

VOLUME 2
Appendix 5-E

REGION 5 NECHES 2023 REGIONAL FLOOD PLAN

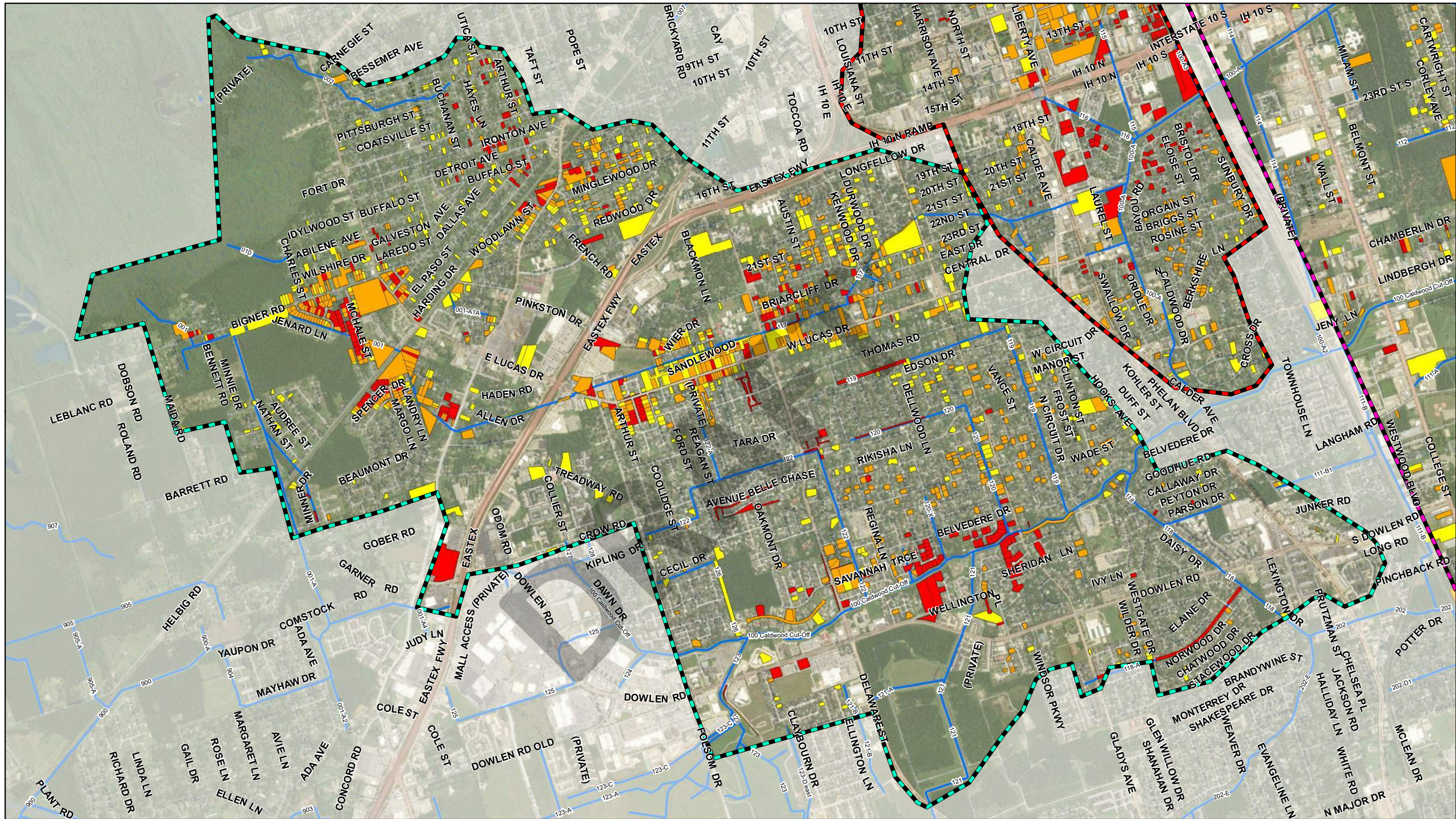
JULY 2023

DRAFT

PREPARED FOR THE
REGION 5 NECHES FLOOD PLANNING GROUP

DRAFT

**APPENDIX 5-E
SUPPORTING DOCUMENTATION FOR RECOMMENDED FLOOD MITIGATION
PROJECTS**



Location Map



LAN Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY

Legend

Project Areas of Influence

- Basins 3-10
- Blanchette Diversion & Basin 1
- Lucas Diversion
- South Park Diversion & Basin 2
- Tevis Diversion

