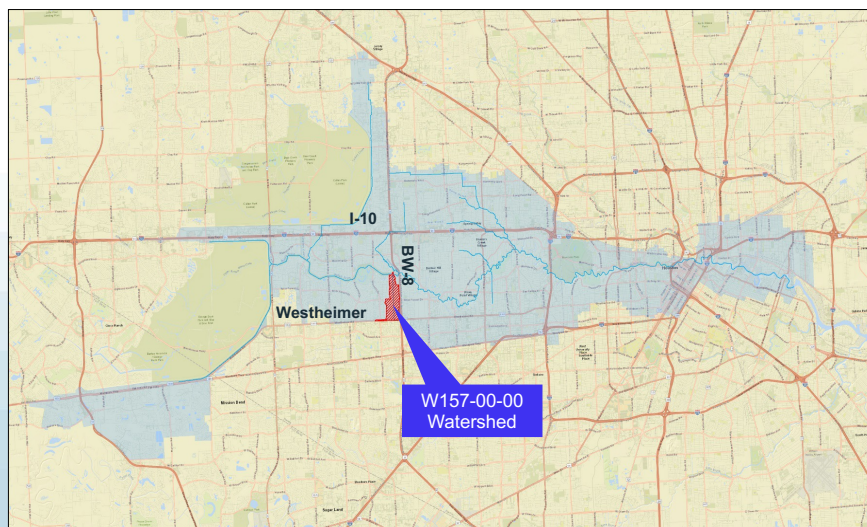
Shrinivas Kaulgud, PE, CFM  
Brett Sachtleben, PE, CFM

03/26/2025



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## Project Area - Location



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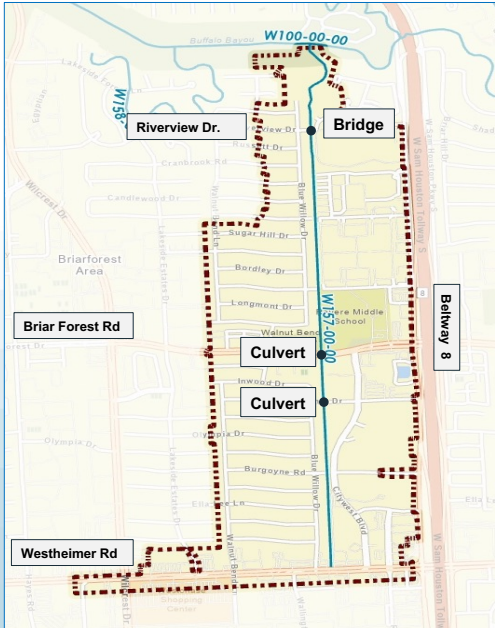


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# Project Area - Overview

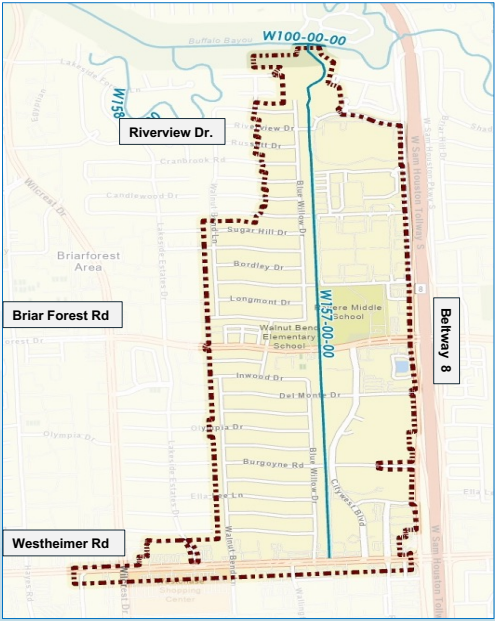
## W157-00-00 Watershed

- 0.84 mi<sup>2</sup> Drainage Area
- 1.7 mile in Length
- Channel Studied in TSARP & MAAPnext
- Limited Easement Width



# Project Area – Jurisdictions

- Precinct 4
- HCFCD (Owns W157-00-00 channel)
- City of Houston - Neighborhood Drainage
- TxDOT
- HCTRA
  - Trail system along W157-00-00



