

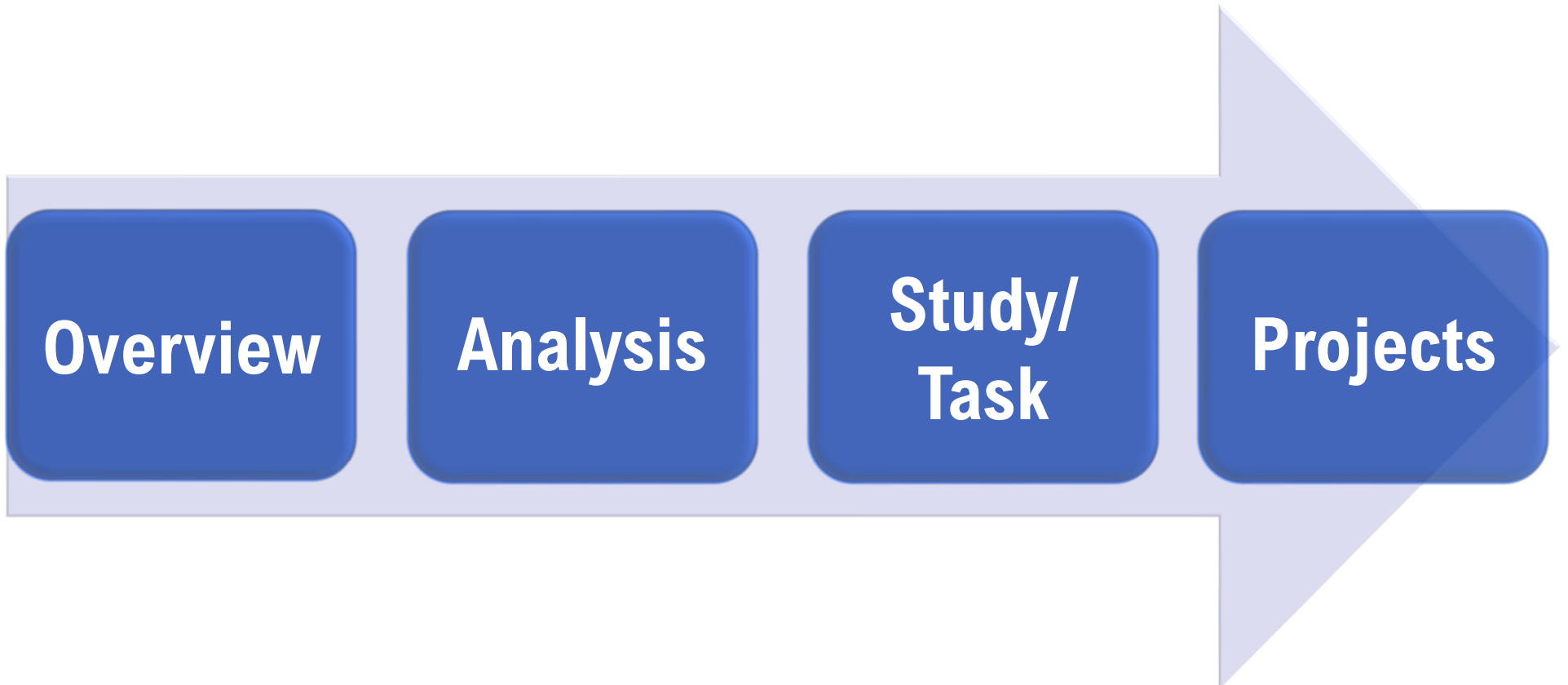


City of Harlingen HUC 10 Flood Protection Planning Study City Commission Meeting

FEBRUARY 4, 2026



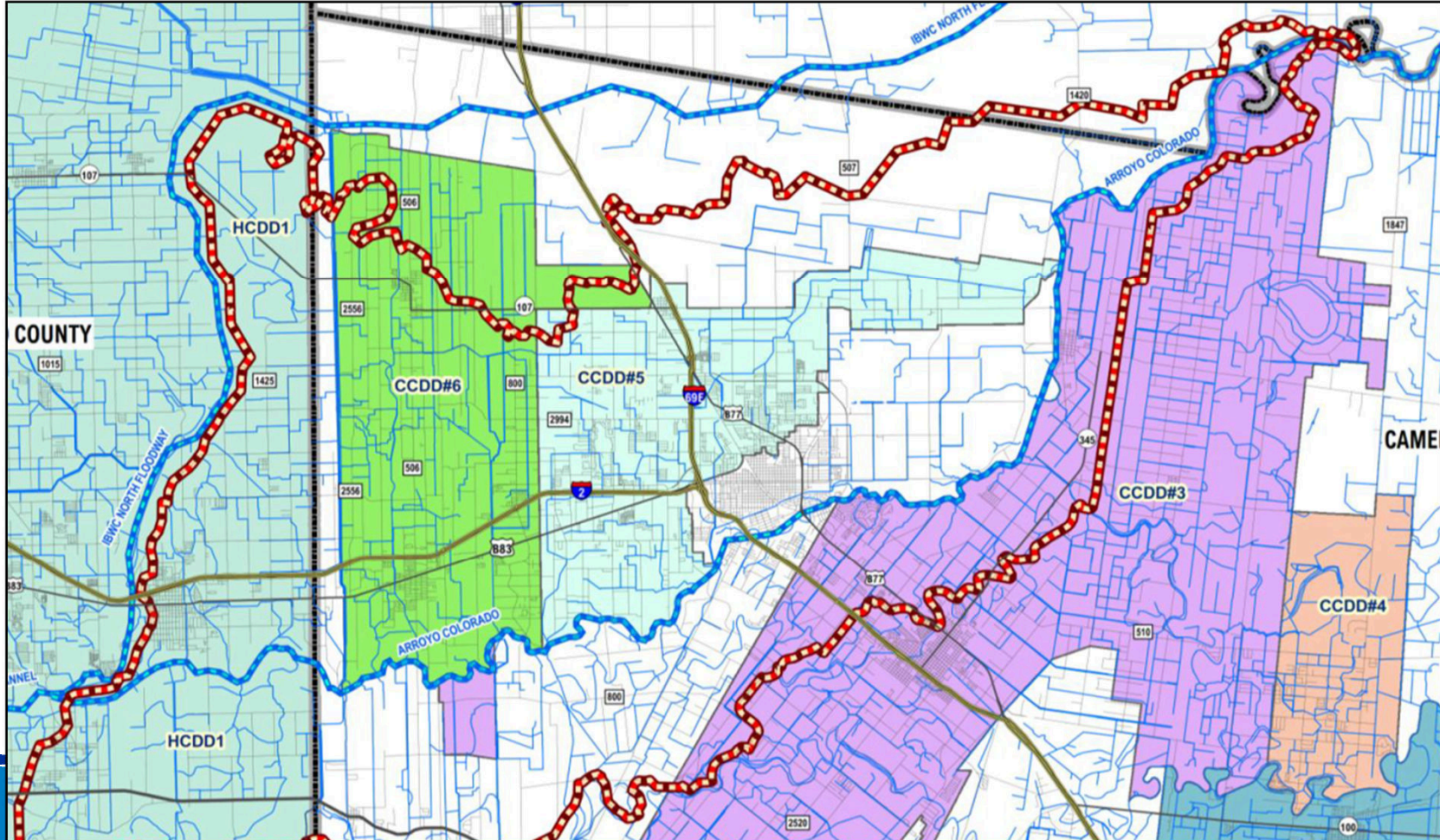
OUTLINE OF PRESENTATION



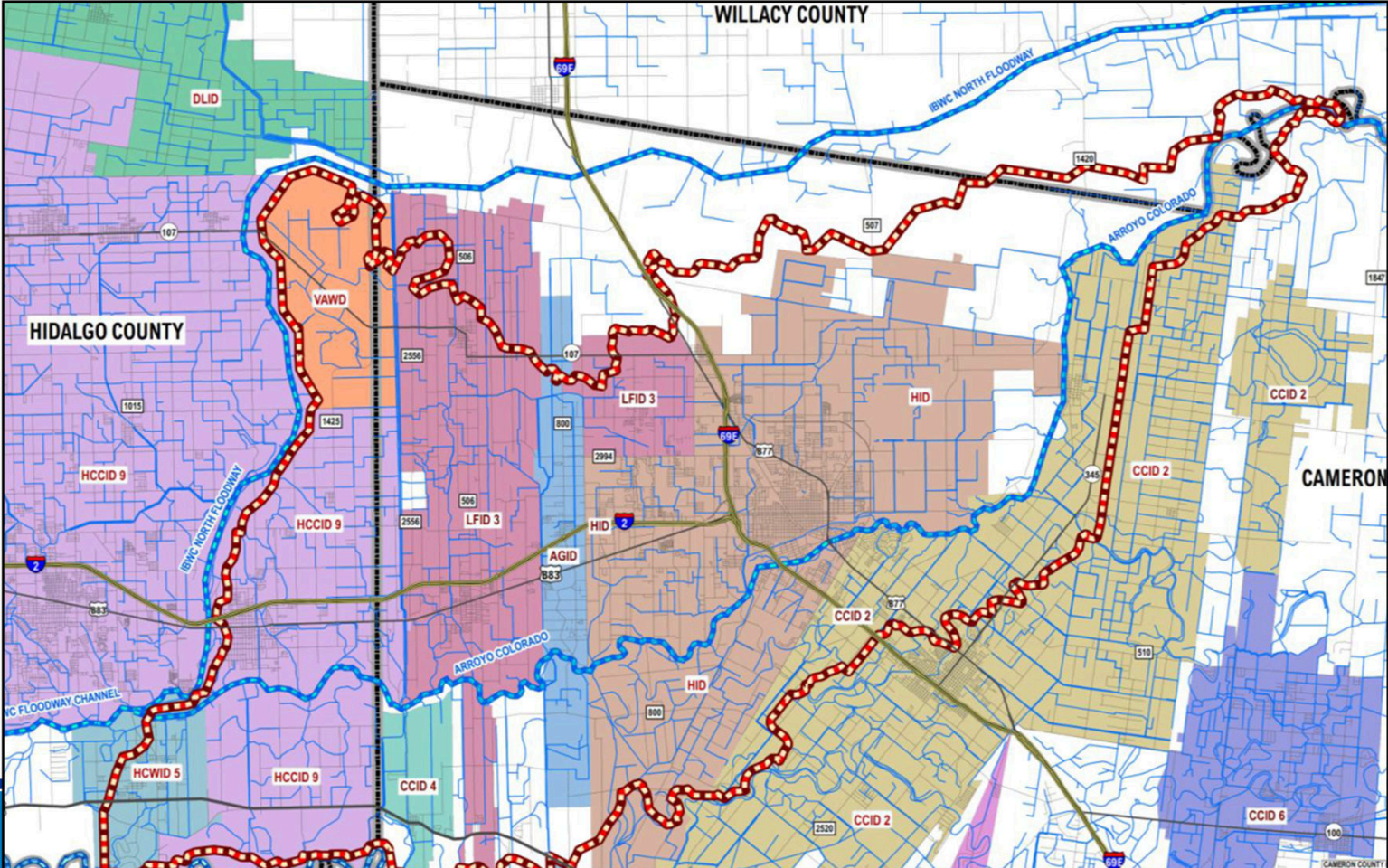
PROJECT GOALS

- 1. Reduce existing flooding**
- 2. Enhance safety of residents and communities**
- 3. Provide drainage infrastructure for future development and infrastructure**
- 4. Provide a guidance plan for regional flood protection management**