Open Channels

- DD6 Channel
- Non-DD6 Channel

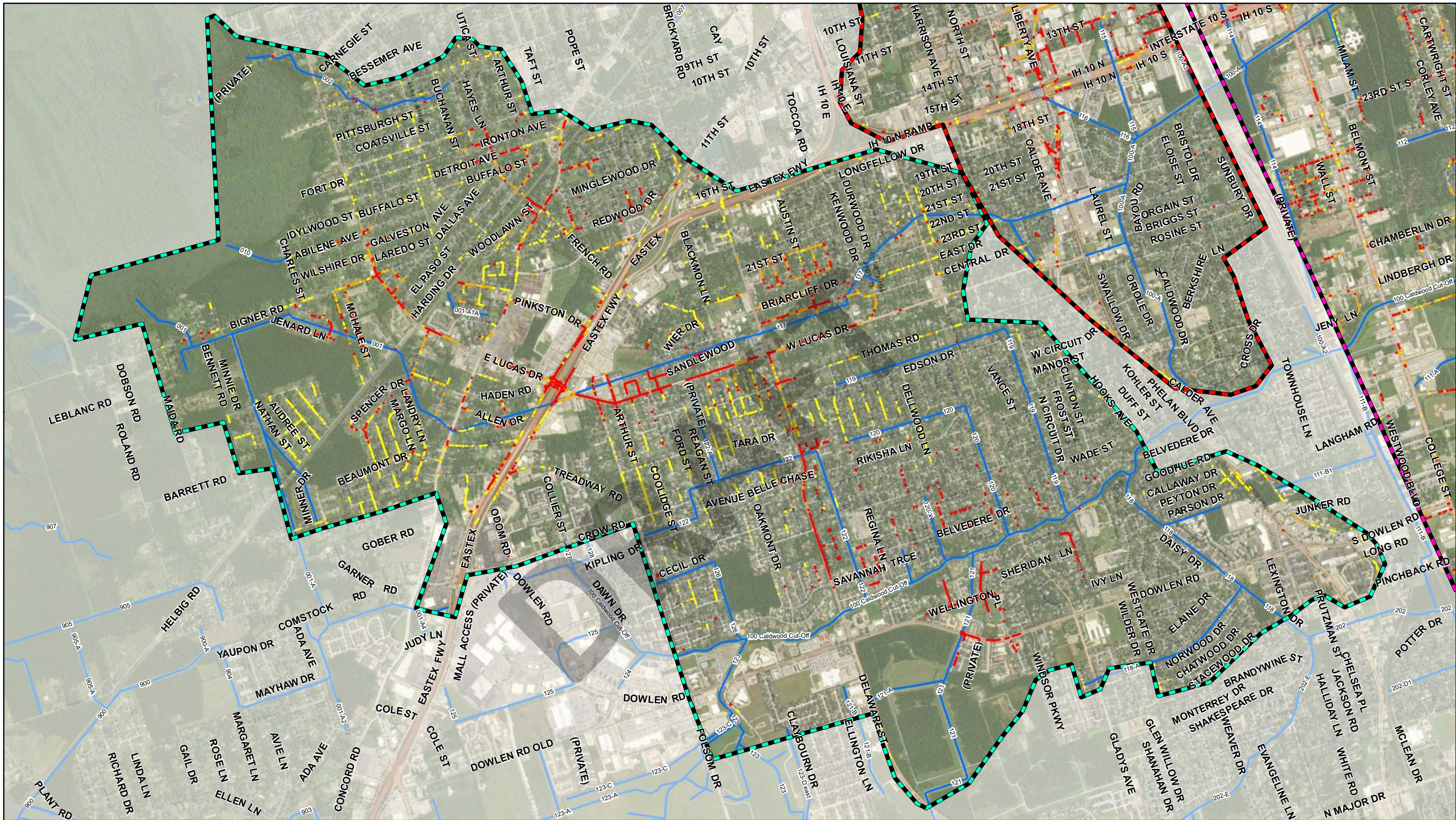
Parcels Removed from Floodplain

- 10-Year
- 100-Year
- 500-Year

**Parcels Removed from Floodplain
Lucas Diversion**



Exhibit # 72



Location Map



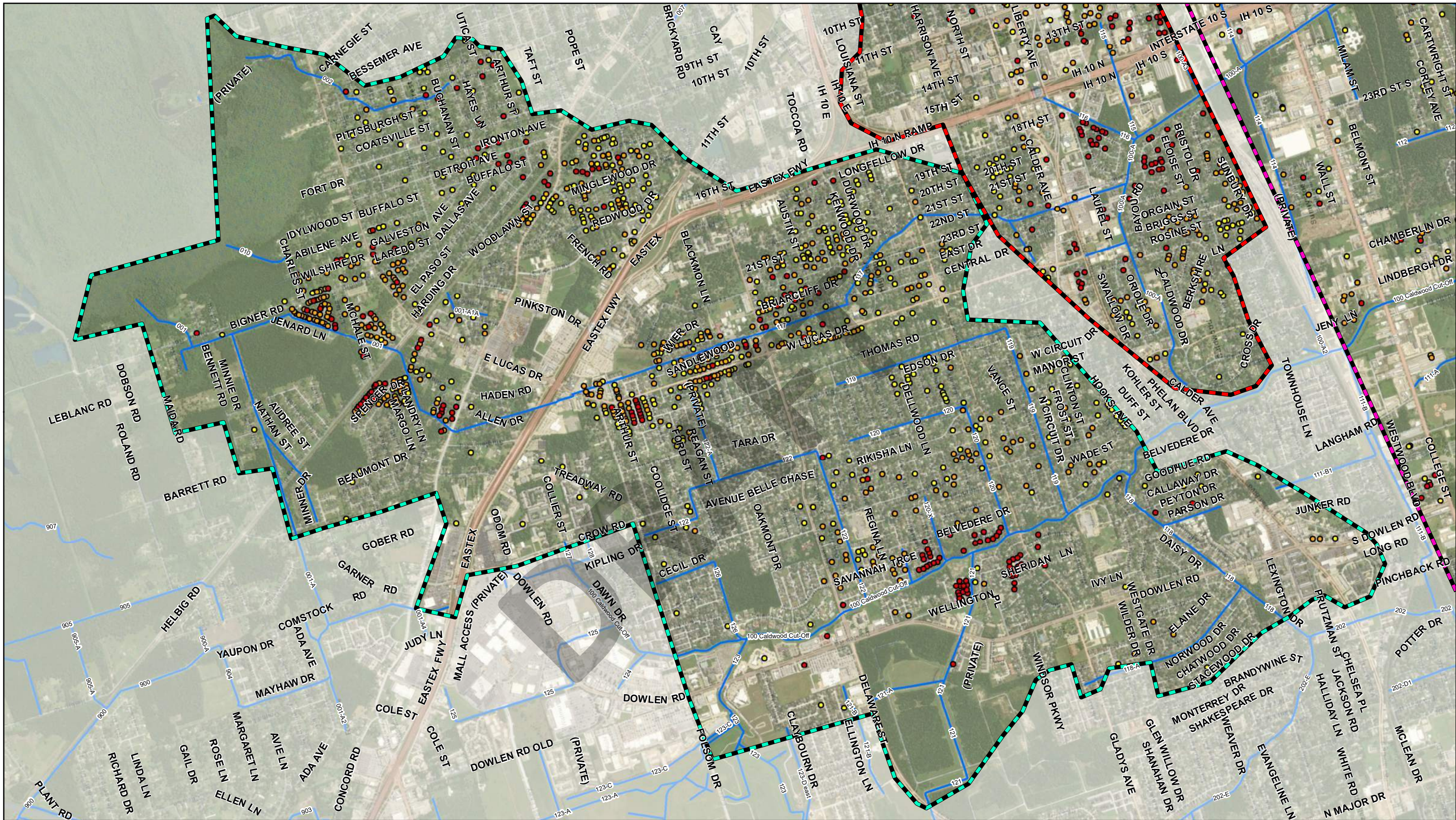
LAN Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY

- Project Areas of Influence**
- Basins 3-10
 - Blanchette Diversion & Basin 1
 - Lucas Diversion
 - South Park Diversion & Basin 2
 - Tevis Diversion

- Legend**
- Roadway Removed from Floodplain**
- 10-Year
 - 100-Year
 - 500-Year
- Open Channels**
- DD6 Channel
 - Non-DD6 Channel

Roadway Removed from Floodplain Lucas Diversion





Location Map



LAN Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY

Project Areas of Influence

- Basins 3-10
- Blanchette Diversion & Basin 1
- Lucas Diversion
- South Park Diversion & Basin 2
- Tevis Diversion

Legend

Structures Removed from Flooding

- 10-Year
- 100-Year
- 500-Year

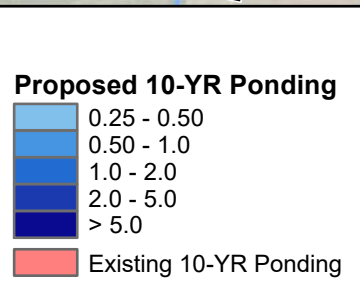
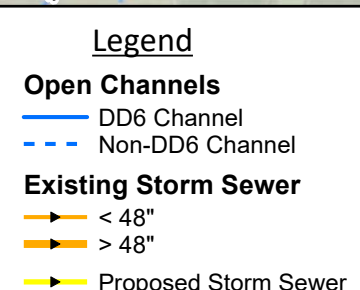
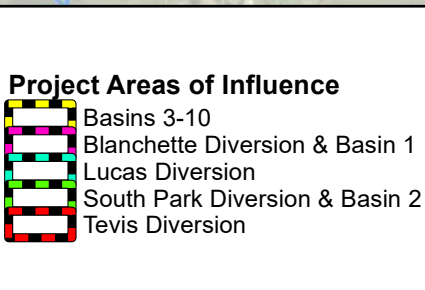
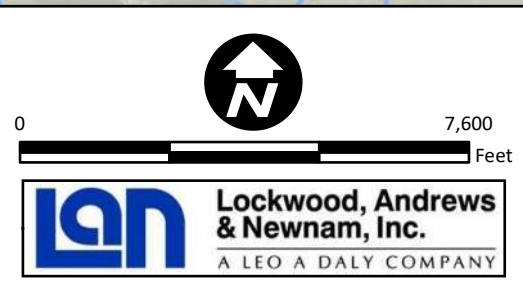
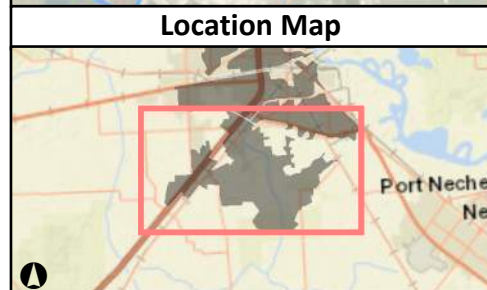
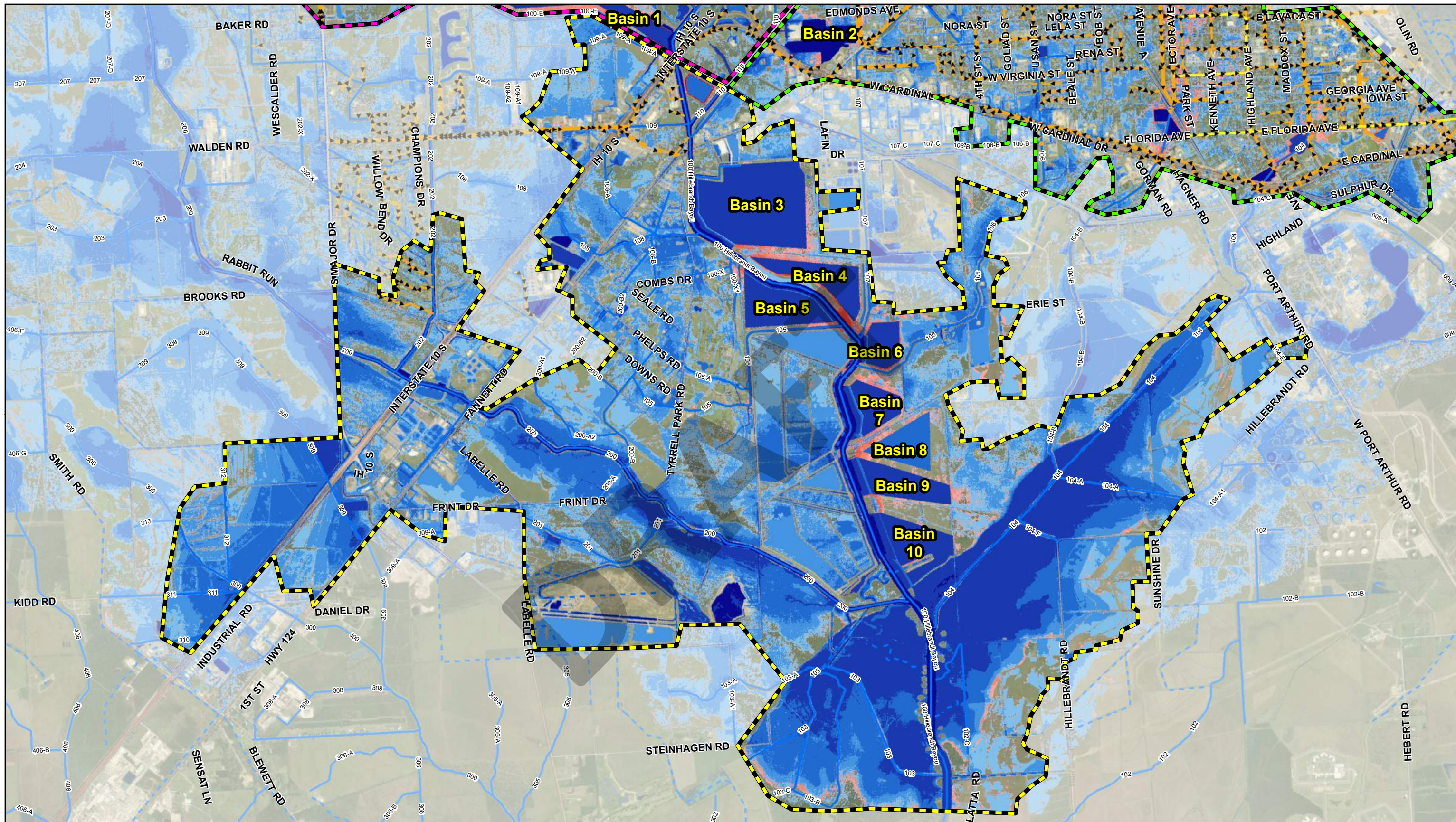
Open Channels