# Project Area - Channel Photos



W157-00-00 at Westheimer  
(Looking South / Downstream)



W157-00-00 At Del Monte  
(Looking South / Downstream)



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# Project Area - Channel Photos



W157-00-00 at Briar Forest  
(Looking South / Downstream)



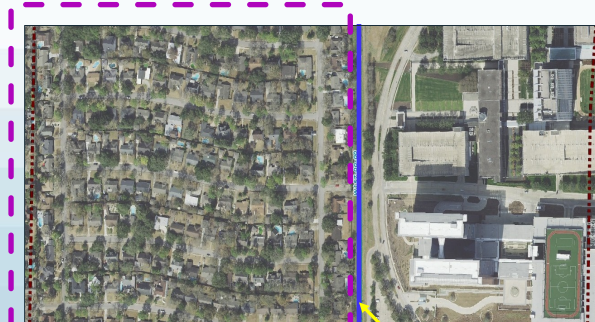
W157-00-00 At Riverview  
(Looking South / Downstream)



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## Project Area (West of W157-00-00)

- Older Residential Subdivisions (part of Walnut Bend Neighborhood)
- Developed in 1960's
- Undersized Drainage Systems



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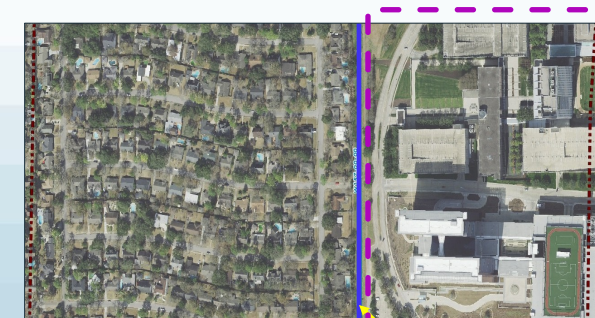
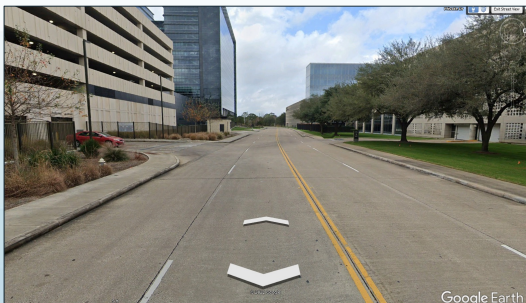
W157-00-00 Channel



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## Project Area (East of W157-00-00)

- Commercial Area
- Multi-Family Residential Area / Middle School
- Most eastern area developed in or after 1990's



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W157-00-00 Channel



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# W157 WATERSHED FLOODING PROBLEMS



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## Observed Flooding

Pictures from Tax Day 2016 floods



Visible Debris  
Lines



Pictures after 07/07/2023 Storm  
(2" rainfall in ~2 Hrs)



Visible Debris  
Lines



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# Observed Flooding

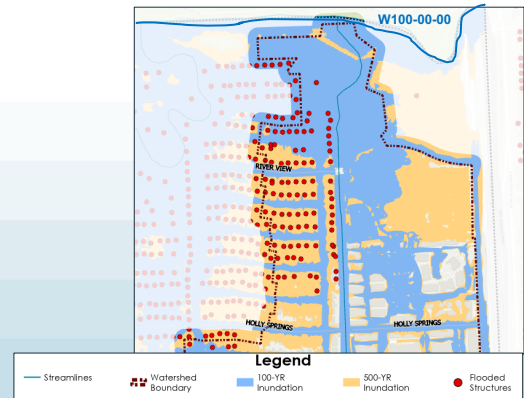
- Downstream areas prone to flooding from Buffalo Bayou
- Regular occurrences of localized and street flooding
- Instances of flooded properties
- Impassable roadway intersections

Street Flooding



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Flooded structures near Buffalo Bayou Confluence



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# Causes of Flooding

- Buffalo Bayou backwater
- Undersized storm sewer systems
- Shallow storm sewer systems
- Overflows from adjacent watersheds

Small Inlets – Clog Easily



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Low Outfall Pipes / Shallow Depths