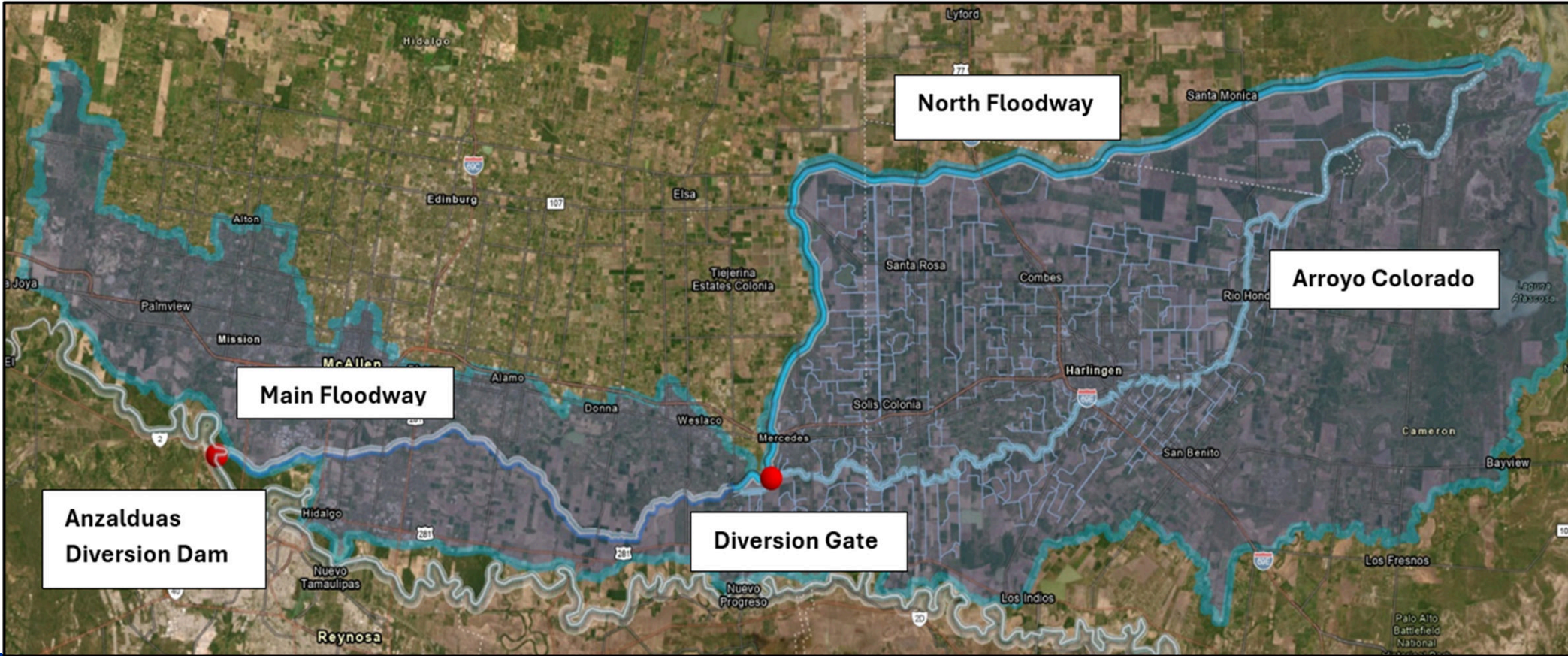
DRAINAGE DISTRICTS



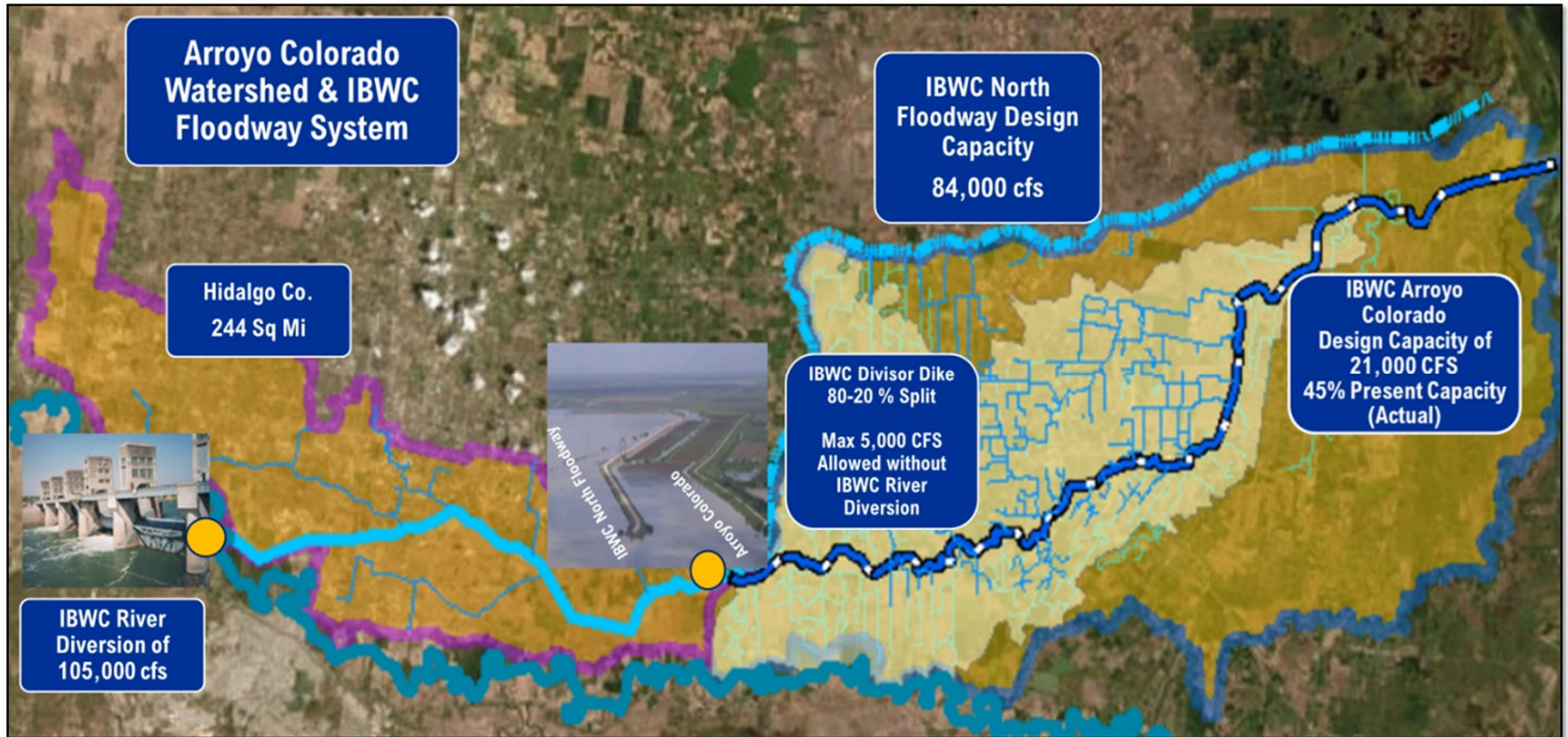
IRRIGATION DISTRICTS



ARROYO COLORADO WATERSHED & IBWC FLOODWAY SYSTEM



ARROYO COLORADO WATERSHED & IBWC FLOODWAY SYSTEM



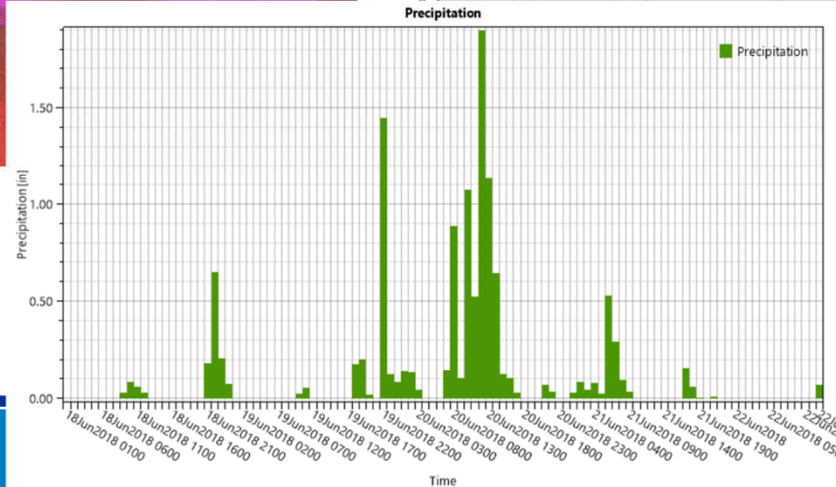
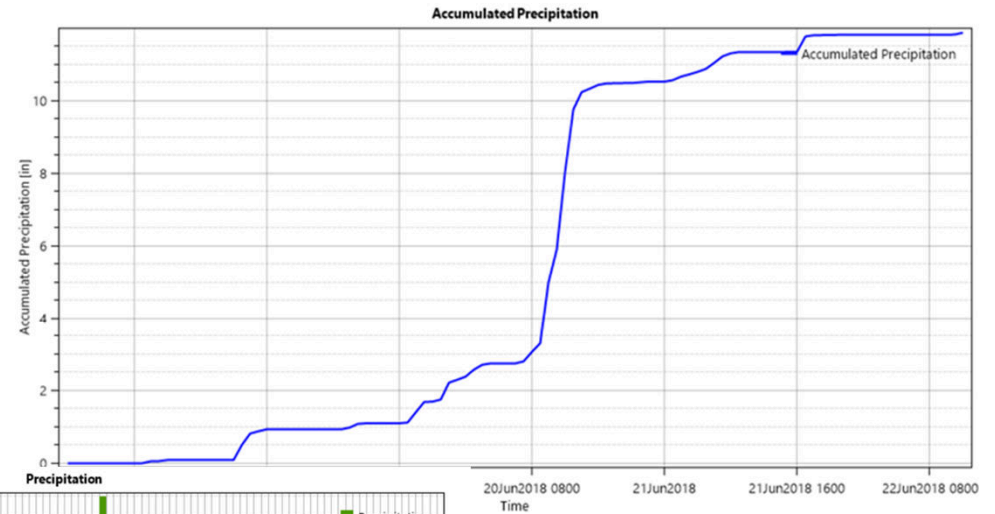
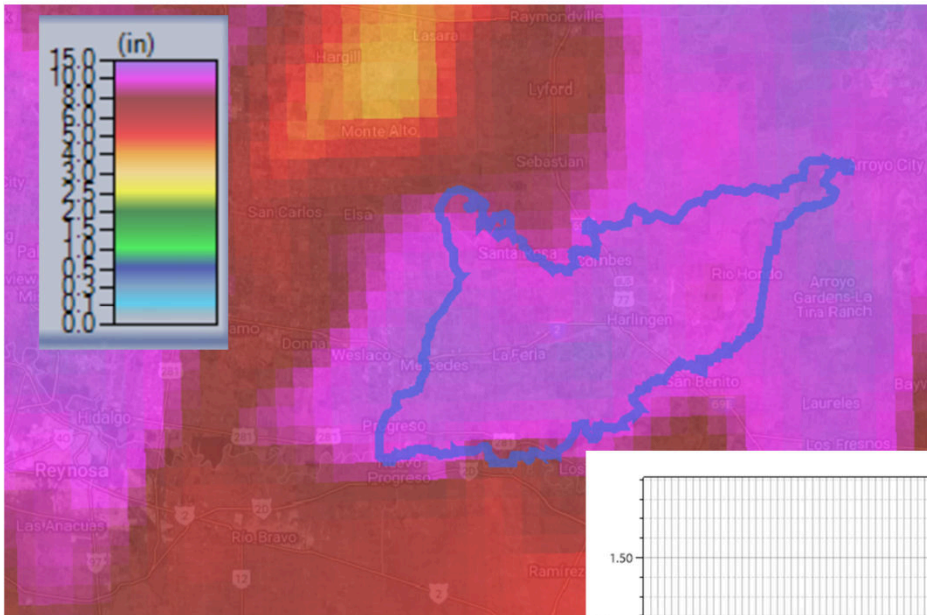
PROJECT OBJECTIVES

- 1. Develop watershed-based 2D H&H models
(Atlas 14/ 2018 LiDAR/ Survey/Historical Floods)**
- 2. Identify/ map existing flooding and flood risk areas**
- 3. Formulate/ evaluate alternative drainage improvement
measures**
- 4. Provide a regional drainage plan with No Adverse Impacts**
- 5. Develop a regional drainage criteria**
- 6. Evaluate stream gage station locations for monitoring Arroyo
Colorado flow conditions**

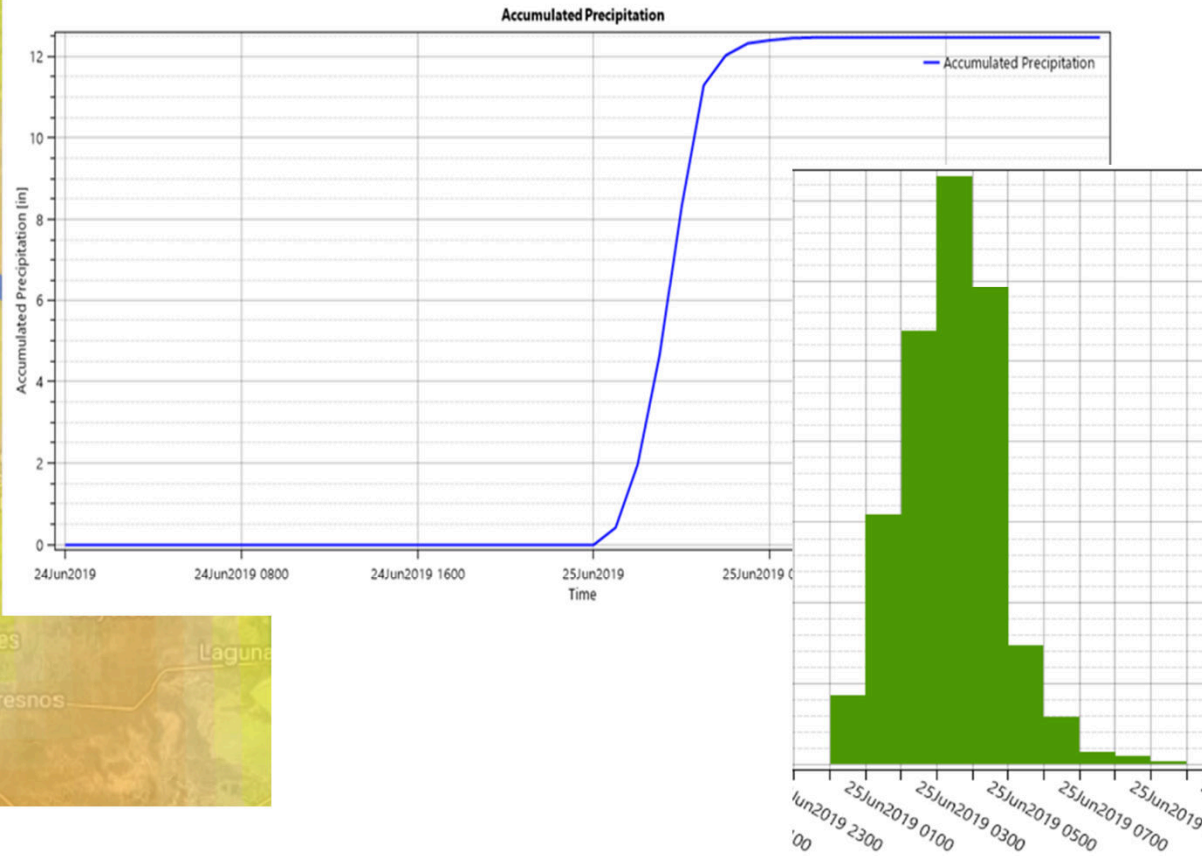
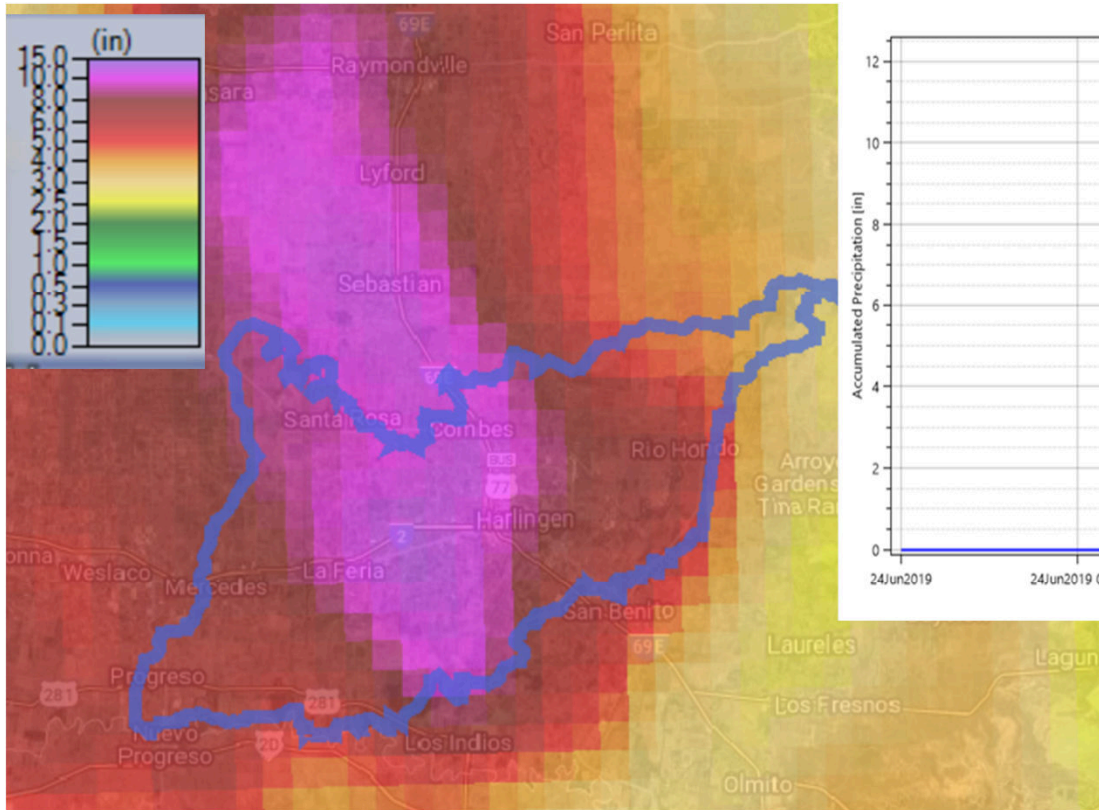
HISTORICAL FLOOD EVENTS

- **Hurricane Beulah (1967)**
- **Hurricane Dolly (July 2008)**
- **Hurricane Alex (July 2010)**
- **June 2018**
- **June 2019**
- **Hurricane Hanna (July 2020)**
- **October 2021**
- **March 2025**

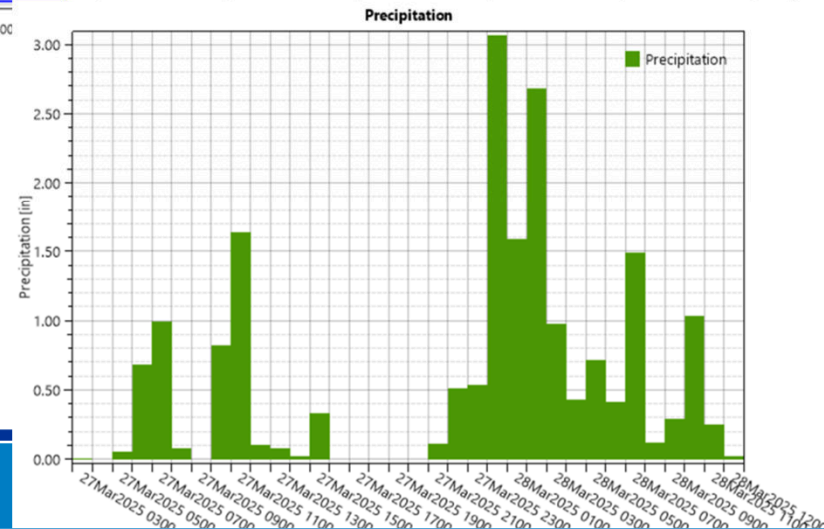
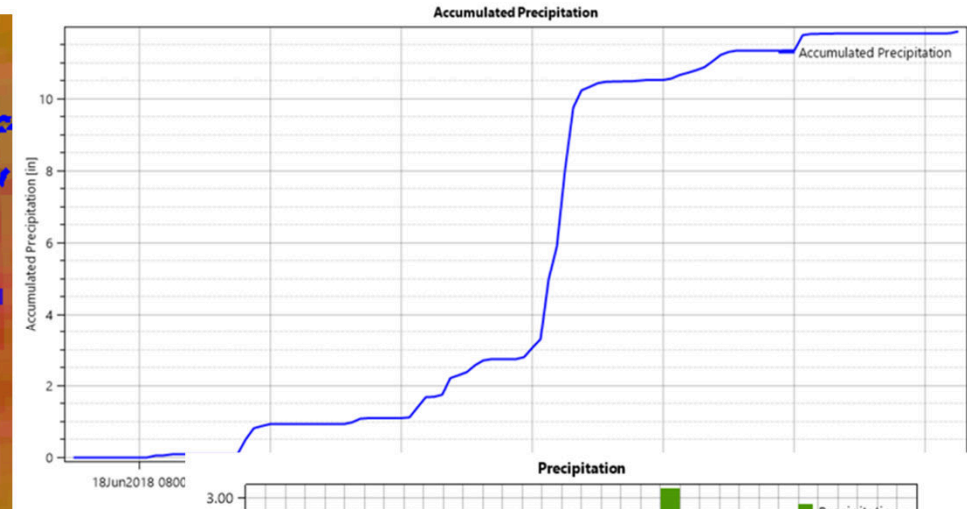
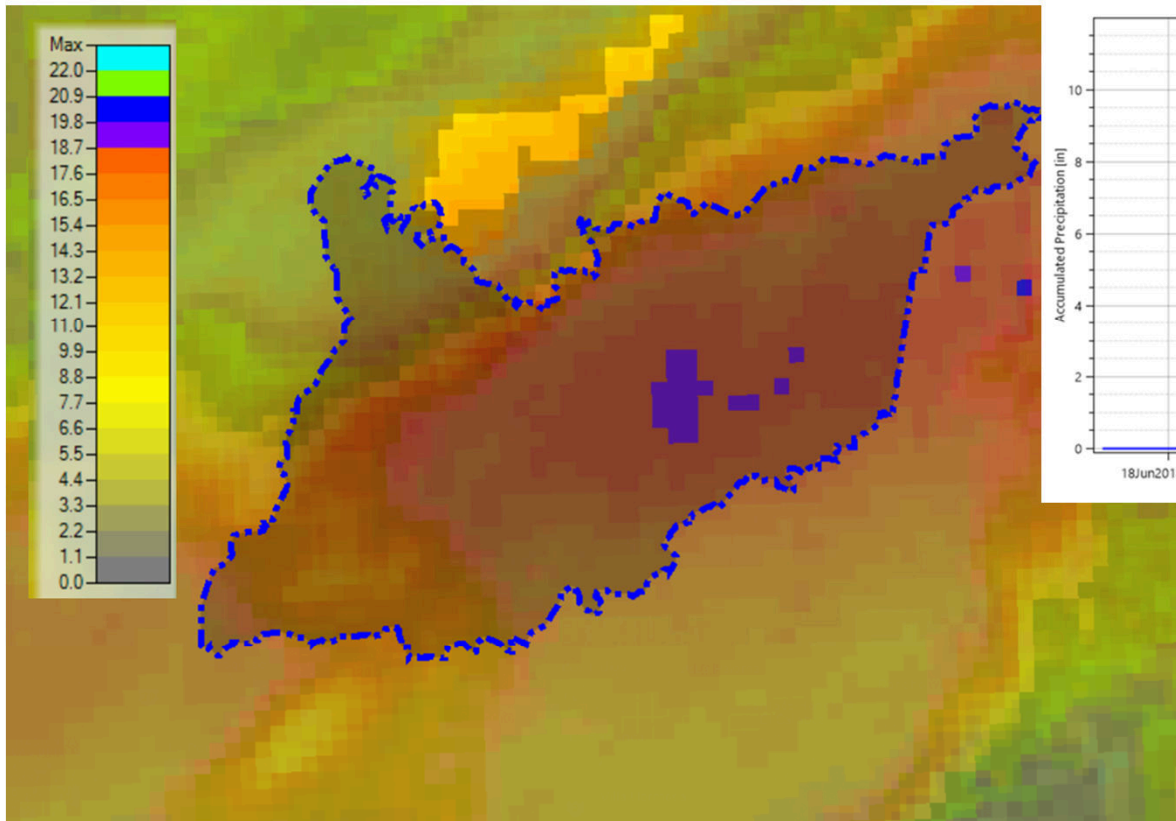
JUNE 19-21 2018 EVENT - NEXRAD RAINFALL DATA