- DD6 Channel
- Non-DD6 Channel

**Structures Removed from Flooding
Lucas Diversion**



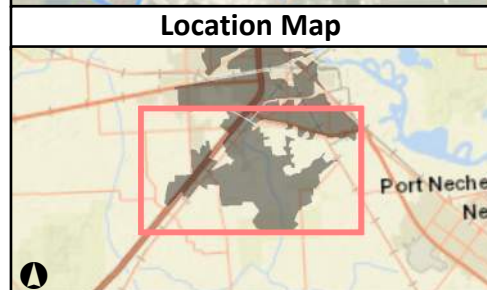
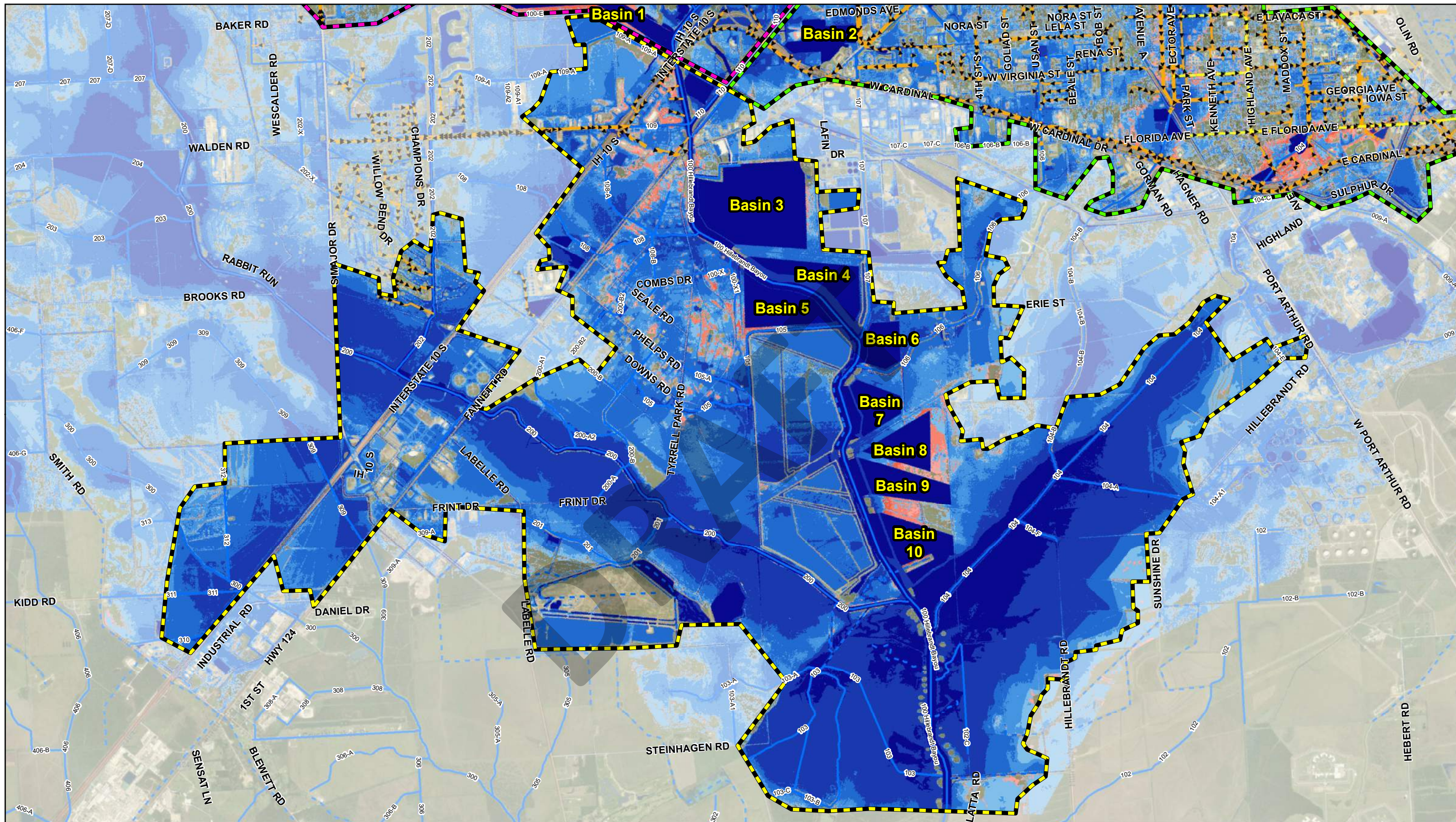
Exhibit # 74



10-Year Proposed Ponding Basins 3-10



Exhibit # 75



- Project Areas of Influence**
- Basins 3-10
 - Blanchette Diversion & Basin 1
 - Lucas Diversion
 - South Park Diversion & Basin 2
 - Tevis Diversion

- Legend**
- Open Channels**
- DD6 Channel
 - Non-DD6 Channel
- Existing Storm Sewer**
- < 48"
 - > 48"
- Proposed Storm Sewer**
- Proposed Storm Sewer

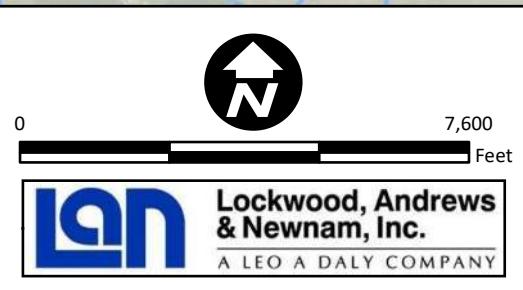
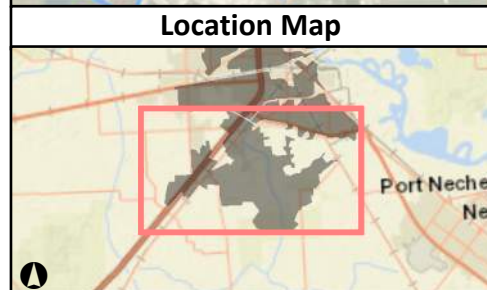
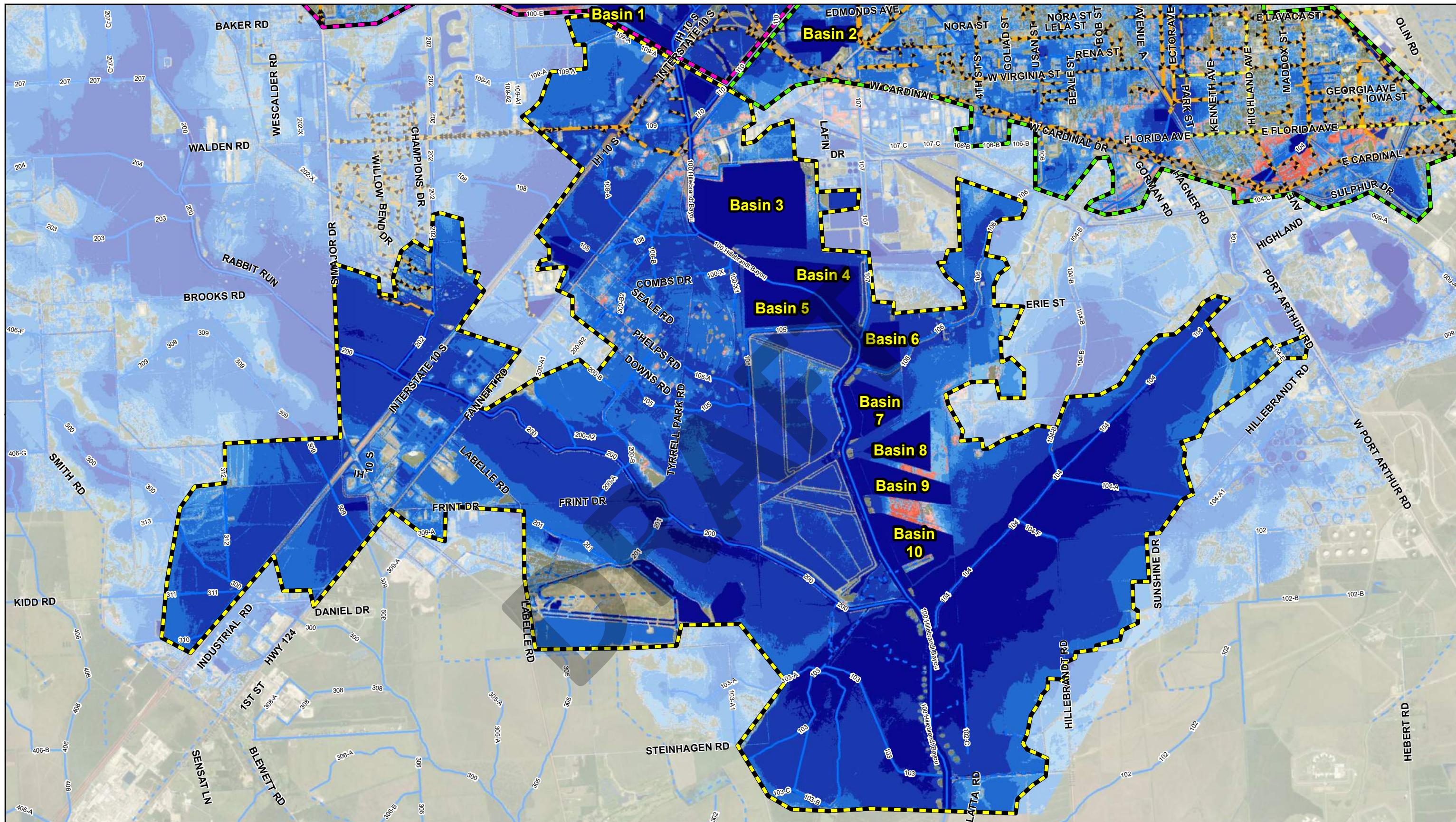
- Proposed 100-YR Ponding**
- 0.25 - 0.50
 - 0.50 - 1.0
 - 1.0 - 2.0
 - 2.0 - 5.0
 - > 5.0
 - Existing 100-YR Ponding