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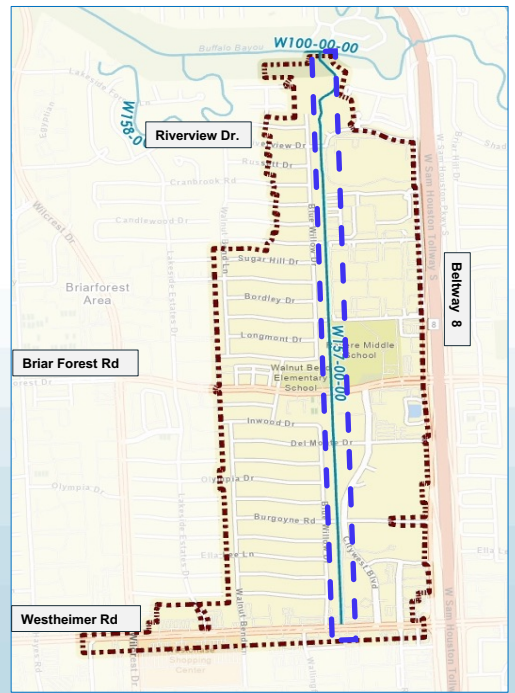
# STUDY APPROACH



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## Traditional Approach

- Evaluate riverine systems only
- Plan improvements and mitigation for riverine systems
- **Urban drainage systems improved & mitigated independently**

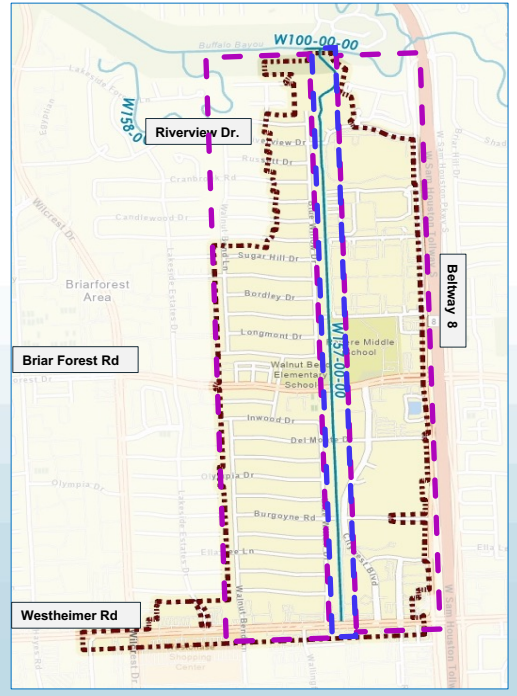


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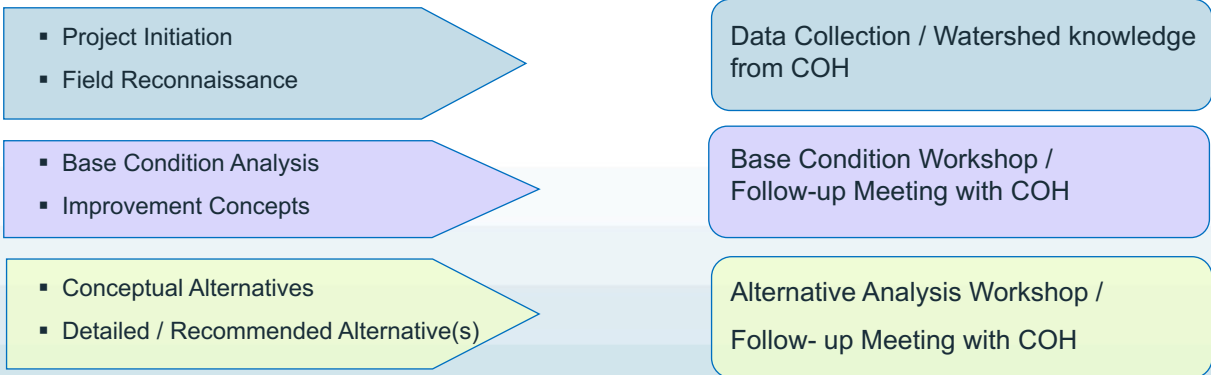
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# New Approach