JUNE 25 2019 STORM EVENT - NEXRAD RAINFALL DATA



MARCH 27-28 2025 STORM EVENT - NEXRAD RAINFALL DATA



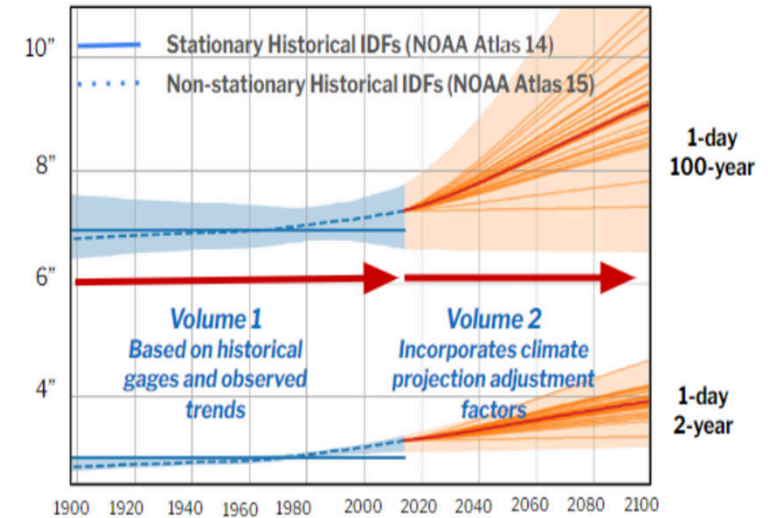
HYDROLOGIC/HYDRAULIC MODELING

NOAA ATLAS 14 RAINFALL DATA

Duration	Average Resurrence Interval (Years)						
	5	10	25	50	100	200	500
5-min	0.70	0.82	0.98	1.11	1.24	1.36	1.53
10-min	1.11	1.30	1.57	1.77	1.97	2.17	2.42
15-min	1.40	1.64	1.97	2.23	2.47	2.72	3.04
30-min	2.00	2.34	2.80	3.14	3.48	3.83	4.29
60-min	2.63	3.08	3.71	4.18	4.66	5.16	5.85
2-hr	3.23	3.84	4.70	5.38	6.09	6.87	7.99
3-hr	3.57	4.29	5.32	6.13	7.02	8.02	9.49
6-hr	4.18	5.08	6.39	7.46	8.65	10.00	12.10
12-hr	4.79	5.87	7.47	8.81	10.30	12.10	14.70
24-hr	5.45	6.72	8.61	10.20	12.00	14.10	17.10
2-day	6.23	7.68	9.85	11.70	13.70	16.00	19.30

NOAA Atlas 15

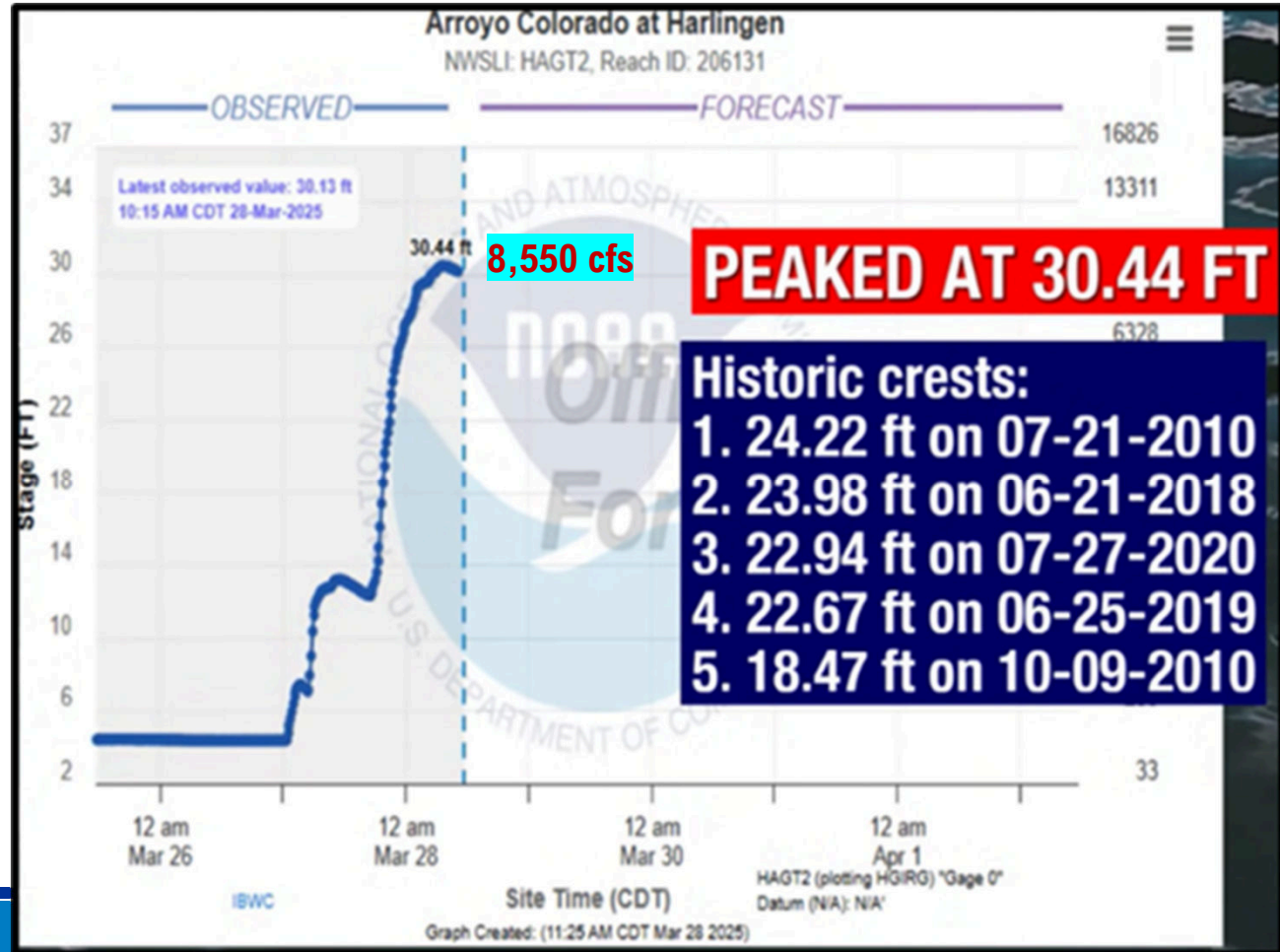
New National Precipitation Frequency Standard



ARROYO COLORADO AT BU77

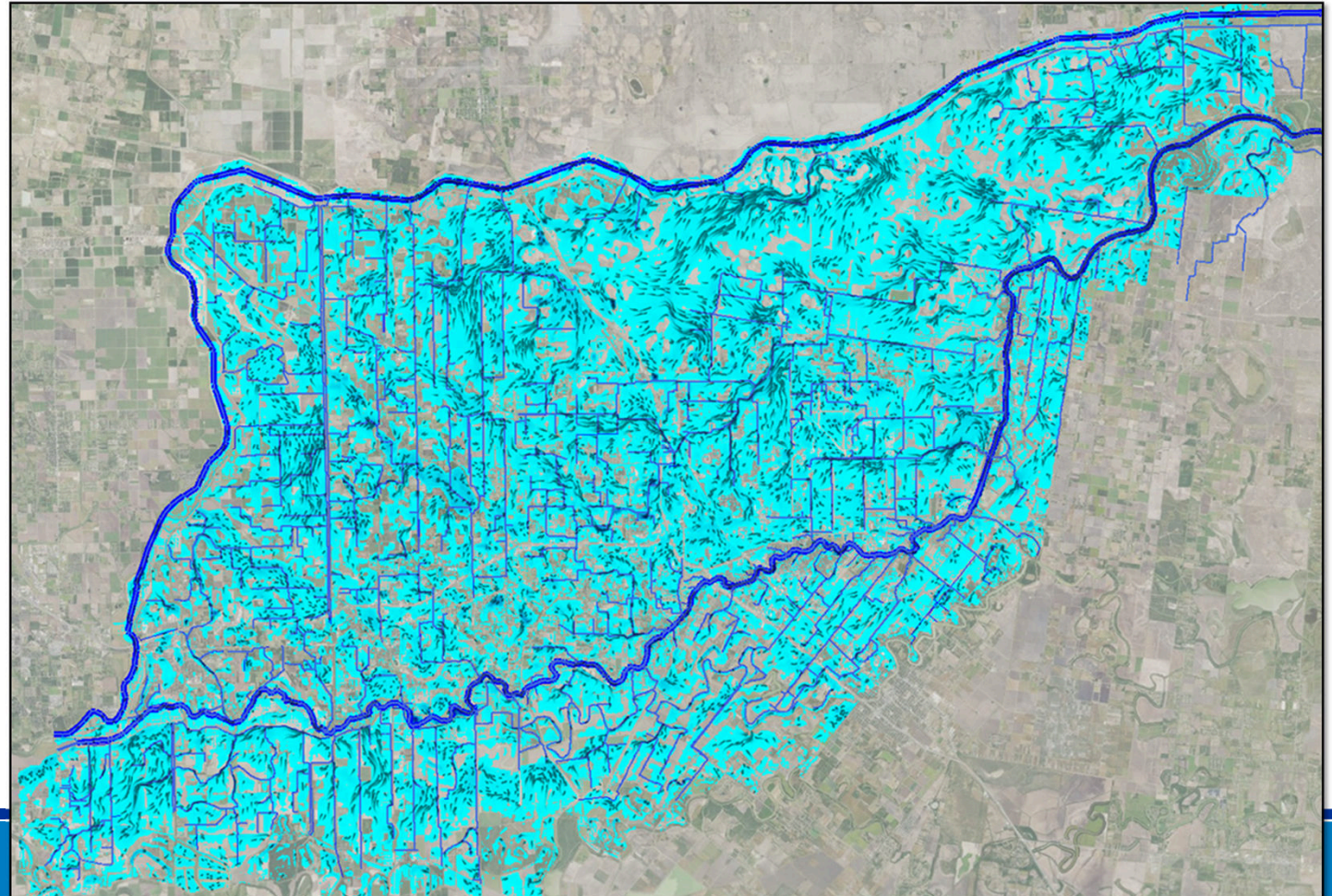
Historic Water Surface At Stream Gage

- ✓ Record -- March 2025
 - 6 Feet above Previous Record
 - Peak Flow = 8,550 cfs
- ✓ IBWC Design Flow = 21,000 cfs

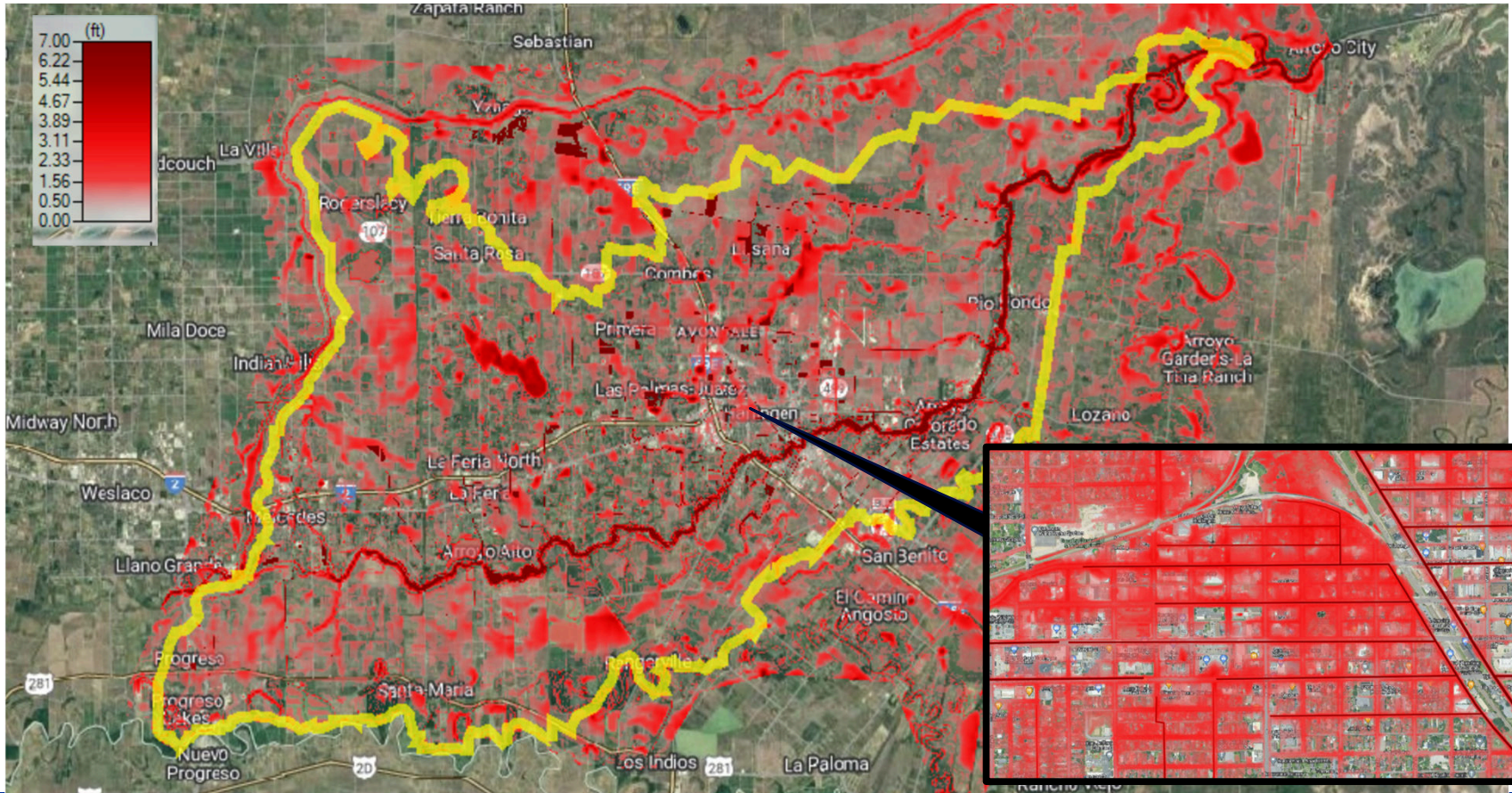


HEC-RAS 2D UNSTEADY FLOW MODELING

- ✓ Historical floods
- ✓ LiDAR DEM
- ✓ Soil Data
- ✓ Land Use/Land Cover
- ✓ NOAA Atlas 14 Precipitation
- ✓ NexRAD Rainfall Data
- ✓ IBWC Stream Gauge Data
- ✓ Parcel Data
- ✓ Critical Facilities Data
- ✓ Agricultural Land Use Data
- ✓ Field Surveying