100-Year Proposed Ponding Basins 3-10



Exhibit # 76

LAN Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY



- Project Areas of Influence**
- Basins 3-10
 - Blanchette Diversion & Basin 1
 - Lucas Diversion
 - South Park Diversion & Basin 2
 - Tevis Diversion

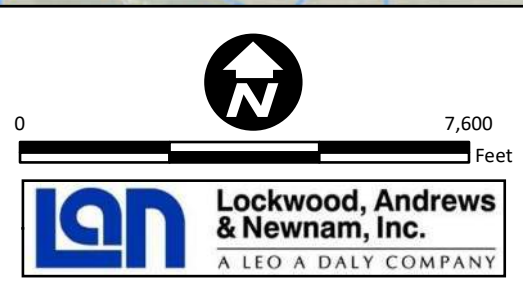
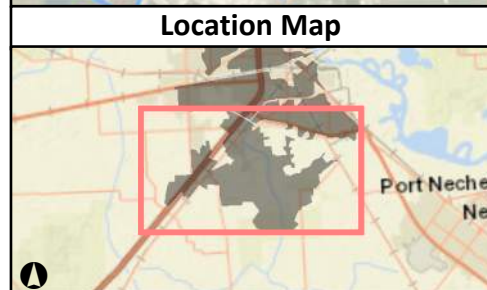
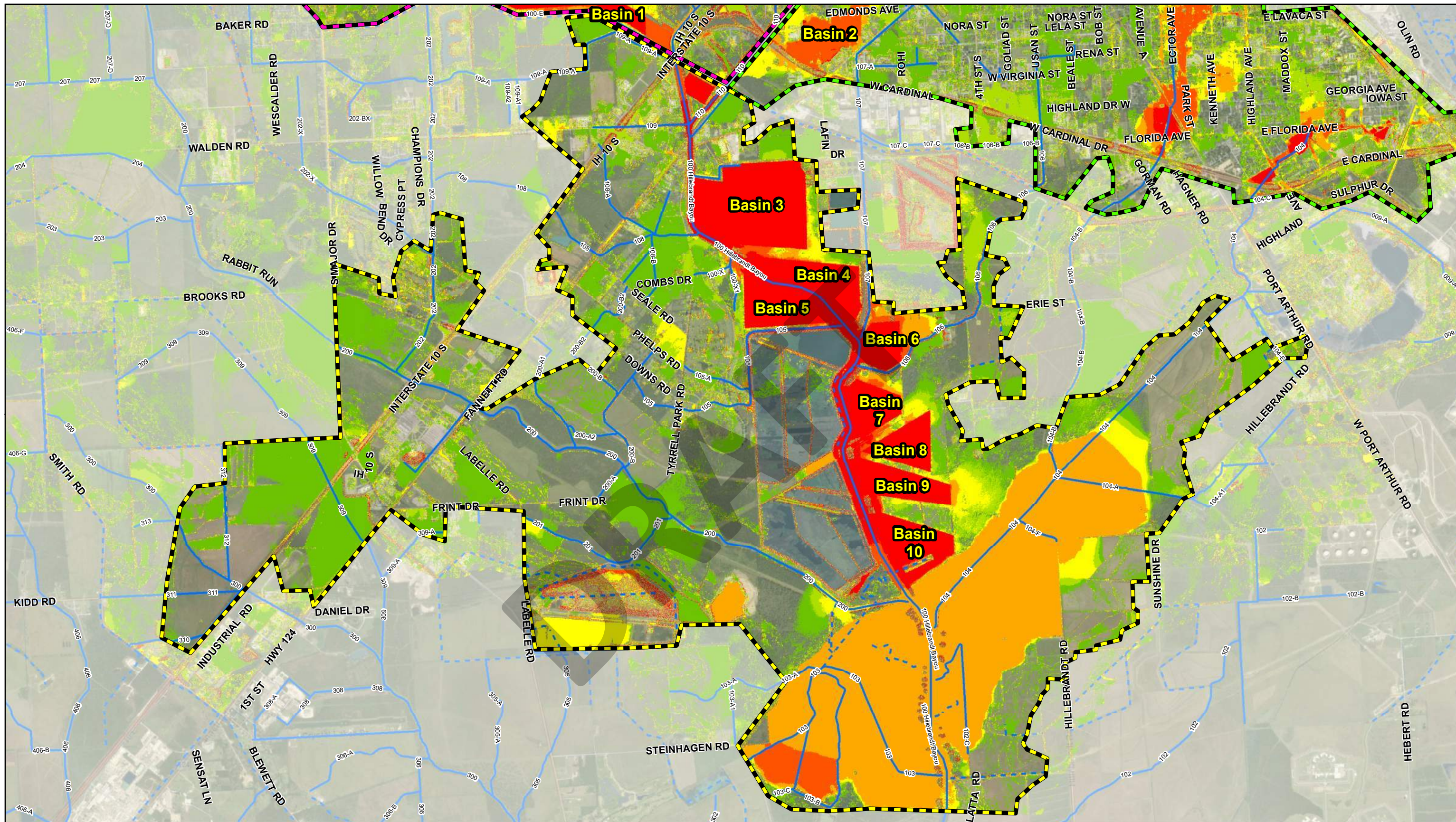
- Legend**
- Open Channels**
- DD6 Channel
 - Non-DD6 Channel
- Existing Storm Sewer**
- < 48"
 - > 48"
- Proposed Storm Sewer**
- Proposed Storm Sewer

- Proposed 500-YR Ponding**
- 0.25 - 0.50
 - 0.50 - 1.0
 - 1.0 - 2.0
 - 2.0 - 5.0
 - Existing 500-YR Ponding