- Evaluate riverine & urban drainage systems
- Plan improvements and mitigation for riverine & urban drainage systems
- **Riverine and urban drainage systems improved & mitigated holistically**

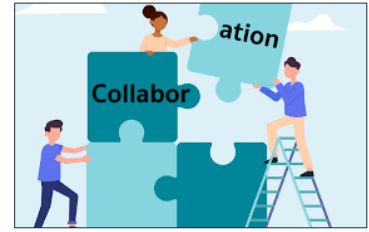


# Collaboration Efforts



# Collaboration Efforts

- Coordination meetings with City of Houston at major milestones
- HCFCD coordinated frequently with City of Houston
- HCFCD directly coordinated with HCTRA and TXDOT



# KEY STUDY FINDINGS

# Modeling Platform

## Causes of Flooding

- Buffalo Bayou Backwater
- W157-00-00 Tailwater
- Undersized Storm Sewers
- Overflows from Adjacent Watersheds



XPSWMM 1D/2D

## Model Setup

- 1D Channels
- Storm Sewer Network
- 2D Mesh for Ground Surface
- 1D/2D connections



# Improvement Concepts (10-Yr)

- 3 Improvement Scenarios
- Simplified Modeling

Base (Existing Condition)



Storm Sewer Only Improvements



Channel Only Improvements



Improved Channel and Storm Sewer Improvements



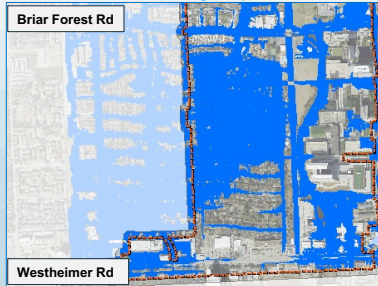
# Improvement Concepts (100-Yr)

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Storm Sewer Only Improvements



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Channel Only Improvements



Improved Channel and Storm Sewer Improvements



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# PROPOSED SOLUTIONS

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# Proposed Solutions

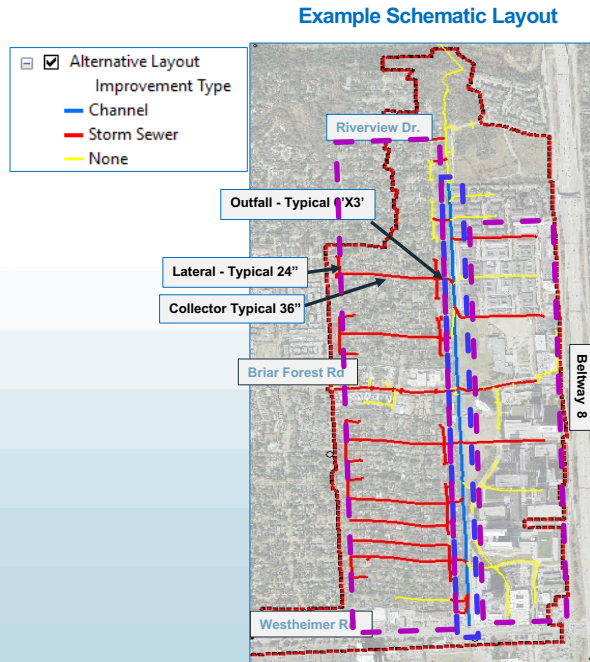
## Developed 6 Alternatives

- 4 Conceptual Alternatives
- 2 Detailed / Recommended Alternatives

## Example Recommended Alternative

- W157 pilot channel (8'X4') to increase channel depth
- Upsized and deepened storm sewer systems
- Upsized inlets from Type B to Type BB
- Quantified detention volumes for mitigation
- Identified potential sites for mitigation