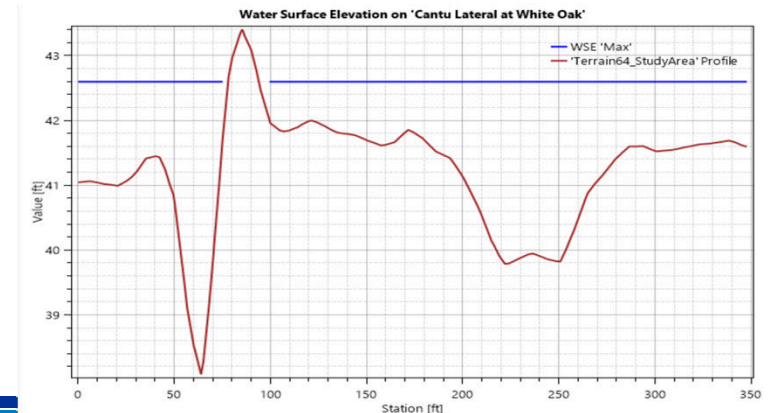
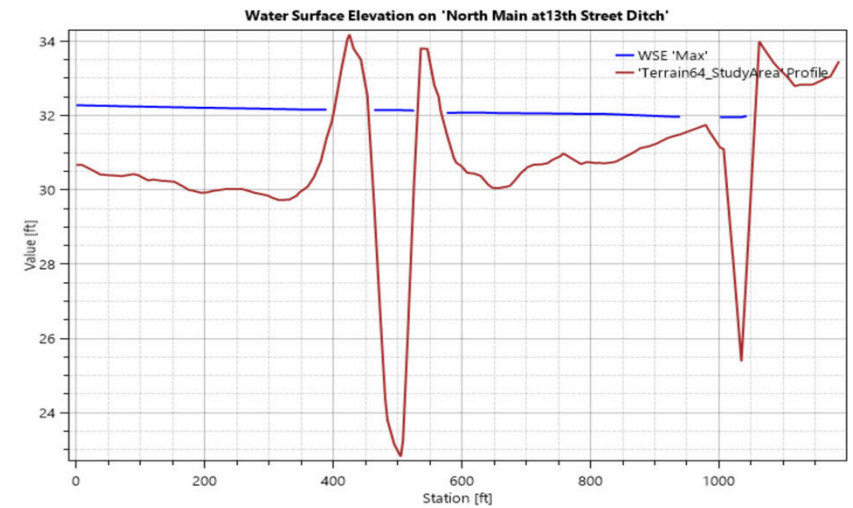


100-YEAR INUNDATION MAPPING

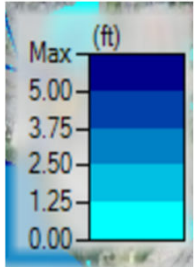


TOPOGRAPHIC AND DRAINAGE INFRASTRUCTURE CONSTRAINTS

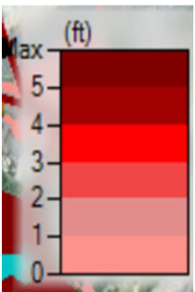
- ✓ Very flat terrain and obstacles such as elevated irrigation canals, railroads, and roadways
- ✓ Limited major open ditch outfall infrastructures such as North Main Drain
- ✓ Limited underground storm sewer systems and street inlets (locations, numbers, and sizes)
- ✓ Limited detention basin infrastructures (local and regional)



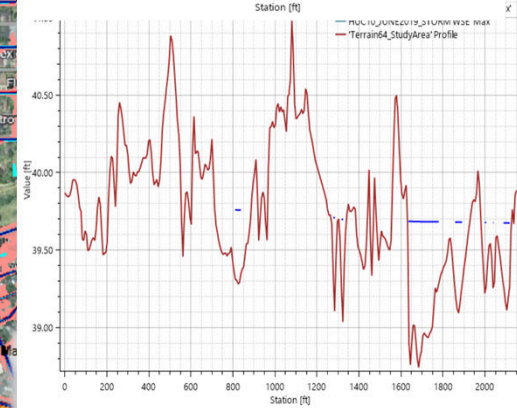
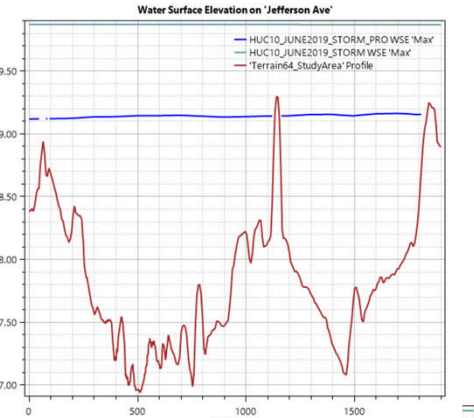
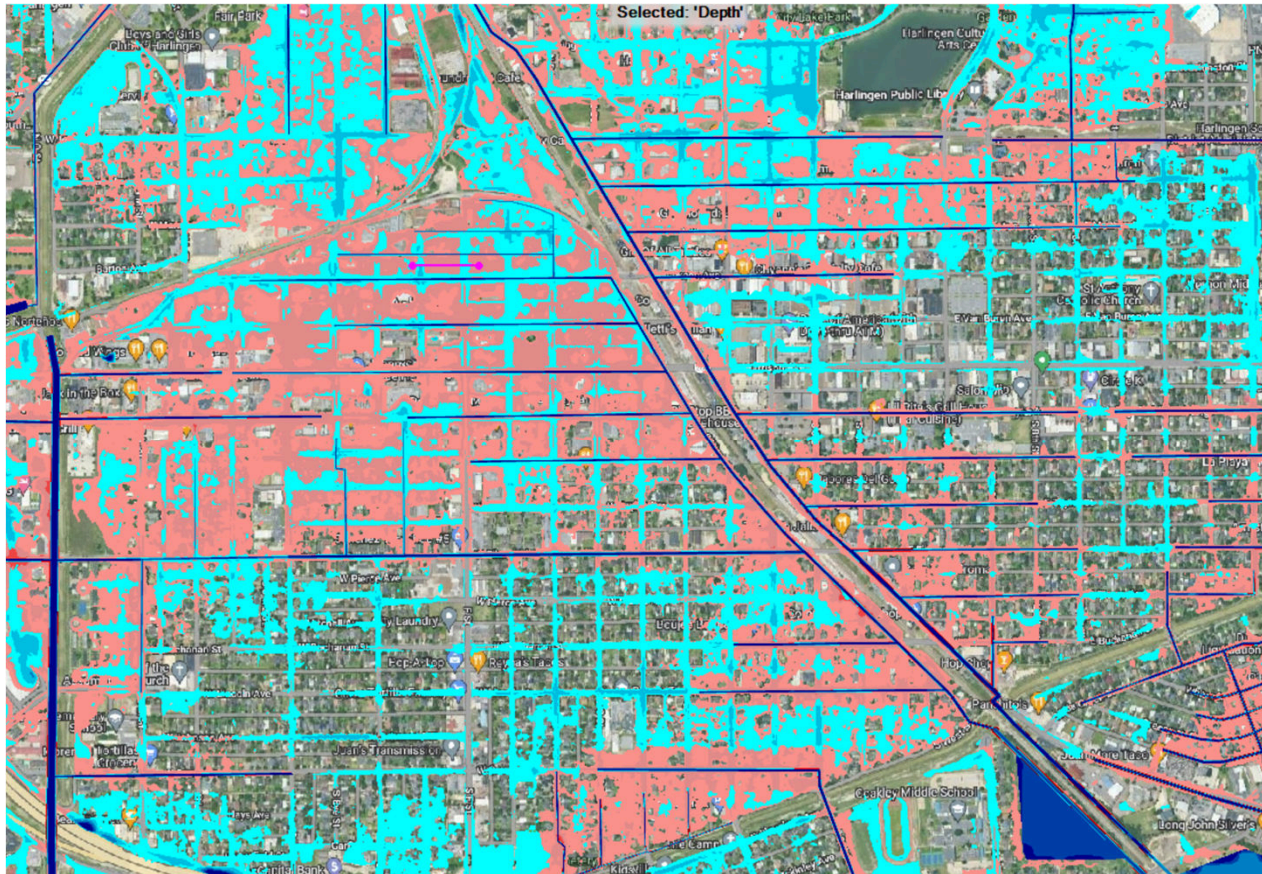
FLOOD INUNDATION DEPTH COMPARISON EXISTING VS. PROPOSED



Proposed



Existing



IMPROVEMENT MEASURES

- ✓ Large conveyance trunklines
- ✓ Improve street storm sewer/ inlet sizes
- ✓ Increased design frequency
- ✓ Channel Improvements
- ✓ Crossing Improvements
- ✓ Increase detention basin storage capacity within available city open land and acquisitions.
- ✓ Convert existing Irrigation Canal Right of Way for irrigation and drainage dual purpose.
- ✓ Restore Arroyo Colorado Design Capacity

ALTERNATIVES STRATEGIES

- ✓ Reduce runoff loading on North Main Drain by diversion and detention of flood water
- ✓ Construct large storm sewer systems along West Street and Commerce Street to provide a conveyance trunkline for Downtown area
- ✓ Improve drains and lateral channel systems including culvert crossings (ie. 32nd Street Drain)
- ✓ Construct new diversion channel north of North Main Drain
- ✓ Regional Flood Warning/Operational Policy

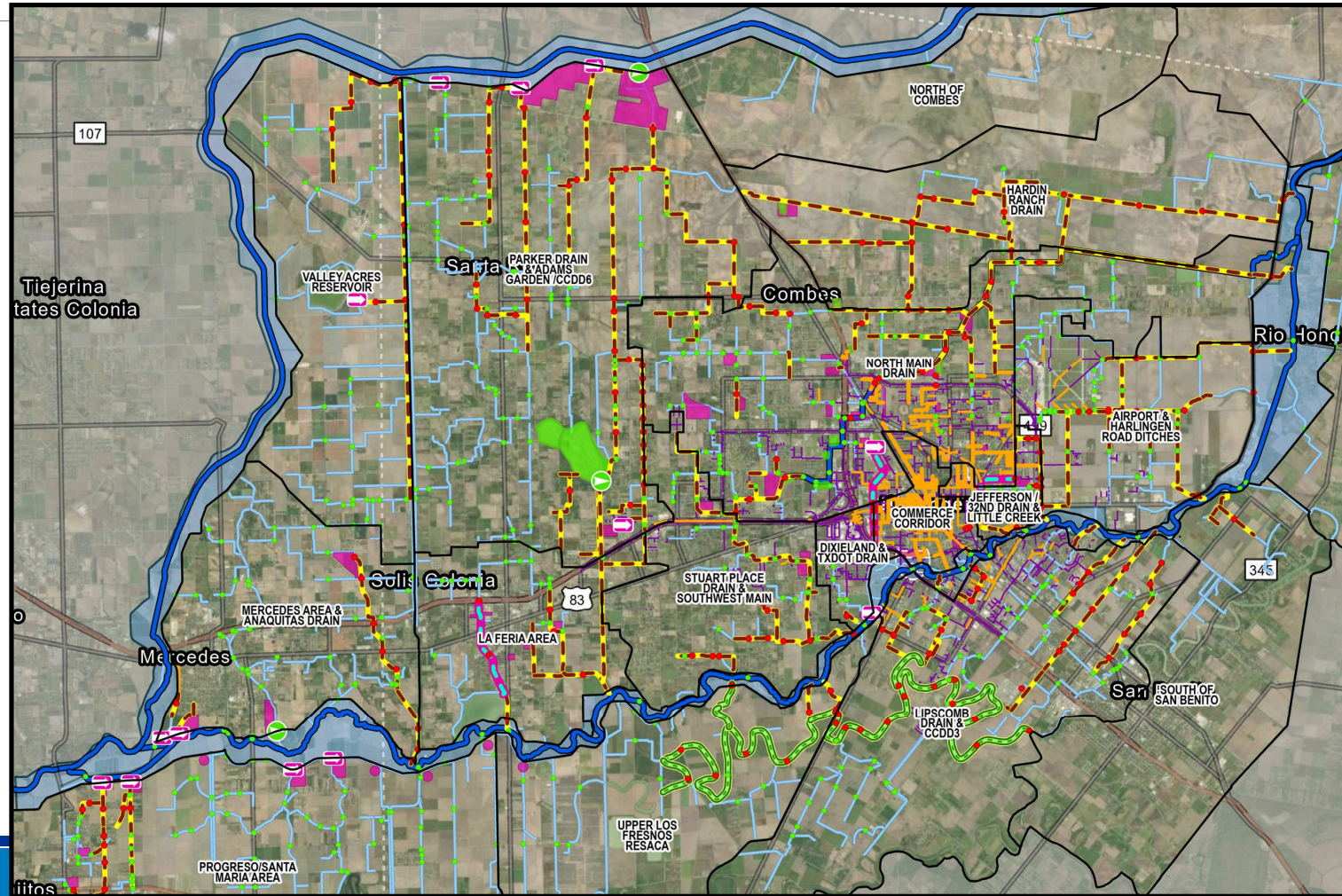
FLOOD MITIGATION STRATEGIES AND ALTERNATIVE MEASURES

SUBBASIN DIVISIONS

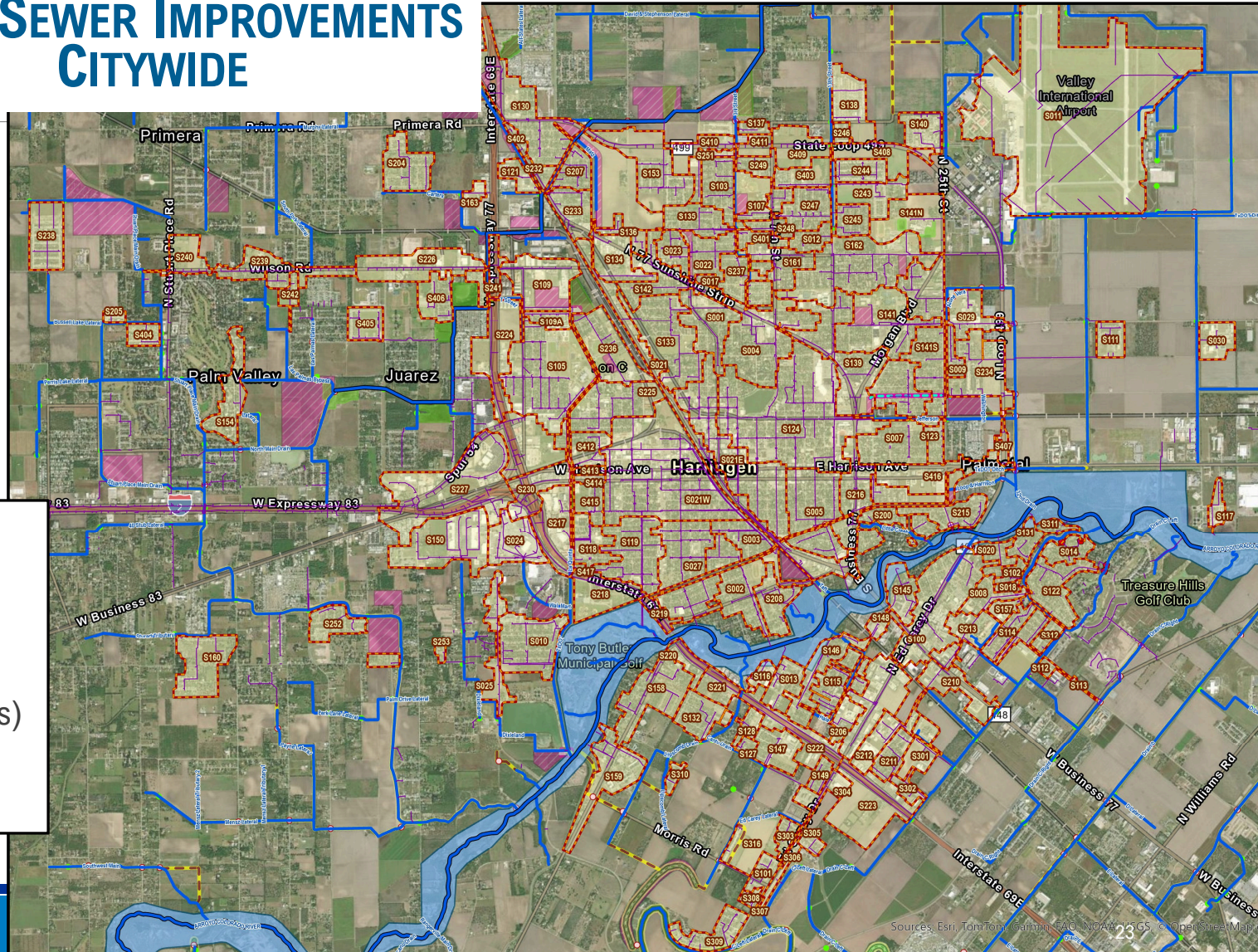
- ✓ 39 Subbasins
- ✓ Physical Constraints & Drainage Boundaries
- ✓ Area Interactions

SUBBASIN IMPROVEMENTS

- ✓ Channel Improvements
- ✓ Detention
- ✓ Pump Stations
- ✓ Canal Conversions
- ✓ Culvert Improvements
- ✓ Resaca Improvements