500-Year Proposed Ponding Basins 3-10

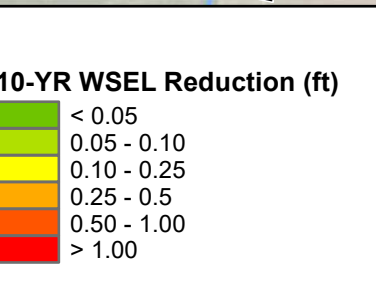


Exhibit # 77



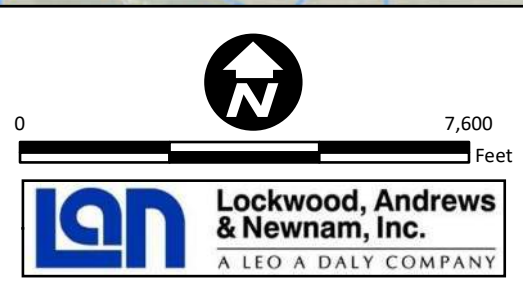
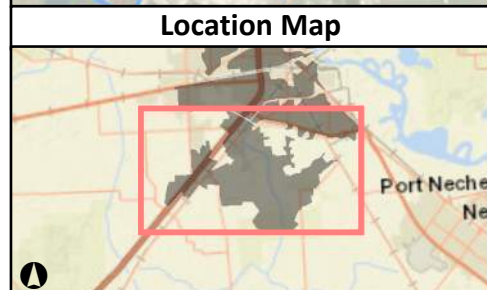
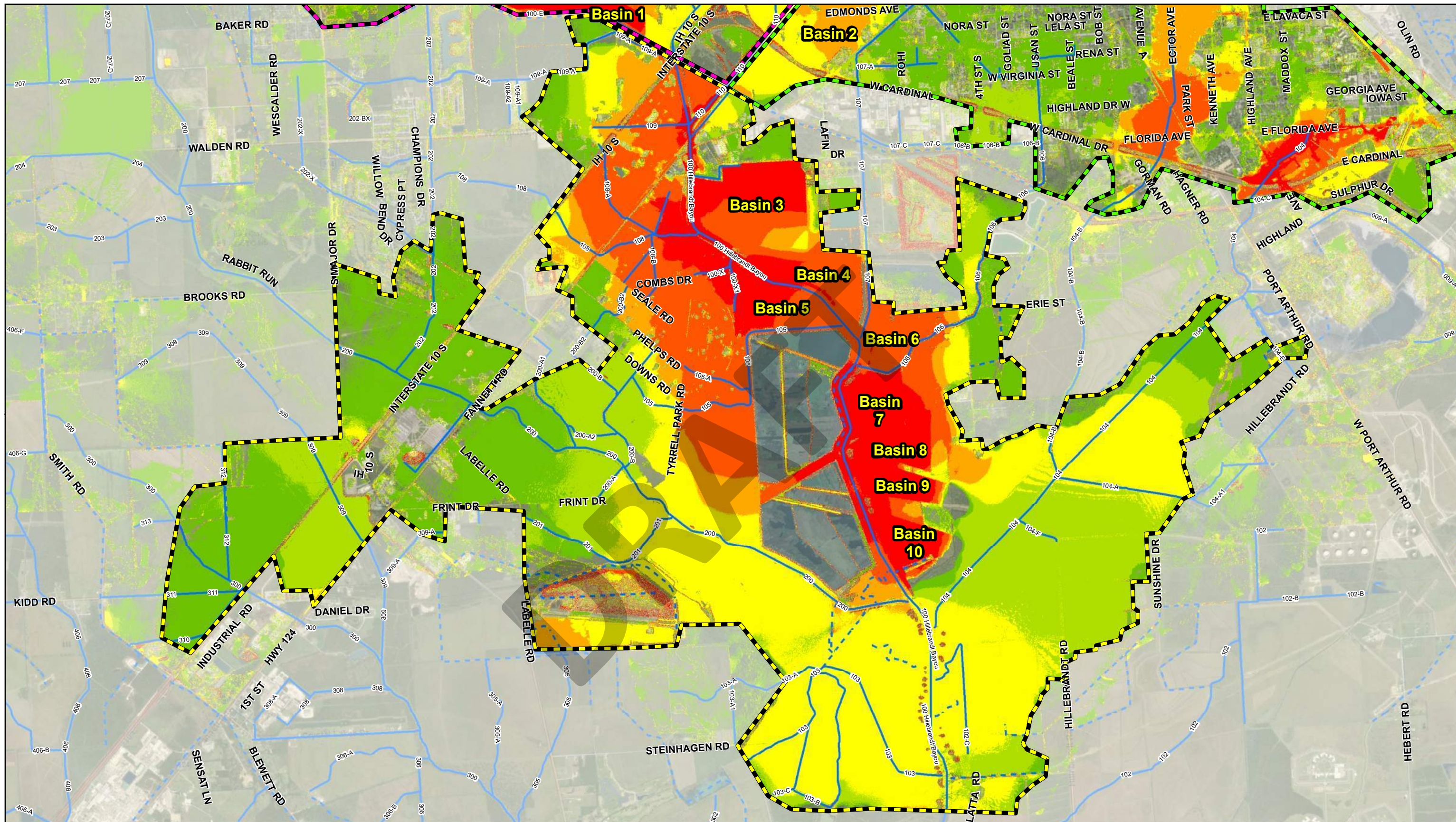
- Project Areas of Influence**
- Basins 3-10
 - Blanchette Diversion & Basin 1
 - Lucas Diversion
 - South Park Diversion & Basin 2
 - Tevis Diversion

- Legend**
- Open Channels**
- DD6 Channel
 - Non-DD6 Channel



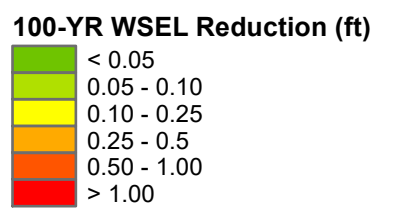
**10-Year WSEL Reductions
Basins 3-10**





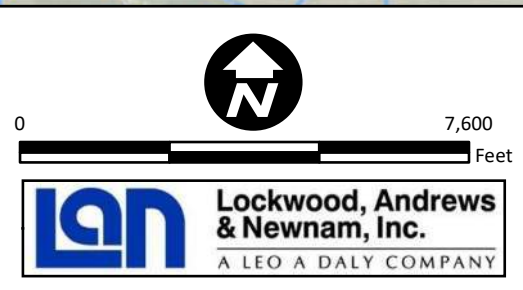
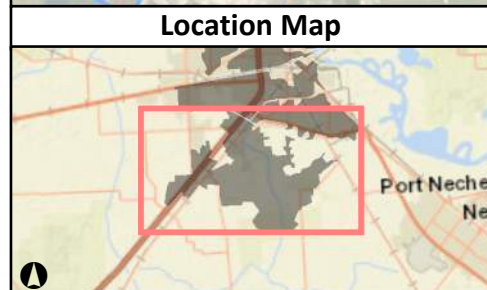
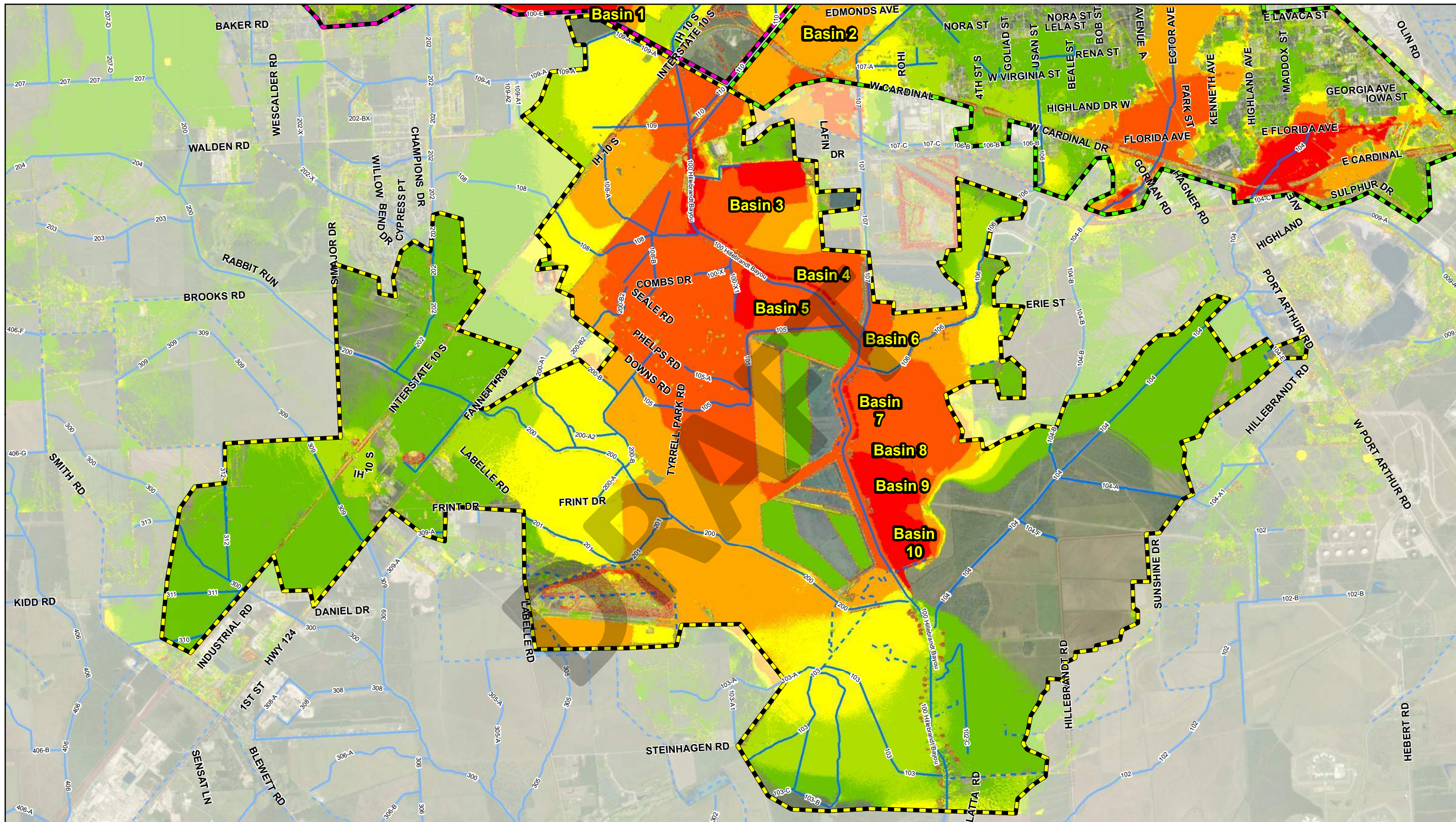
- Project Areas of Influence**
- Basins 3-10
 - Blanchette Diversion & Basin 1
 - Lucas Diversion
 - South Park Diversion & Basin 2
 - Tevis Diversion