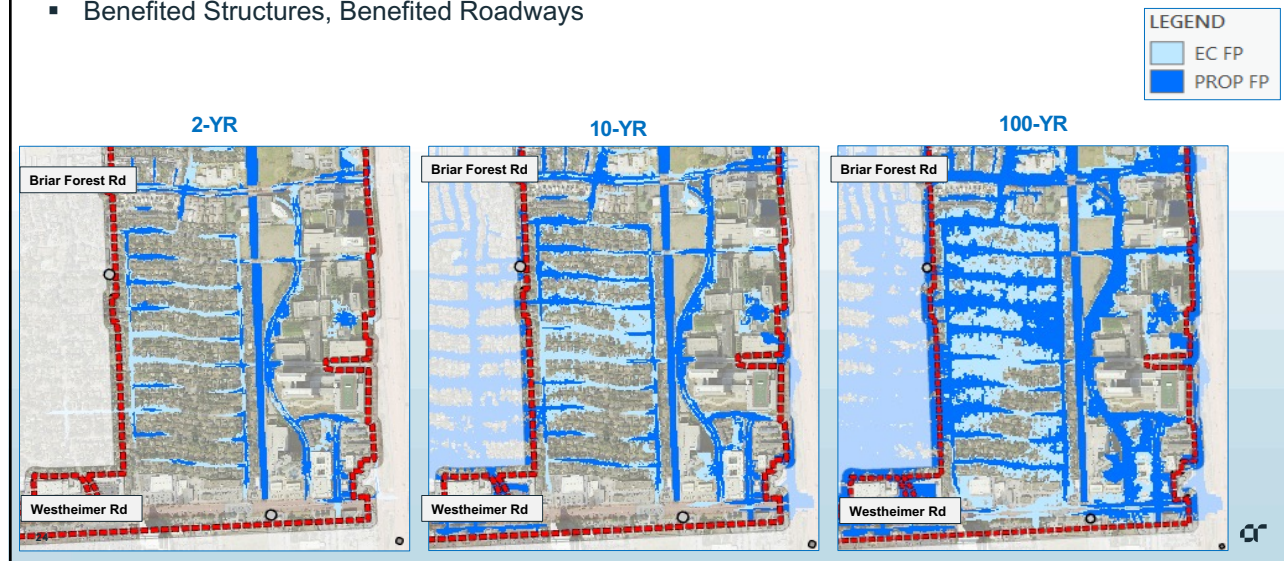
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# Floodplain Comparisons

- Proposed condition floodplain extents significantly smaller than existing conditions
- Benefited Structures, Benefited Roadways





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# Mobility Improvements


- Significant reduction in ponding depths
- Proposed Improvements will make some of neighborhood intersections passable

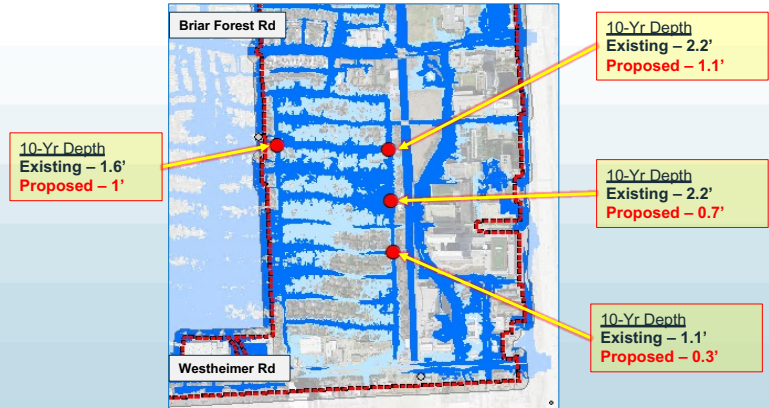
**Turn Around, Don't Drown**  
 Harris County Flood Education Mapping Tool



0.25' Deep – Likely 

0.5' Deep – Maybe

1.0' Deep – Not Likely 



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# Potential Cost Sharing

Improvement Category	Lead Agency	Est. Cost (\$)
Storm Sewer	COH	~ 8M
W157-00-00 Channel	HCFC	~ 4M
Detention Mitigation (Channel & Storm Sewers)	Shared	~ 3M
ROW Acquisition (Detention Mitigation)	Shared	~ 16M
Contingency	Shared	~ 5M
<b>Total</b>		<b>~ 36M</b>

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# NEXT STEPS



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## Next Steps

- HCFCO completed study and shared it with City of Houston
- City of Houston began drainage evaluations in the watershed
- HCFCO and COH are continuing coordination

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THANK YOU!!