STORM SEWER IMPROVEMENTS CITYWIDE

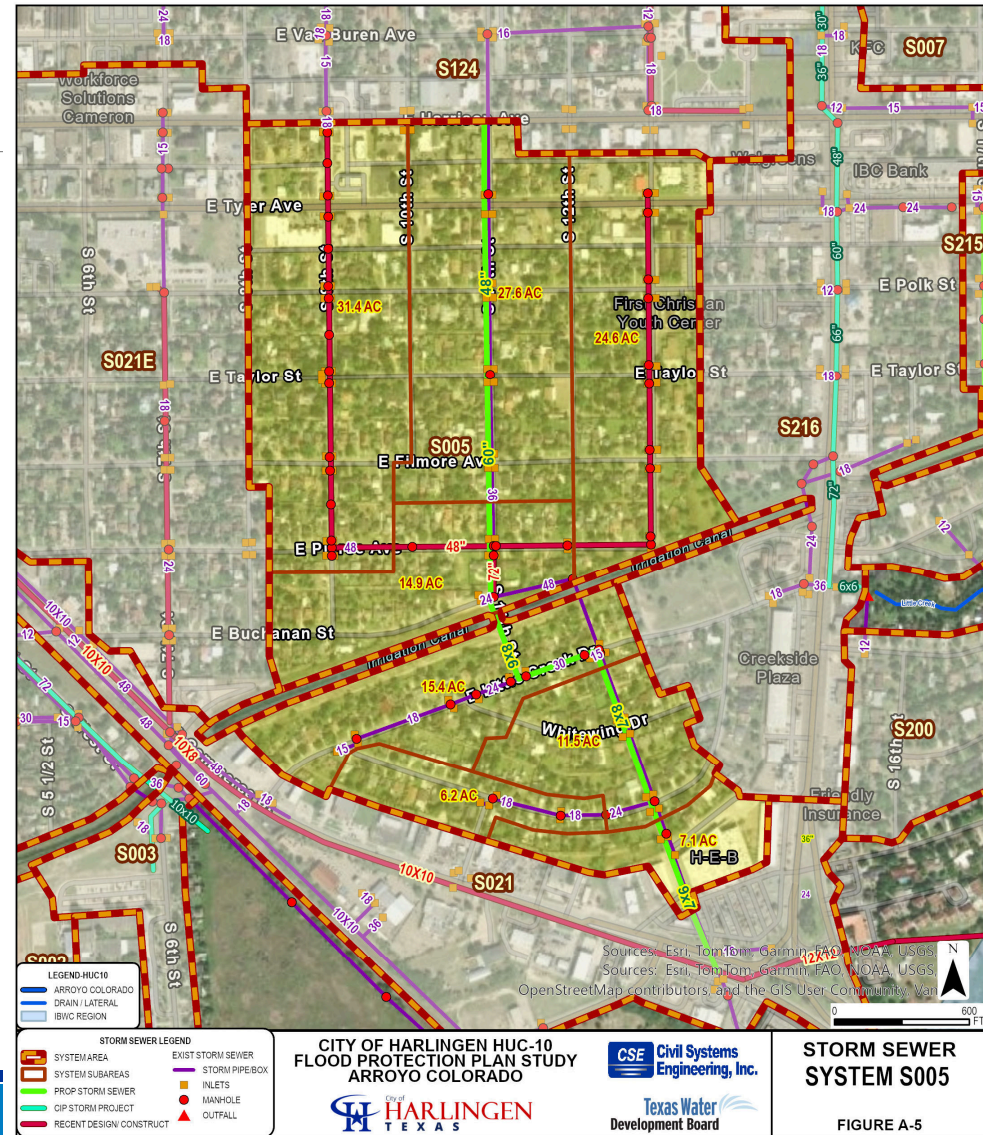
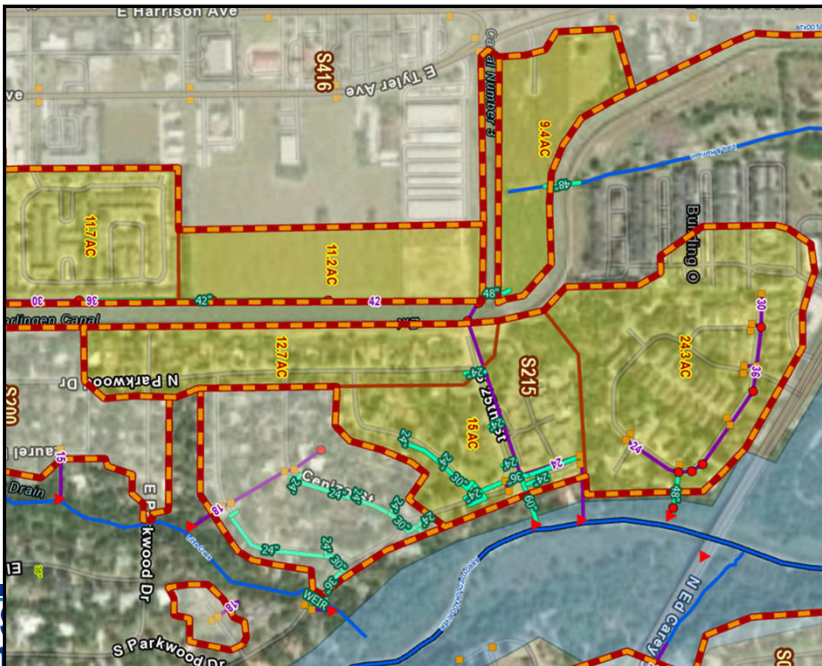


- STORM SEWER ANALYZE**
- ✓ 155 Systems
 - ✓ Maintain COH 2008 Naming
 - ✓ Added Systems
 - ✓ 50-Year Design (Major Corridors)
 - ✓ 25-Year Design
 - ✓ Min 24" RCP

STORM SEWER SYSTEM IMPROVEMENT

STORM SEWER SYSTEM

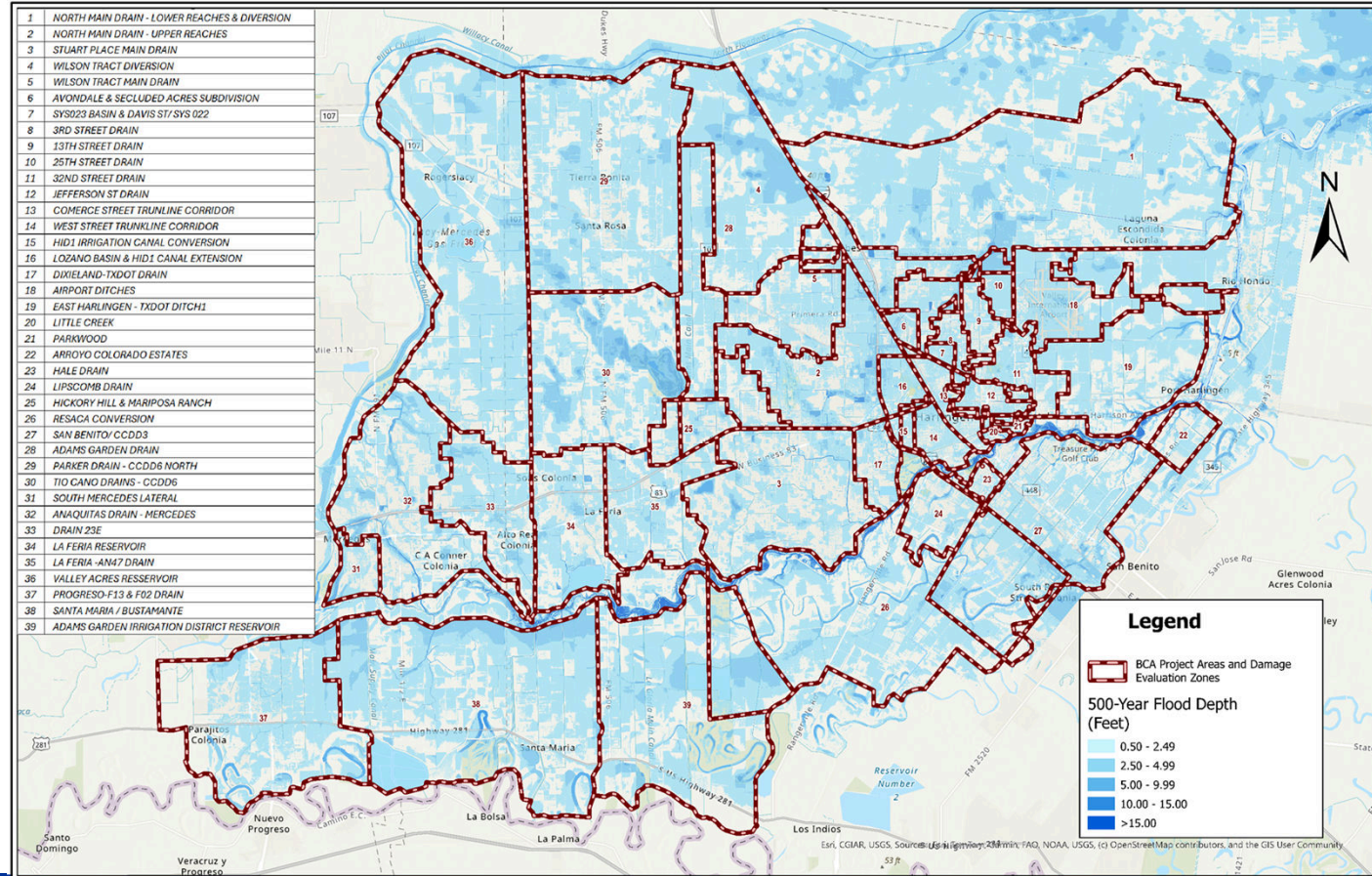
- ✓ Individual System Sheet
- ✓ Improvement Segments & Sizes
- ✓ Recently Design/ Constructed Segments
- ✓ Segments Included in Region CIP Project



BENEFIT COST ANALYSIS (BCA)

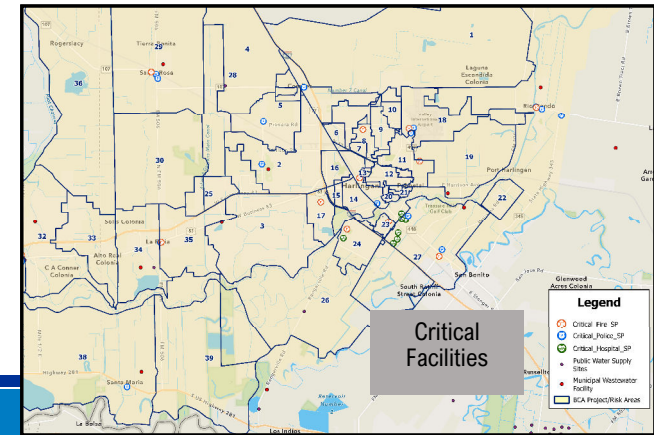
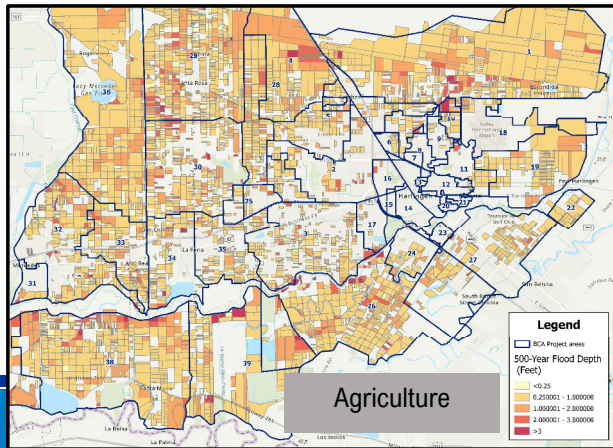
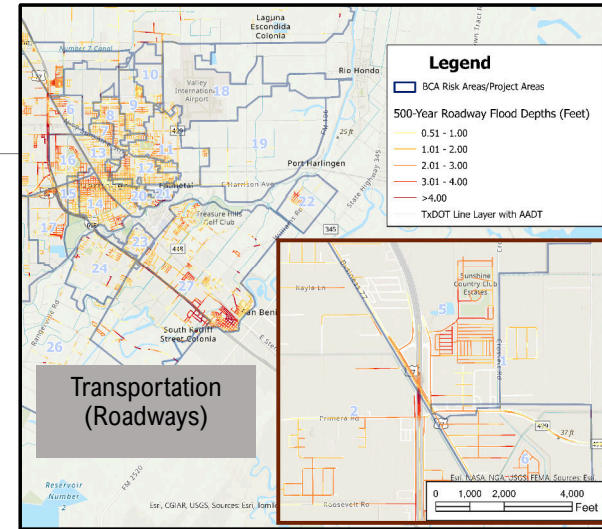
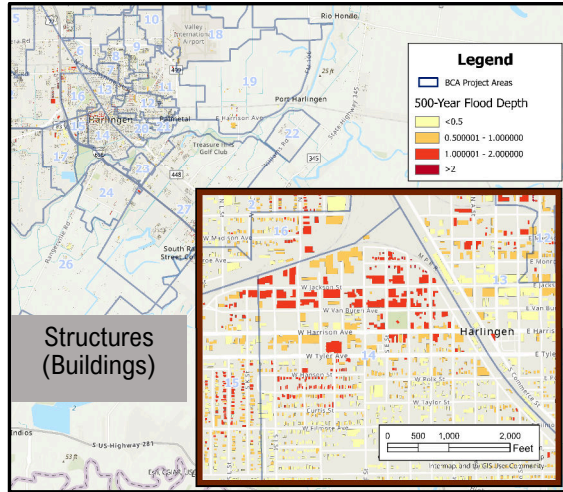
BCA Analysis

- ✓ TWDB BCA Input Workbook v1.3 (Nov 2024)
- ✓ Benefit-cost ratios using FEMA BCA Toolkit.
- ✓ 39 Subbasin Regions
- ✓ Smaller Individual Projects



BENEFIT COST ANALYSIS (BCA)

BCA Analysis
 ✓ Damages for Structures, Transportation, Critical Facilities, Agricultural.



NEW STREAM GAGE STATIONS FOR EARLY FLOOD WARNING

STREAM GAGES

- ✓ 5 New Gages Along Arroyo Colorado
- ✓ Installed by RATES
- ✓ Integration with LRGV Region Gage Monitoring System
- ✓ Provide Infrastructure for Future Regional Early Warning System