- Legend**
- Open Channels**
- DD6 Channel
 - Non-DD6 Channel



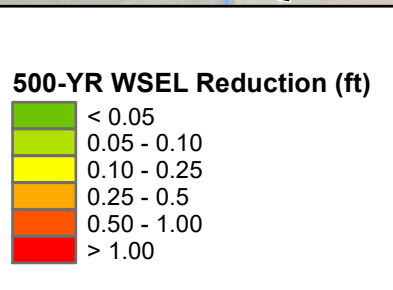
**100-Year WSEL Reductions
Basins 3-10**





- Project Areas of Influence**
- Basins 3-10
 - Blanchette Diversion & Basin 1
 - Lucas Diversion
 - South Park Diversion & Basin 2
 - Tevis Diversion

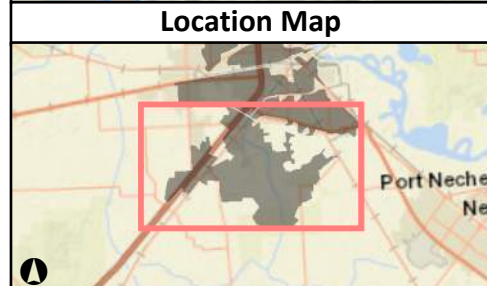
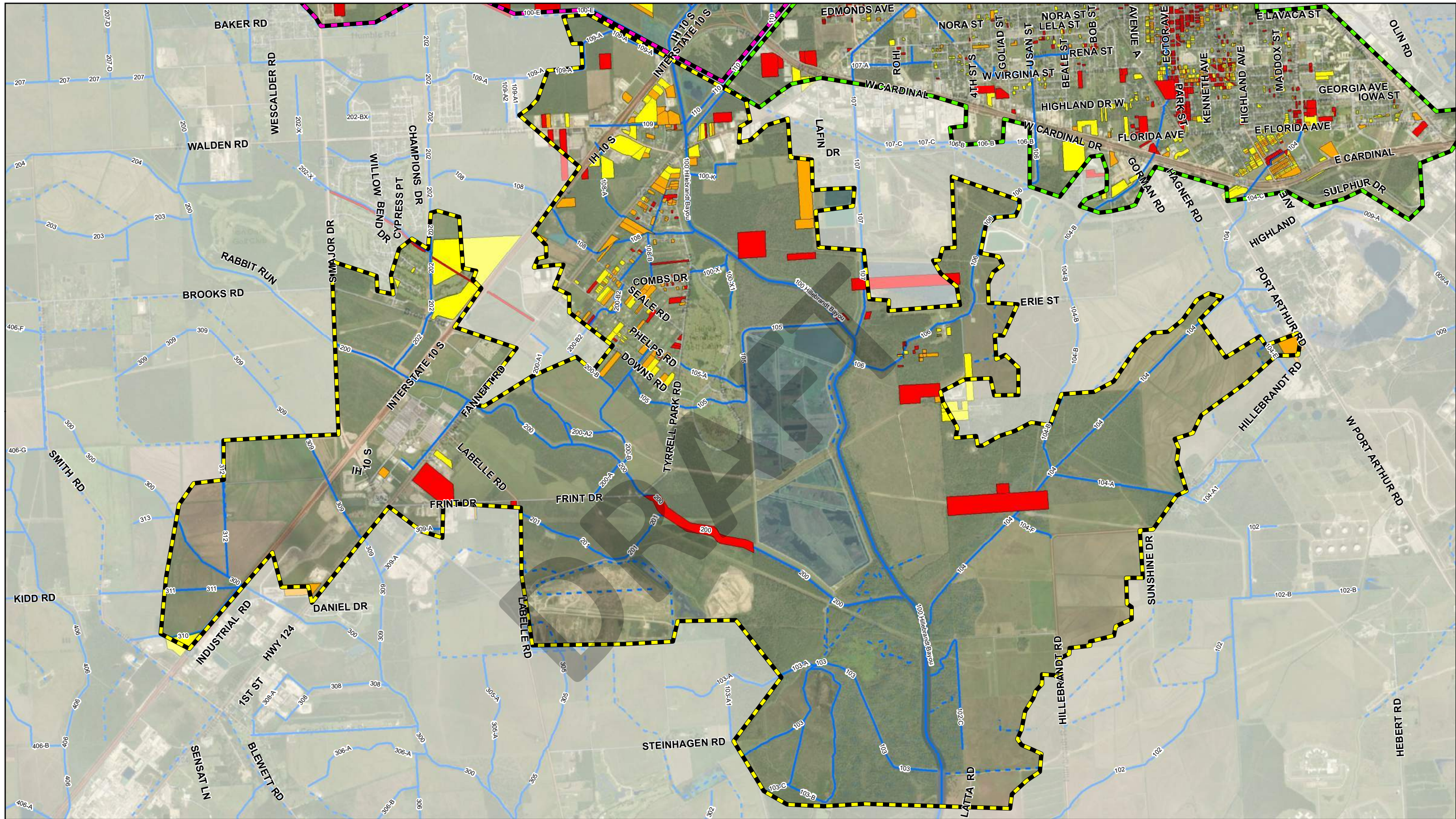
- Legend**
- Open Channels**
- DD6 Channel
 - Non-DD6 Channel



**500-Year WSEL Reductions
Basins 3-10**



Exhibit # 80



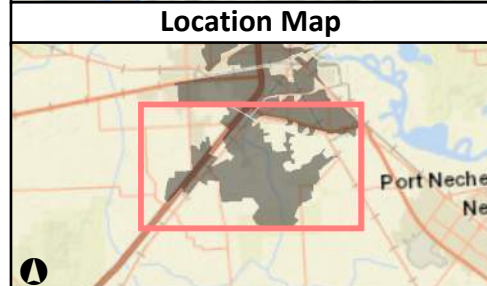
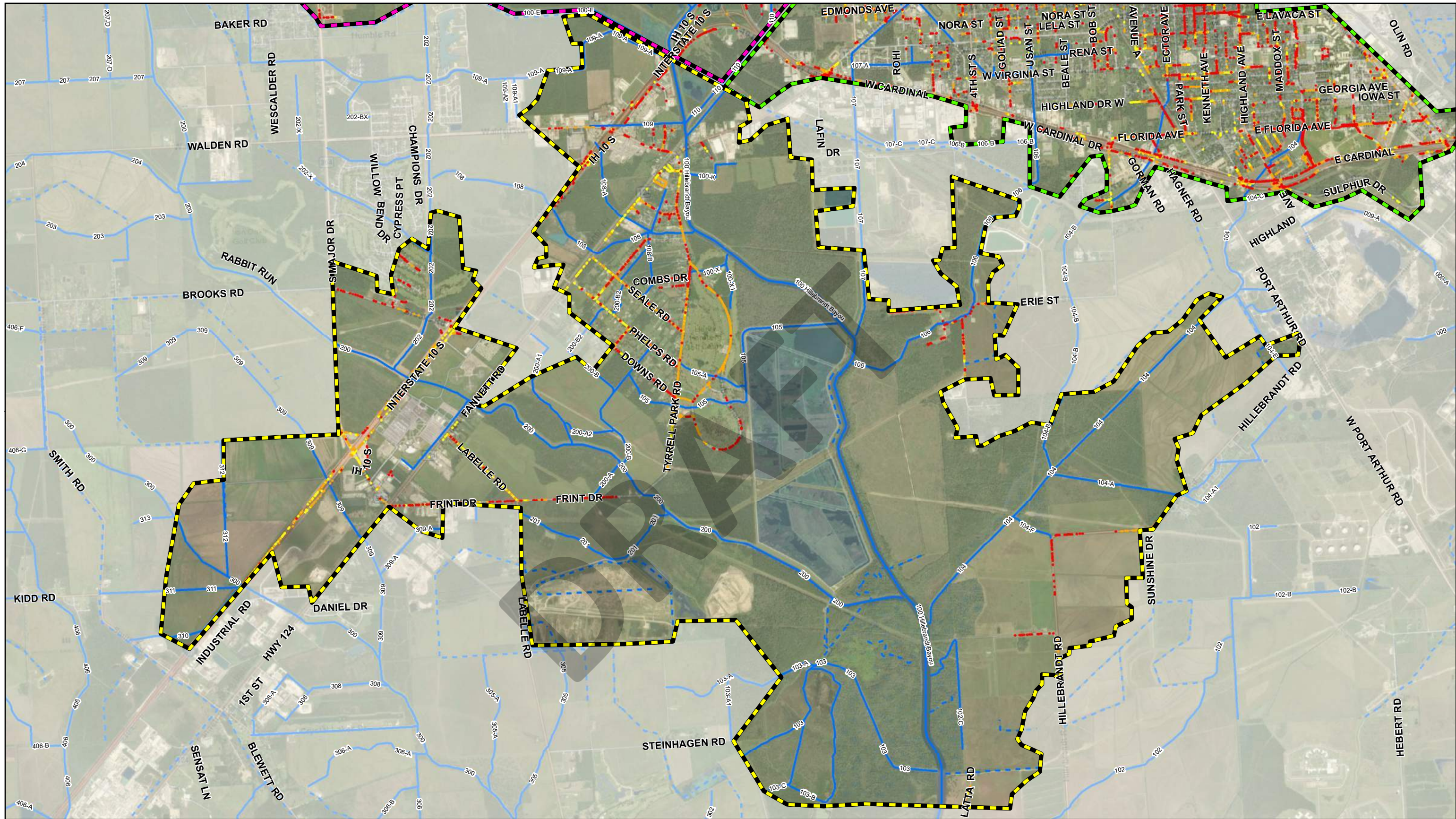
0 7,600 Feet