Harlingen 1

Location
26.12007, -97.96126

Stream Segment
The Arroyo Colorado River

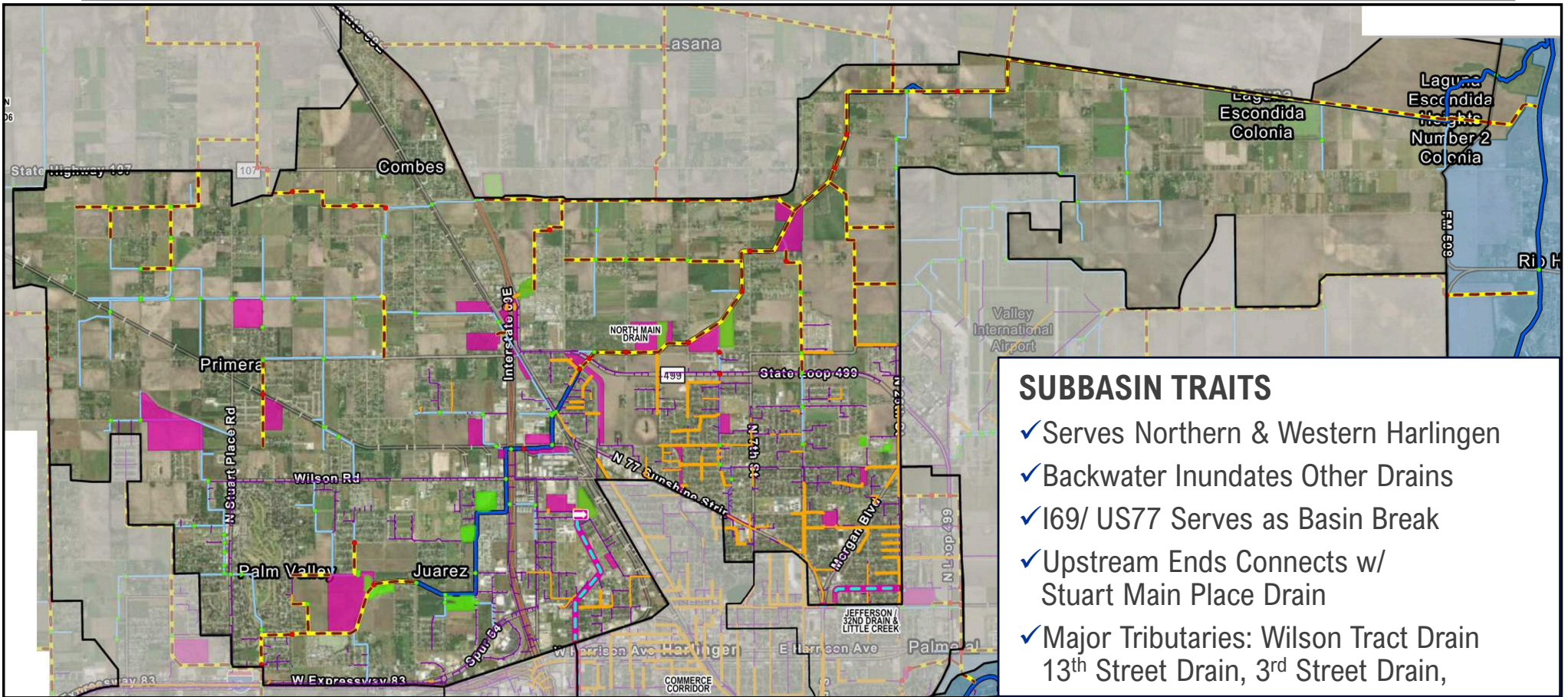
County
Hidalgo County

Proximate Road
FM 1015



SIGNIFICANT EXAMPLES CITY OF HARLINGEN

FLOOD MITIGATION PROJECTS NORTH MAIN DRAIN



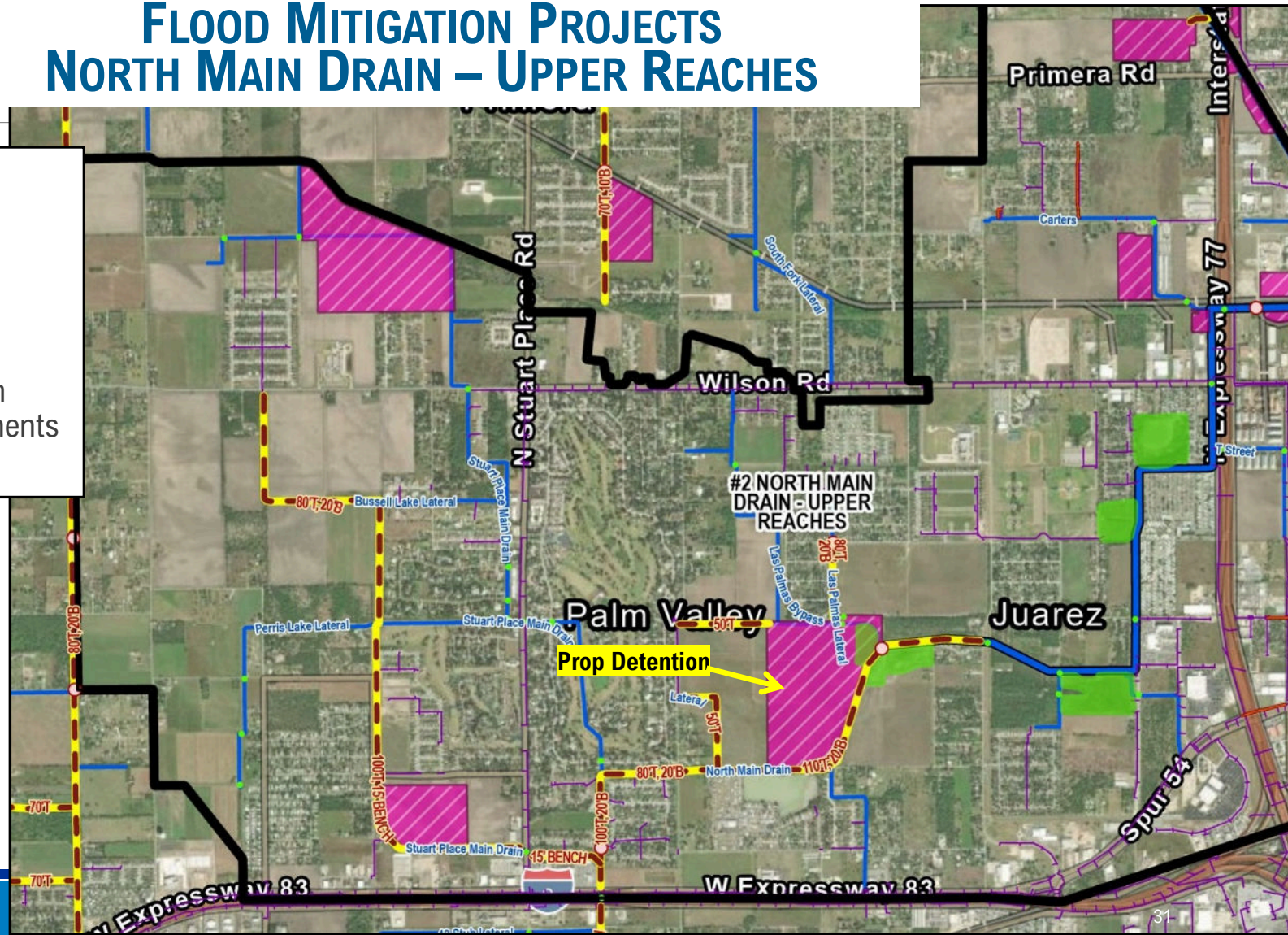
SUBBASIN TRAITS

- ✓ Serves Northern & Western Harlingen
- ✓ Backwater Inundates Other Drains
- ✓ I69/ US77 Serves as Basin Break
- ✓ Upstream Ends Connects w/ Stuart Main Place Drain
- ✓ Major Tributaries: Wilson Tract Drain
13th Street Drain, 3rd Street Drain,

FLOOD MITIGATION PROJECTS NORTH MAIN DRAIN – UPPER REACHES

SUBBASIN TRAITS

- ✓ Large Contributing Area
- ✓ Limited Channel Capacity
- ✓ Future Development
- ✓ Improvements:
Mainstem Detention Basin
Lateral Channel Improvements
Lateral Detention Basins



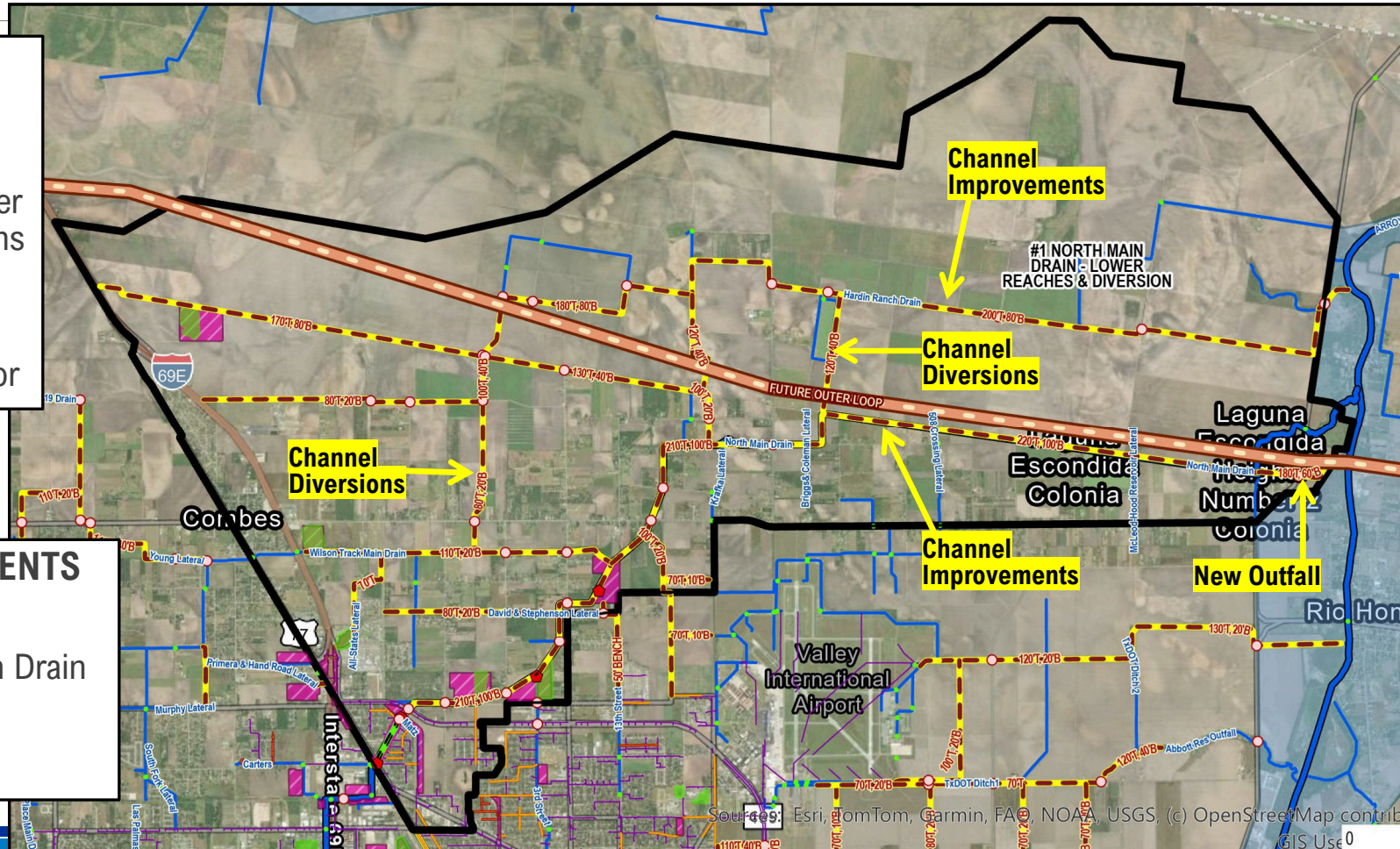
FLOOD MITIGATION PROJECTS NORTH MAIN DRAIN - LOWER REACHES

SUBBASIN TRAITS

- ✓ Receives Drainage from North Harlingen
- ✓ High Tailwater & Backwater Effects onto Other Systems & Drains
- ✓ Future Development
- ✓ Future Outer Loop Corridor

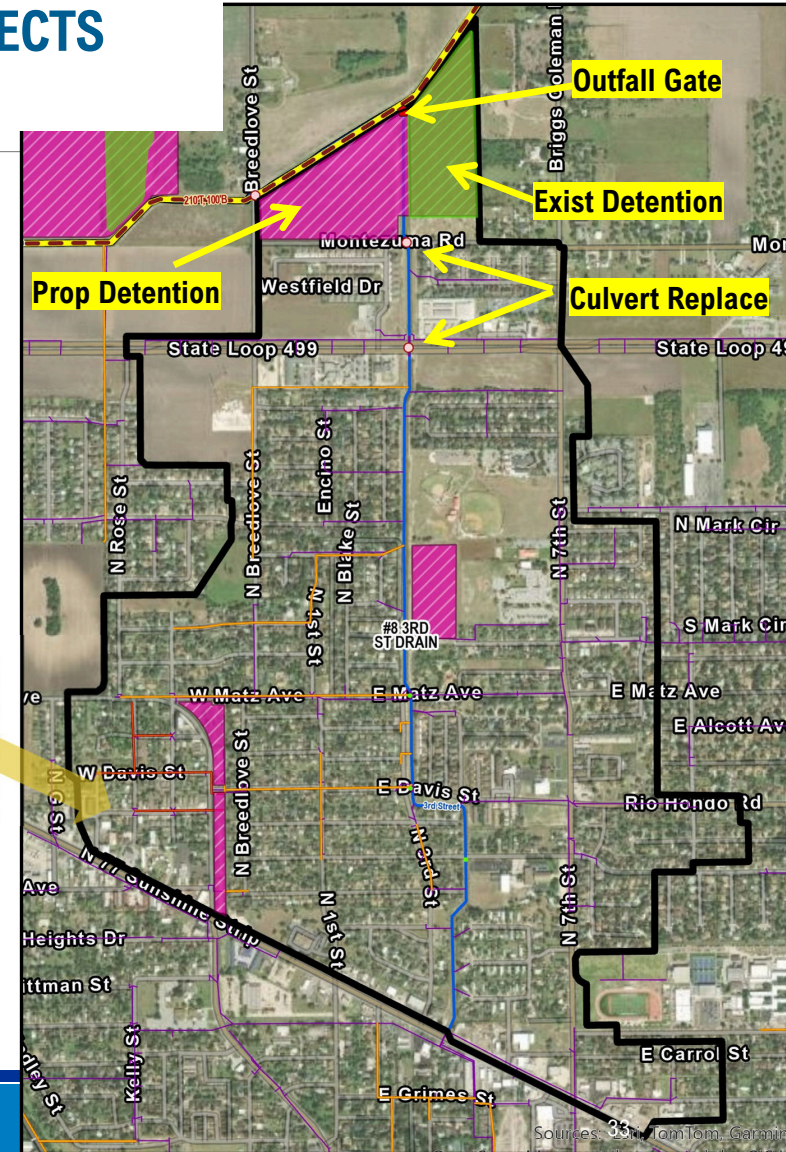
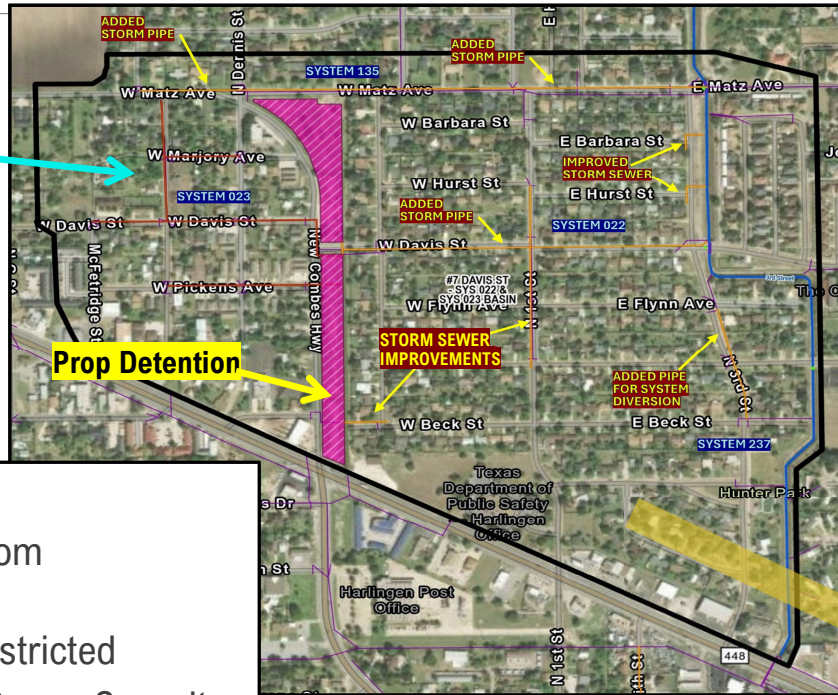
SIGNIFICANT IMPROVEMENTS

- ✓ Channel Improvements
- ✓ Diversion to Hardin Ranch Drain
- ✓ Lateral Basins
- ✓ New Outfall



FLOOD MITIGATION PROJECTS 3RD STREET DRAIN

SYS 023 Recently Constructed



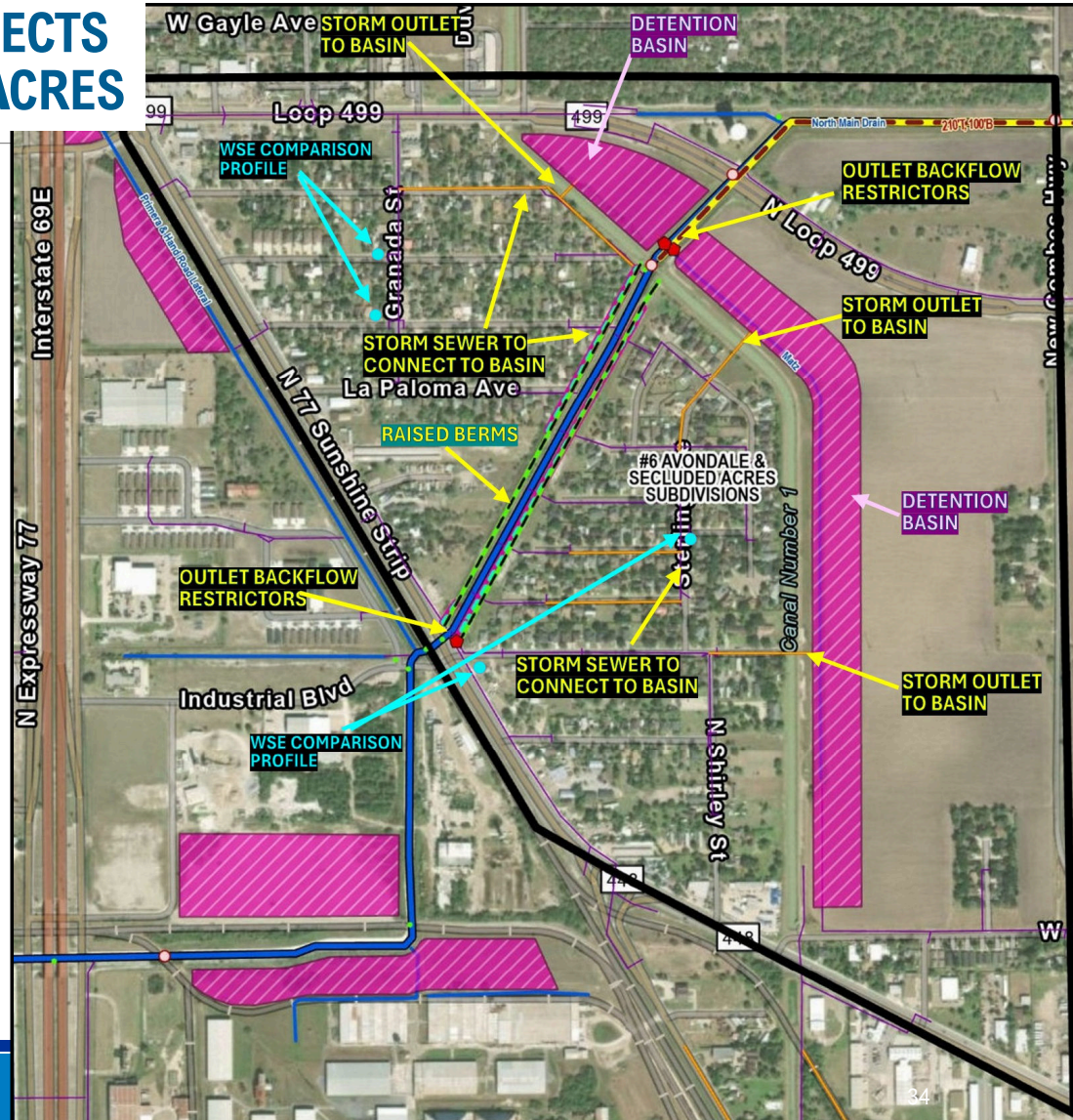
SUBBASIN TRAITS

- ✓ Backwater Inundation from North Main Drain
- ✓ Upstream Channel is Restricted
- ✓ Limited Internal Storm Sewer Capacity
- ✓ Improvements:
Backflow Protection from NMD
D/S Detention Basin
Sys 023 Basin & Sys 022 Storm Sewer

FLOOD MITIGATION PROJECTS AVONDALE & SECLUDED ACRES

SUBBASIN TRAITS

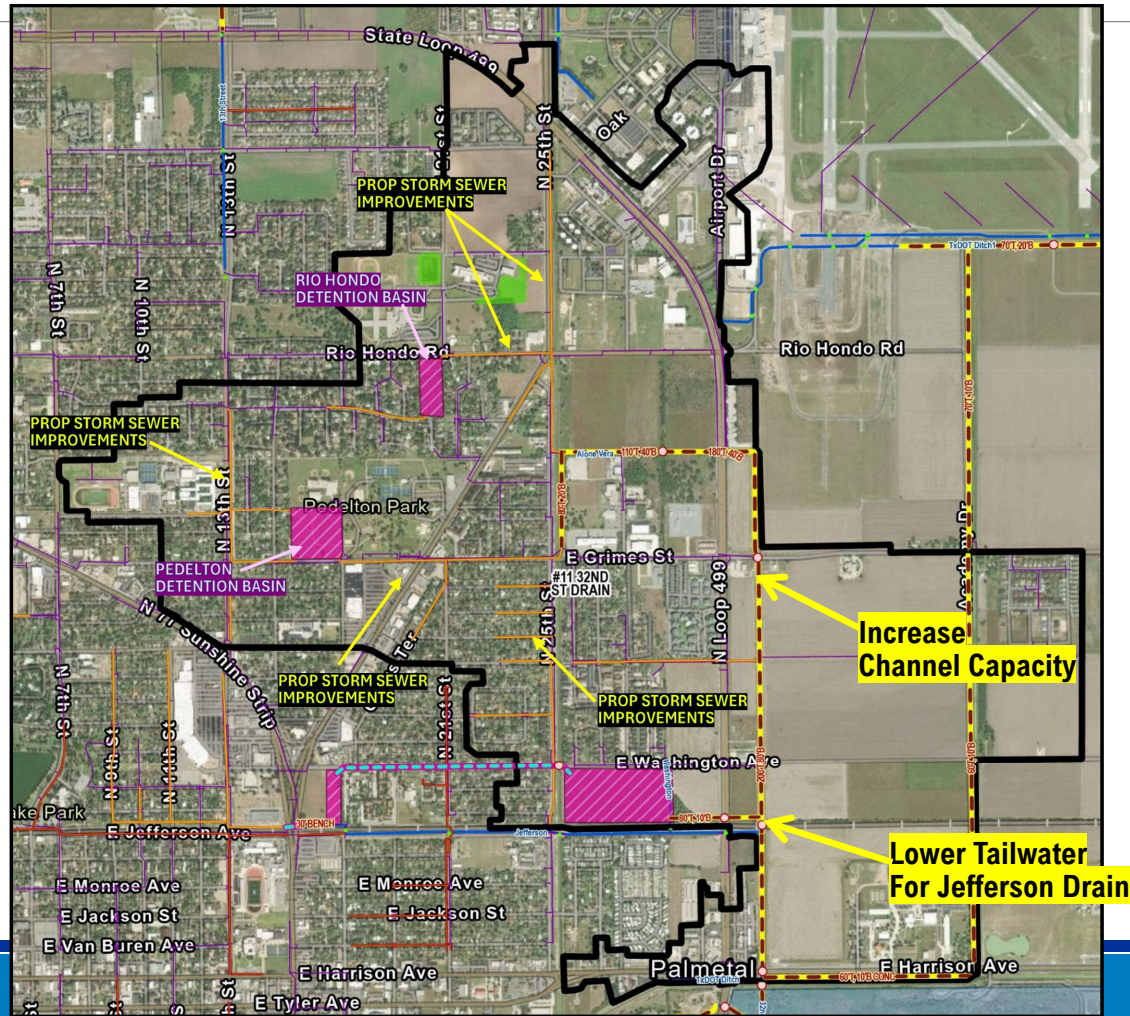
- ✓ Backwater Inundation from North Main Drain
- ✓ Upstream Channel is Restricted
- ✓ Limited Internal Storm Sewer Capacity
- ✓ Improvements:
Backflow Protection from NMD
D/S Detention Basin
Sys 023 Basin & Sys 022 Storm Sewer



FLOOD MITIGATION PROJECTS 32ND STREET DRAIN

SUBBASIN TRAITS

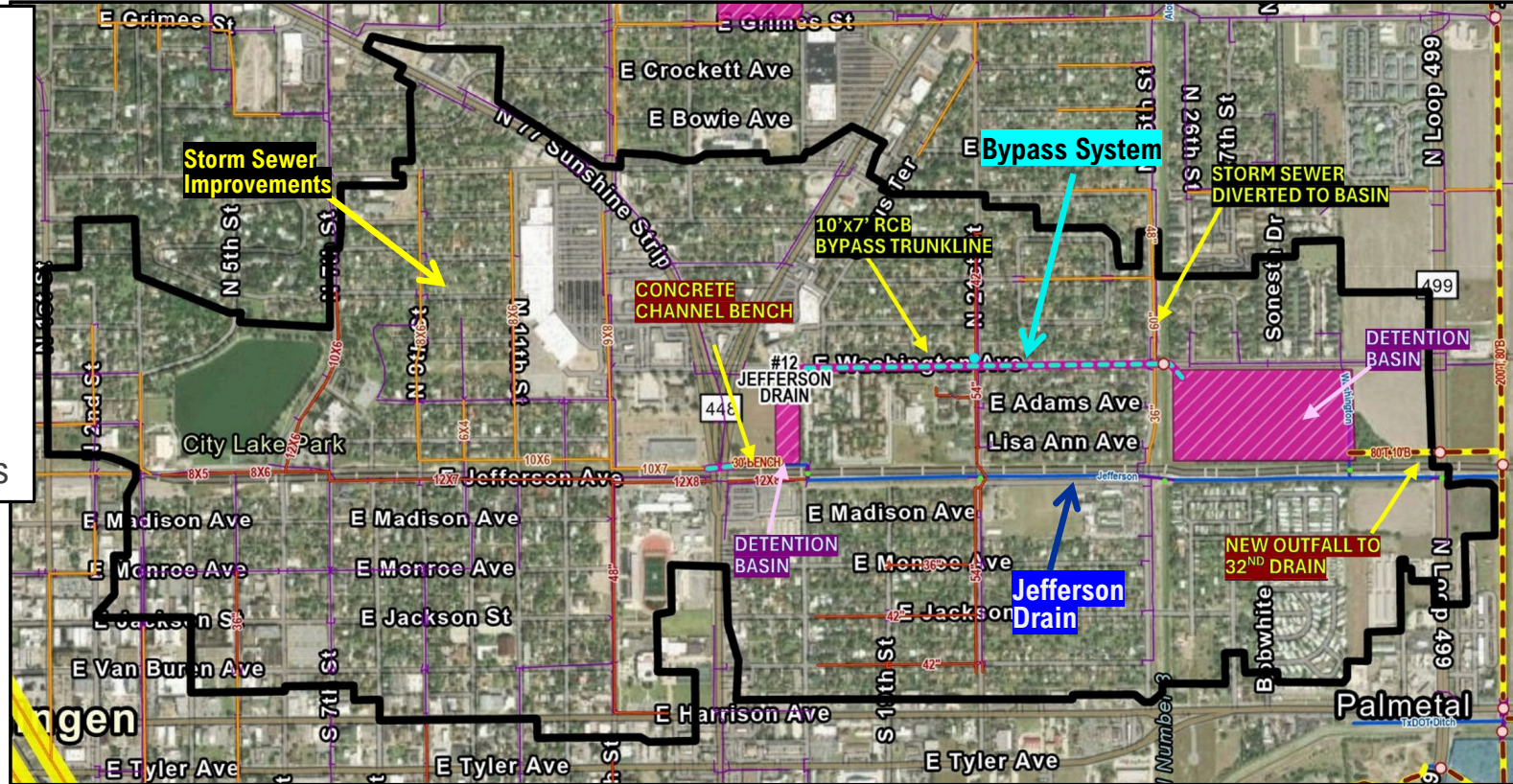
- ✓ Drainage Outfall for Eastern Harlingen
- ✓ Future Development Area
- ✓ Outfall for Jefferson Drain
- ✓ Improvements:
Channel Improvements
Storm Sewer Improvements
Interior Detention Basins



FLOOD MITIGATION PROJECTS JEFFERSON STREET DRAIN

SUBBASIN TRAITS

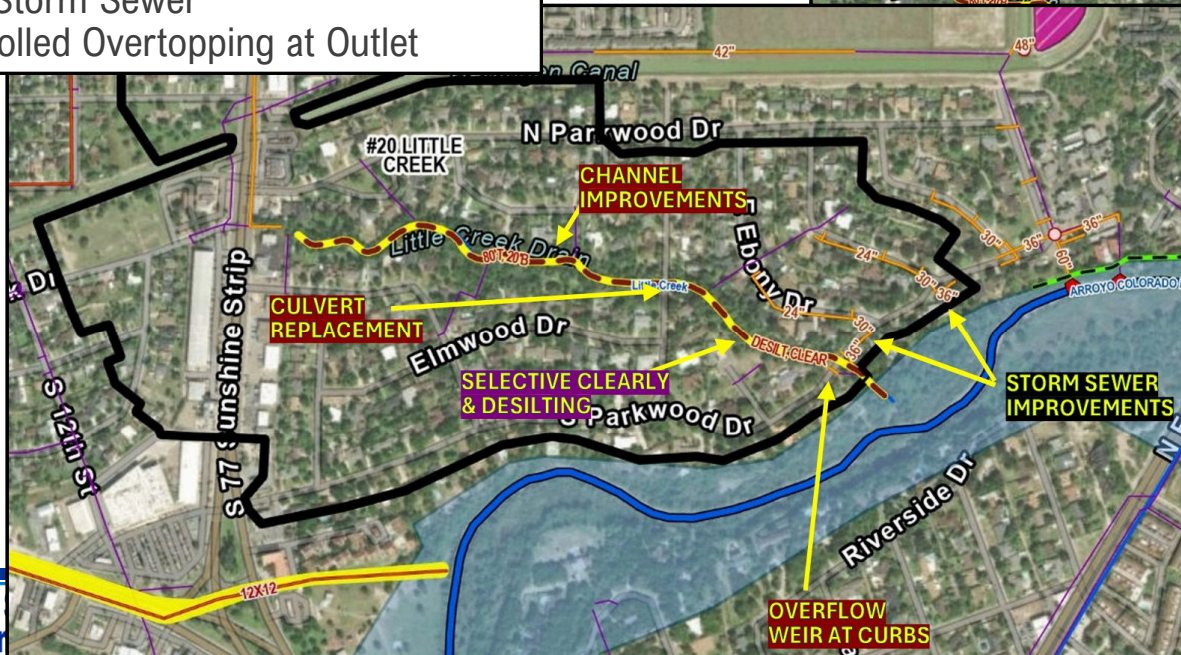
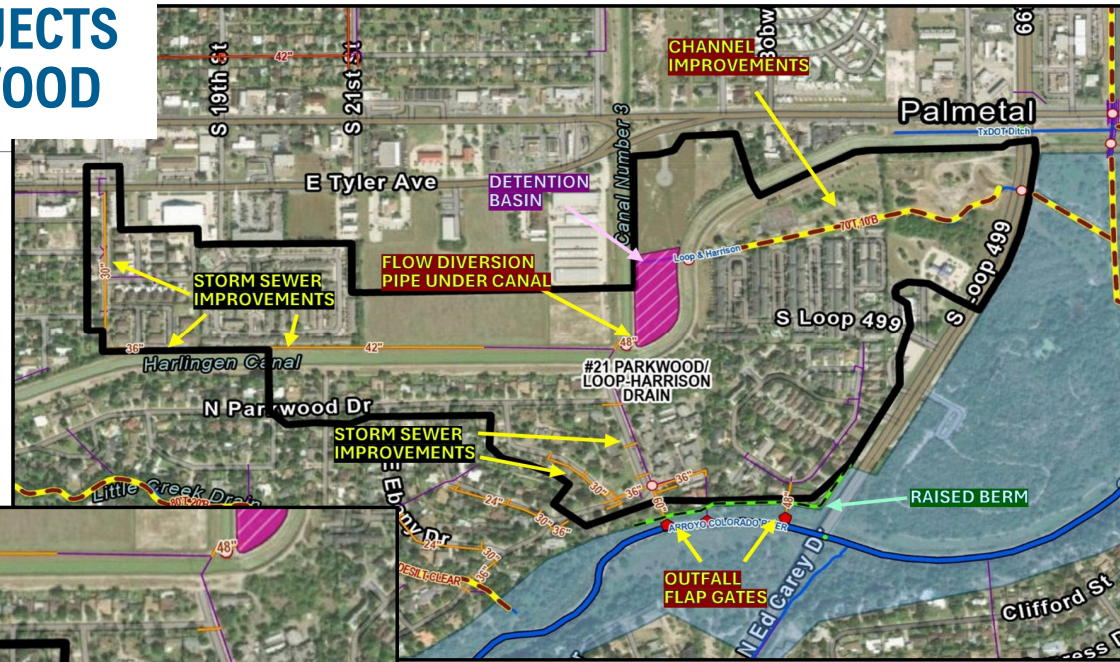
- ✓ Central Harlingen Drainage
- ✓ Full Development
- ✓ Restrictive Capacity
- ✓ Restrictive ROW
- ✓ Improvements:
Bypass Systems
Detention Basins
Secondary Outfall
Storm Sewer Improvements



FLOOD MITIGATION PROJECTS LITTLE CREEK & PARKWOOD

SUBBASIN TRAITS

- ✓ Creek Limited Capacity & Restrictions
- ✓ Arroyo Colorado Backwater
- ✓ Improvements:
 - Selective Clearly & Desilting
 - Crossing Improvements
 - New Storm Sewer
 - Controlled Overtopping at Outlet



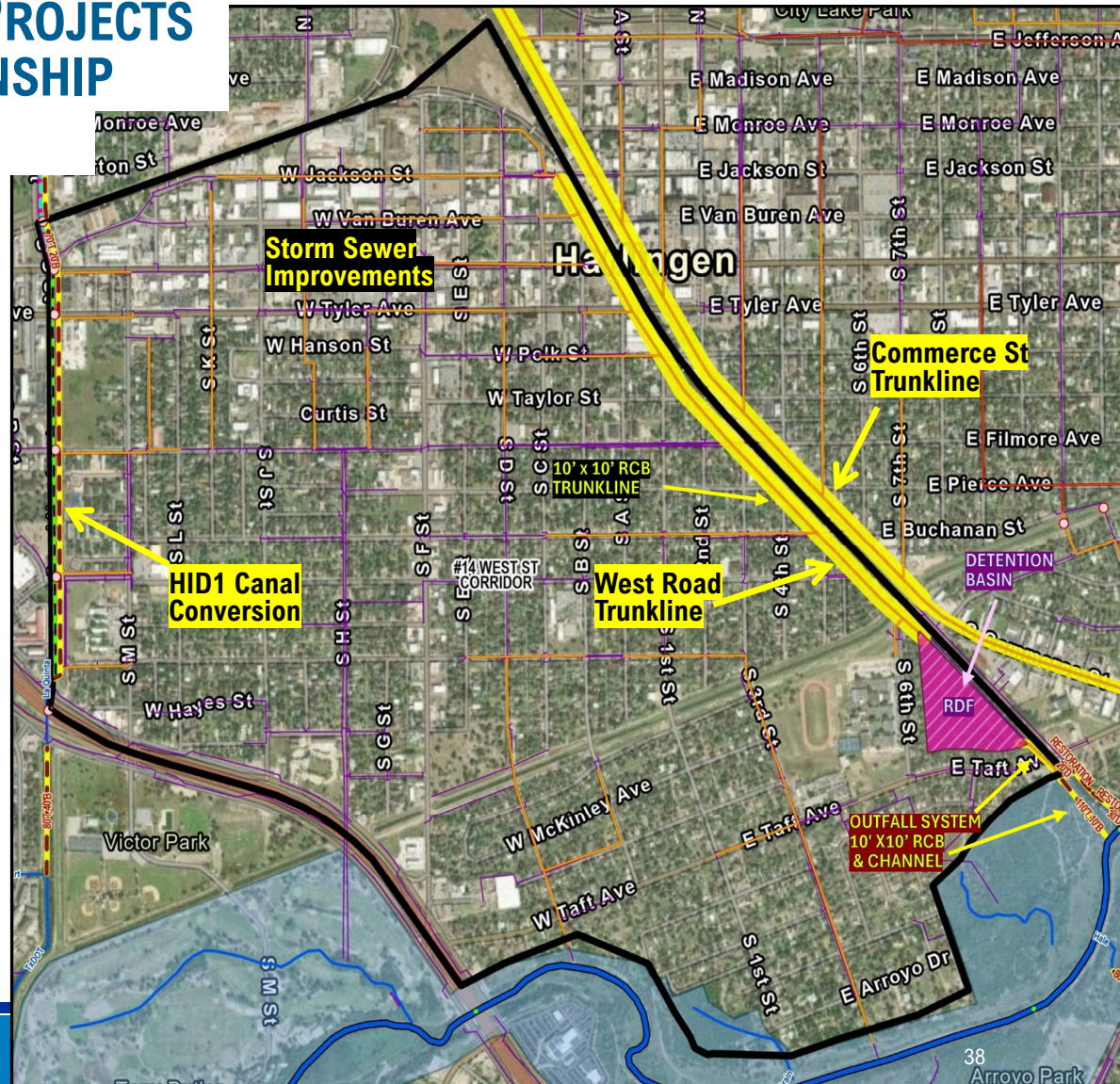
SUBBASIN TRAITS

- ✓ Arroyo Colorado Backwater
- ✓ Limited Storm Sewer Capacity
- ✓ No Overland Outfall
- ✓ Improvements:
 - Backflow Preventers
 - Berm Protection
 - Flow Diversion
 - Detention