- Project Areas of Influence**
- Basins 3-10
 - Blanchette Diversion & Basin 1
 - Lucas Diversion
 - South Park Diversion & Basin 2
 - Tevis Diversion

- Legend**
- Open Channels**
- DD6 Channel
 - Non-DD6 Channel
- Parcels Removed from Floodplain**
- 10-Year
 - 100-Year
 - 500-Year

Parcels Removed from Floodplain Basins 3-10





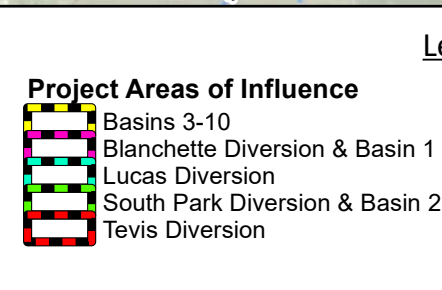
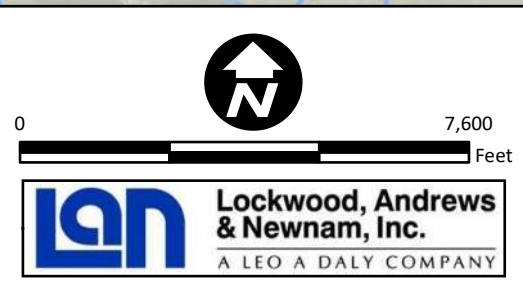
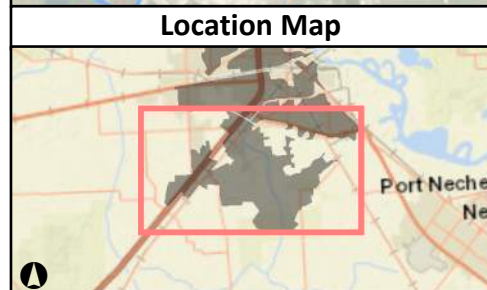
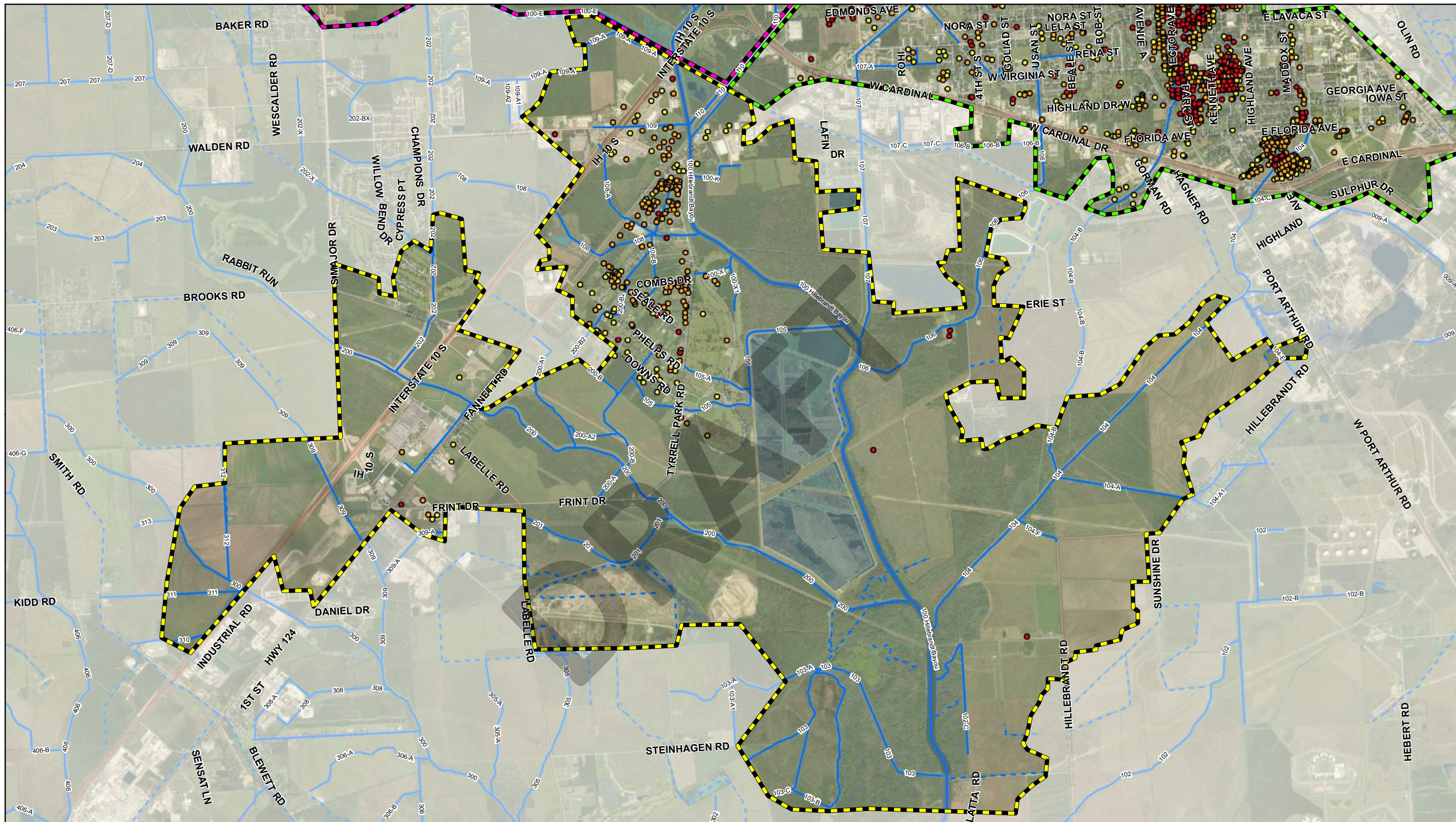
0 7,600 Feet

- Project Areas of Influence**
- Basins 3-10
 - Blanchette Diversion & Basin 1
 - Lucas Diversion
 - South Park Diversion & Basin 2
 - Tevis Diversion

- Legend**
- Roadway Removed from Floodplain**
- 10-Year
 - 100-Year
 - 500-Year
- Open Channels**
- DD6 Channel
 - Non-DD6 Channel

Roadway Removed from Floodplain Basins 3-10

Exhibit # 82



Structures Removed from Flooding Basins 3-10



Jefferson County
Drainage District No. 6
 6550 Walden Rd., Beaumont, Texas 77707
 Telephone (409) 842-1818
 Fax (409) 842-2729
 Established in 1920

April 13, 2023

From: Wallace R. Wilson, P.E., C.F.M.
 District Engineer
 Jefferson County Drainage District No. 6

Subject: Hydrology and Hydraulics for Borley Heights Relief Project
 Application and Benefit-Cost Analysis

The purpose of this memo is to certify the accuracy and appropriateness of Hydrology and Hydraulics data (H&H) used for the BCA.