FLOOD MITIGATION PROJECTS HARLINGEN TOWNSHIP WEST ROAD

SUBBASIN TRAITS

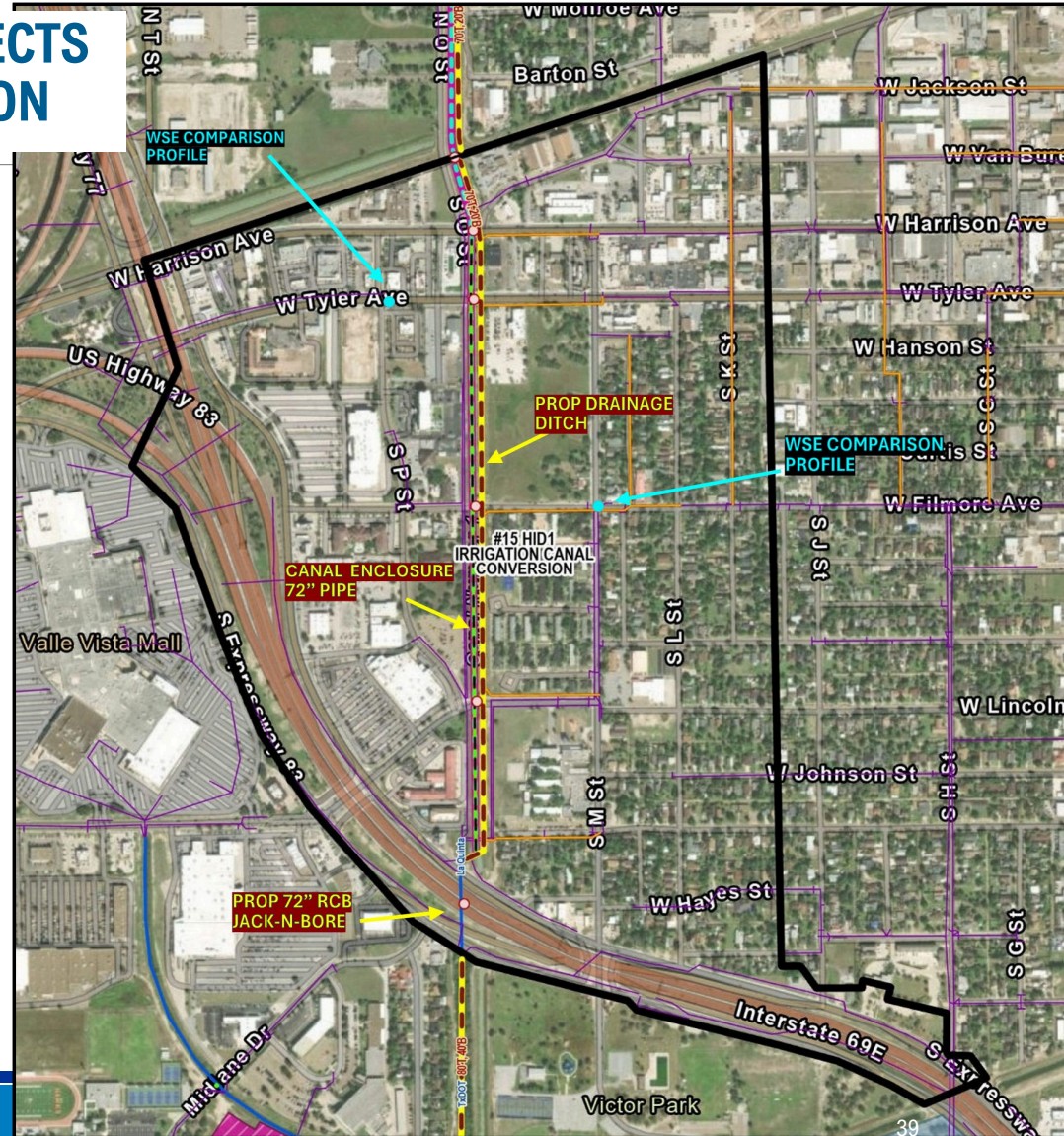
- ✓ Limited Outfall Capacity – Into Commerce St. System
- ✓ Topographic Bowl along Jackson, Van Buren, Harrison
- ✓ Improvements:
Outfall Trunkline along West Road
Outfall to Arroyo Colorado
Storm Sewer Improvements



FLOOD MITIGATION PROJECTS HID1 CANAL CONVERSION

SUBBASIN TRAITS

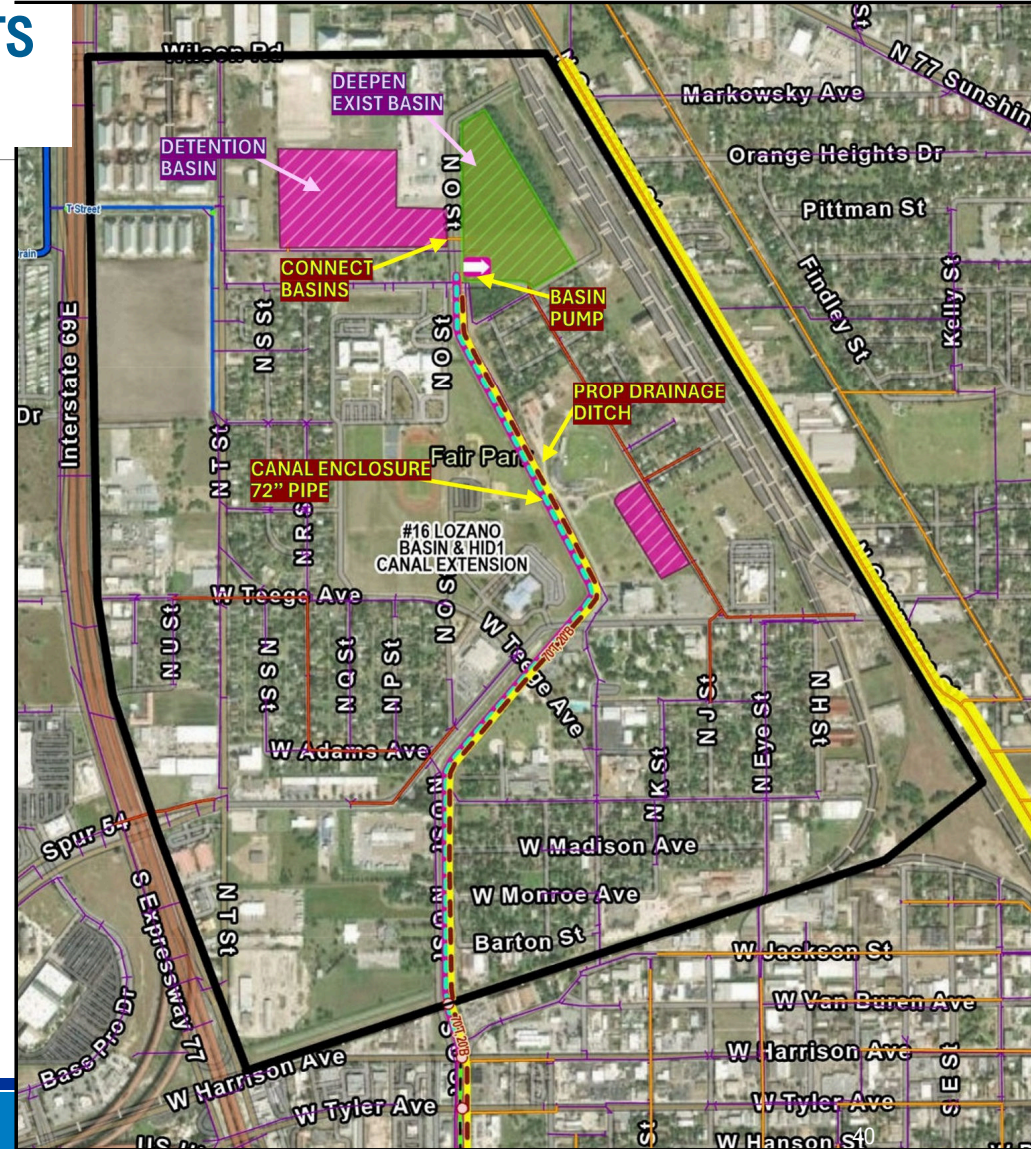
- ✓ Limited Outfall Capacity
- ✓ Topographic Bowl along Jackson, Van Buren, Harrison
- ✓ Improvements:
New Outfall to TxDOT Drain
Provide Added Conveyance
Storm Sewer Improvements



FLOOD MITIGATION PROJECTS LOZANO BASIN EXPANSION

SUBBASIN TRAITS

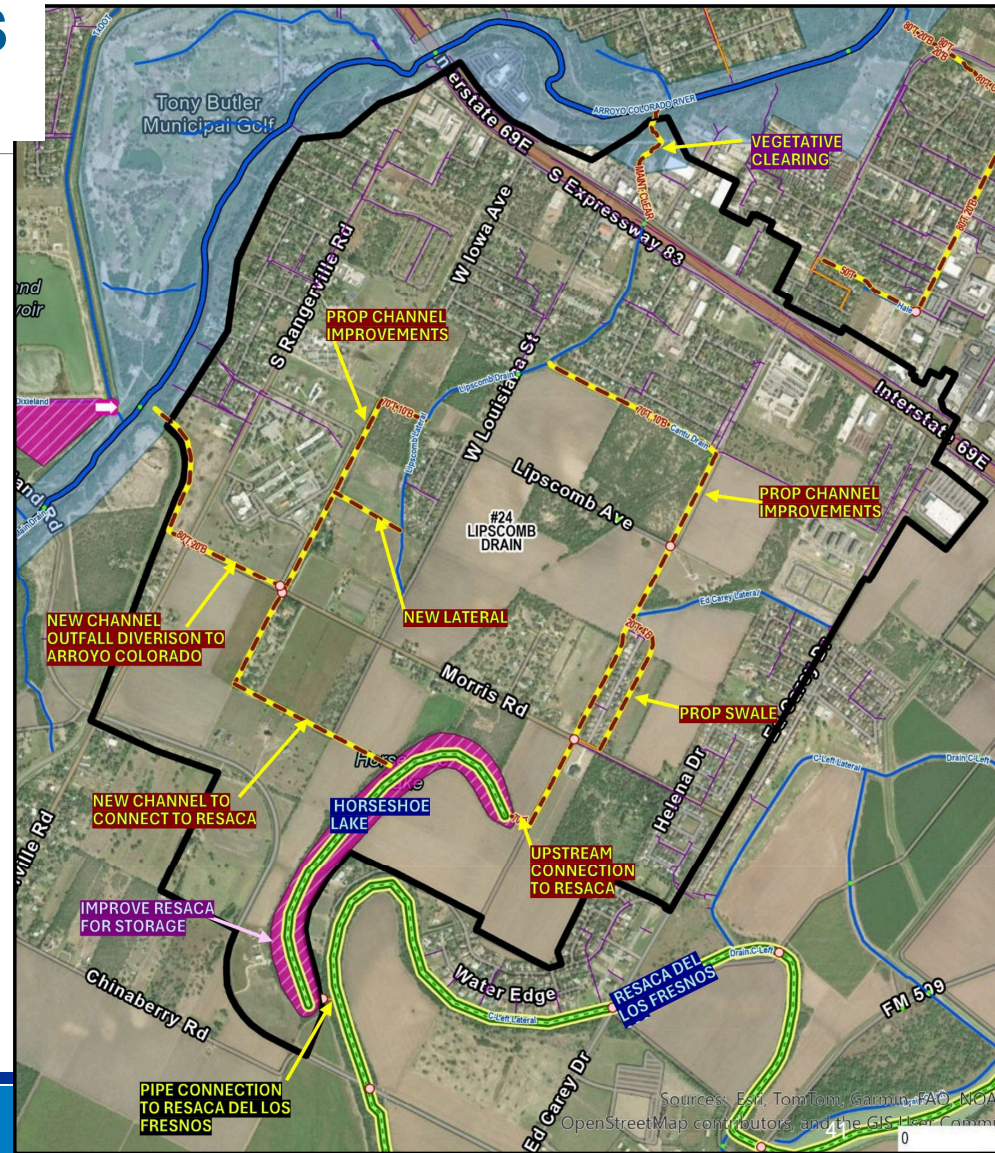
- ✓ Restrictive Outfall
- ✓ Limited Storm Sewer Capacity
- ✓ North Main Drain Backwater
- ✓ Improvements:
 - Expand/ Depend Exist Lozano Basin
 - Extend HID1 Canal Conversion Channel
 - Pump Basin to Channel
 - Storm Sewer Improvements



FLOOD MITIGATION PROJECTS LISCOMB DRAIN

SUBBASIN TRAITS

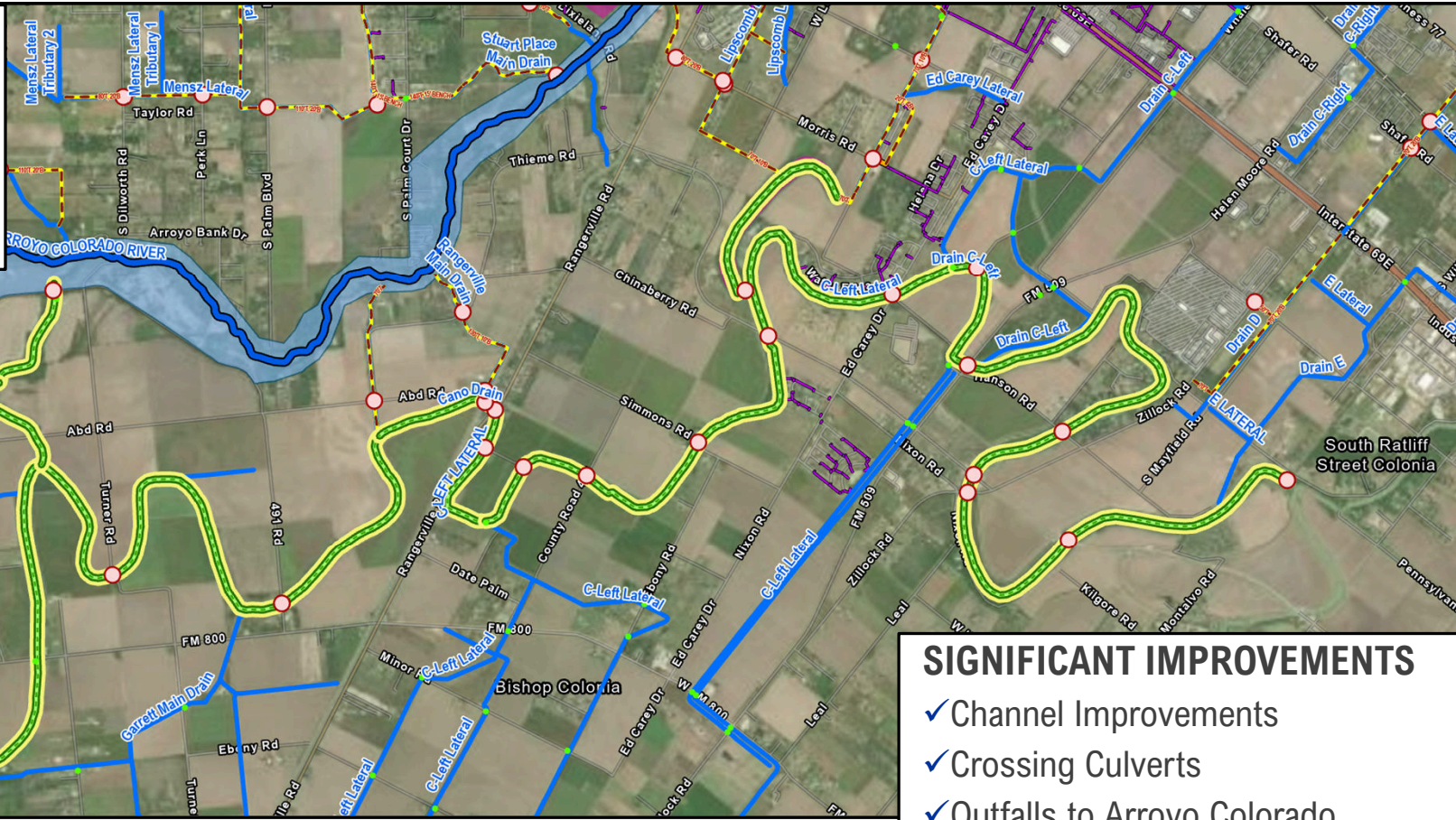
- ✓ Limited Channel Capacity / Depth
- ✓ Increase Development
- ✓ Improvements:
 - Channel Improvements
 - New Laterals
 - New Channel to Resaca Area
 - Storage in Resaca Area (Horseshoe Lake)
 - New Channel Outfall to Arroyo Colorado



FLOOD MITIGATION PROJECTS RESACA CONVERSION

RESACA TRAITS

- ✓ Conveyance Capacity
- ✓ Outfall Depths
- ✓ Detention Storage
- ✓ Future Development



- ### SIGNIFICANT IMPROVEMENTS
- ✓ Channel Improvements
 - ✓ Crossing Culverts
 - ✓ Outfalls to Arroyo Colorado

Questions?