The Engineering Department at Jefferson County Drainage District No. 6 has developed the Hydrology and Hydraulics for the Borley Heights area. The area that has been inundated by flooding is in the northern part of Beaumont in Jefferson County Texas. The existing receiving Ditch 1002-B drains west, directly into Ditch 1002 (Griffing Ditch) that eventually drains into Pine Island Bayou.

U.S. Geological Survey Lidar Point Cloud and ground survey data were used to develop accurate three-dimensional terrain models. These models were used to develop drainage areas to be utilized with HEC- HMS to develop runoff from each area. The drainage areas for Borley Heights are separated by the Lower Neches Valley Authority (LNVA) Canal. The entire combined drainage areas flow through one 15-ft x 5-ft structure under the LNVA Canal. Atlas 14 precipitation was used for the design of the peak runoff events. The 5-yr, 10-yr, 50-yr, 100-yr, and 500-yr events were developed for the existing and proposed conditions.

Existing Conditions					
Elevation (Ft)	30.08	30.02	29.29	26.37	25.16
Frequency (Year)	500	100	50	10	5
Flow (cfs)	1292	1111	962	638	446

Proposed Conditions					
Elevation (Ft)	25.92	24.74	23.99	22.09	21.28
Frequency (Year)	500	100	50	10	5
Flow (cfs)	658	551	476	317	221

The peak flows developed in HEC-HMS were input into HEC-RAS to develop water surface profiles and model the existing and proposed conditions. These profiles were compared to high water elevations collected in similar events. The existing condition for the Borley Heights area consists of four drainage areas with a combined area of 182.02 acres. The canal crossing constricts the flows because of the requirement to stay below the bottom elevation of the Canal. The runoff is required to sheet flow through the subdivisions into the street right of way. The entire flow is channeled down an insufficient ditch along the canal to the undersized existing structure causing the flooding.

The proposed condition for the area includes three new crossings under the LNVA Canal, a diversion ditch on the west side of the canal, concrete-lined receiving ditches along the canal, and improving Ditch 1002-B. Each new structure was strategically located at the end of every street right-of-way. The drainage areas were then able to be separated into four areas consisting of 32.36 acres, 24.68 acres, 26.38 acres, and 98.60 acres, thereby reducing the flows into the existing and proposed structures. Diverting these flows into separate structures and then into the proposed diversion channel lowers the water surface.

The new structures were sized utilizing the FHWA HY-8 Culvert Analysis Program. Headwater and tailwater conditions were compared with the HEC-RAS models.

Summary

The proposed improvements along Ditch 1002-B and the Borley Heights area were analyzed using acceptable hydrologic and hydraulic methods. The analysis shows significant benefits to Borley Heights and surrounding areas.

A study was completed in 2006 showing the downstream receiving stream Pine Island Bayou peaks five days after Ditch 1002-B has already completely receded. The Borley Heights drainage area was included in this study. In 2010 a LOMR was completed showing the flood plain was reduced.

As demonstrated in this letter and the prior improvements, this project will have no adverse impact on the surrounding community up to and including the 500-yr event.

The design of the final Engineering is underway. Please contact me if you have any questions.

Wallace R. Wilson P.E.

Wallace R. Wilson, P.E., C.F.M.



April 13, 2023

Jefferson County
Drainage District No. 6
 6550 Walden Rd., Beaumont, Texas 77707
 Telephone (409) 842-1818
 Fax (409) 842-2729
 Established in 1920

April 13, 2023

From: Wallace R. Wilson, P.E., C.F.M.
 District Engineer
 Jefferson County Drainage District No. 6

Subject: Hydrology and Hydraulics for East China Relief Project
 Application and Benefit-Cost Analysis

The purpose of this memo is to certify the accuracy and appropriateness of the hydrology and hydraulic data (H&H) used for the BCA.

The Engineering Department at Jefferson County Drainage District No. 6 has developed the hydrology and hydraulics for the East China area. The area is in China, Texas, and is located in western Jefferson County, Texas. The existing receiving ditch, Ditch 600, drains south into Ditch 500 (Taylor Bayou).

U.S. Geological Survey Lidar Point Cloud and ground survey data were used to develop accurate three-dimensional terrain models. These models were used to develop drainage areas to be utilized with HEC-HMS to develop runoff from each area. The drainage areas for East China are separated by the Lower Neches Valley Authority (LNVA) Canal. Approximately half of the entire drainage area flows through an LNVA flume over to Ditch 600, and through one 78-in corrugated metal pipe located at Turner Road. Atlas 14 precipitation was used for the design of the peak runoff events. The 10-yr, 50-yr, 100-yr, and 500-yr events were developed for the existing and proposed conditions. The project is broken into two different areas (East China and West China) at the canal crossing.

East China

Existing				
Frequency	500yr	100yr	50yr	10yr
Flow	3271	2283	1863	1143
Elevation	34.25	33.86	33.24	32.60

Proposed				
Frequency	500yr	100yr	50yr	10yr
Flow	3237	2188	1733	780
Elevation	33.15	32.25	31.68	30.84

The peak flows developed in HEC-HMS were input into HEC-RAS to develop water surface profiles and model the existing and proposed conditions. The existing condition for the East China area consists of four drainage areas with a combined area of 2,901 acres. Inadequate ditches, the canal flume crossing, and the 78-in corrugated metal pipe impede the conveyance downstream. The proposed condition for the area includes a linear detention upstream of the canal, a concrete block-lined channel downstream of the canal crossing, and an adequate structure at Turner Road. The detention and new structures were sized utilizing a combination of HEC HMS and HEC RAS. Headwater and tailwater conditions were computed with the HEC-RAS.

Summary

The proposed improvements along Ditch 600 and East of China were analyzed using acceptable hydrologic and hydraulic methods. The analysis shows significant benefits to East China and the surrounding areas.

As demonstrated in this letter and the improvements, this project will have no adverse impact on the surrounding community up to and including the 500-yr event.

The design of the final Engineering is underway. Please contact me if you have any questions.

Wallace R. Wilson P.E.

Wallace R. Wilson, P.E., C.F.M.¶



April 13, 2023

Jefferson County
Drainage District No. 6
 6550 Walden Rd., Beaumont, Texas 77707
 Telephone (409) 842-1818
 Fax (409) 842-2729
 Established in 1920

April 13, 2023

From: Wallace R. Wilson, P.E., C.F.M.
 District Engineer
 Jefferson County Drainage District No. 6

Subject: Hydrology and Hydraulics for South Nome Relief Project
 Application and Benefit-Cost Analysis

The purpose of this memo is to certify the accuracy and appropriateness of the hydrology and hydraulic data (H&H) used for the BCA.

The Engineering Department at Jefferson County Drainage District No. 6 has developed the hydrology and hydraulics for the South Nome Relief area. The area that has been inundated by flooding is in the City of Nome, located in the western part of Jefferson County Texas. The existing receiving ditch, Ditch 804-D, drains south into Ditch 800 (Green Pond Gully).

U.S. Geological Survey Lidar Point Cloud and ground survey data were used to develop accurate three-dimensional terrain models. These models were used to develop drainage areas to be utilized with HEC-HMS to develop runoff from each area. The South Nome Relief area is separated by the Lower Neches Valley Authority (LNVA) Canal. The upper half of the drainage area flows through one 48-in pipe under the LNVA canal. Atlas 14 precipitation was used for the design of the peak runoff events. The 10-yr, 50-yr, 100-yr, and 500-yr events were developed for the existing and the proposed conditions.

Existing				
Frequency	500yr	100yr	50yr	10yr
Elevation	44.30	43.80	43.60	43.00
Flow	1960	1355	1143	707

Proposed				
Frequency	500yr	100yr	50yr	10yr
Elevation	42.5	42.2	41.8	41.4
Flow	3594	2493	1282	806

The peak flows developed in HEC-HMS were input into HEC-RAS to develop water surface profiles and model the existing and proposed conditions. These profiles were compared to high water elevations collected in similar events. The existing condition for the South Nome Relief area consists of eight drainage areas with a combined area of 3,876 acres. The canal crossing is a major constriction due to the requirement to stay below the bottom elevation of the Canal. The runoff backs up into Nome causing home flooding. The entire flow is channeled down an insufficient ditch to the canal to the undersized existing structure causing the flooding. The proposed condition for the area includes improving the channels above the canal crossing and adding three 60-in structures under the LNVA Canal. A detention basin will be constructed below the canal crossing to dampen the increased flows. The new structures were sized utilizing a combination of the HMS and HEC-RAS models. Headwater and tailwater conditions were compared with the HEC-RAS models.

Summary

The proposed improvements along Ditch 804-D and the area south of Nome, Texas were analyzed using acceptable hydrologic and hydraulic methods. The analysis shows significant benefits to South Nome and surrounding areas.

As demonstrated in this letter and the prior improvements, this project will have no adverse impact on the surrounding community up to and including the 500-yr event.

The design of the final Engineering is underway. Please contact me if you have any questions.

Wallace R. Wilson P.E.

Wallace R. Wilson, P.E., C.F.M.¶



April 13, 2023