



CITY OF
FORT LAUDERDALE

CITY COMMISSION
Conference Meeting
**Stormwater Master Plan Modeling
and Design Implementation Update**

Tuesday, December 19, 2017
100 North Andrews Avenue
Fort Lauderdale, FL

The Hazen Team





Project Elements



Data Collection



Modeling



Design



Public Outreach

NEIGHBORHOODS

SUSTAINABLE

SOLUTIONS

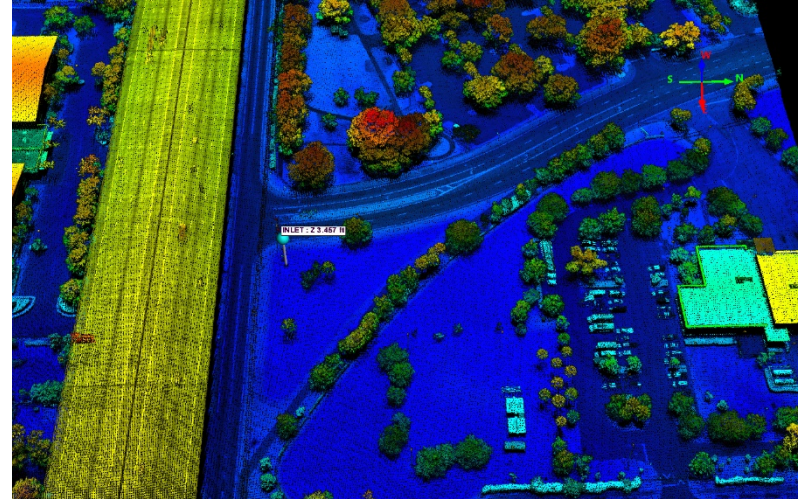
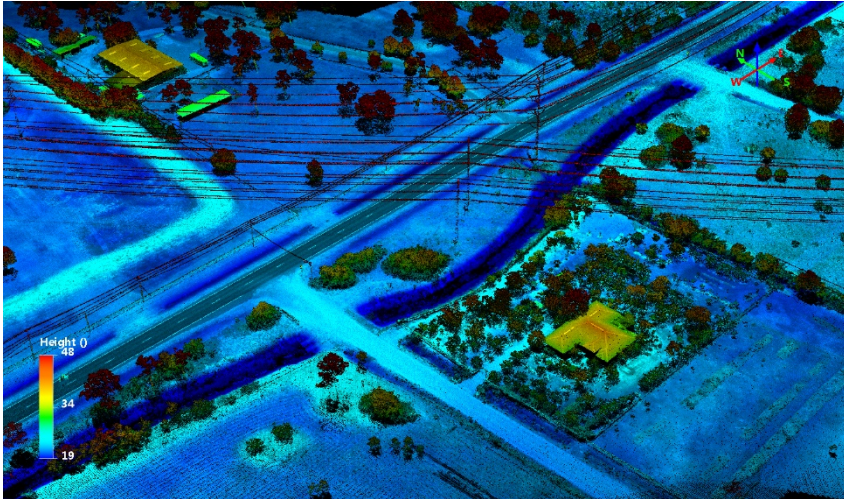
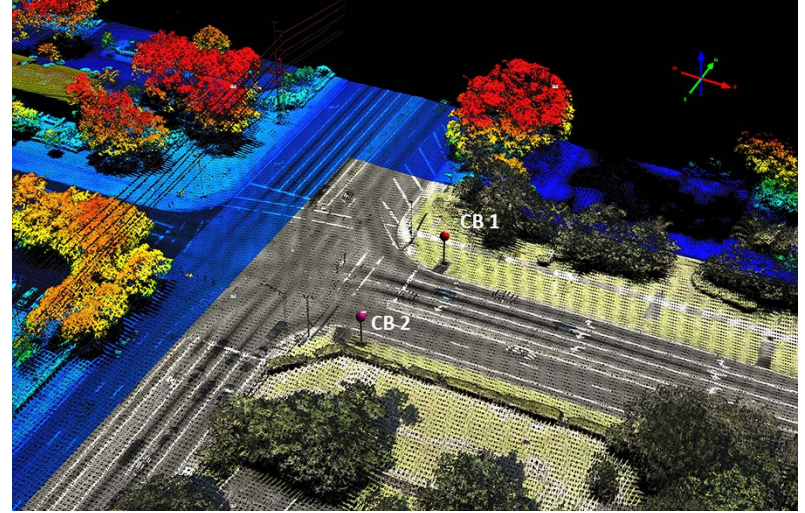
FUTURE



Data Collection

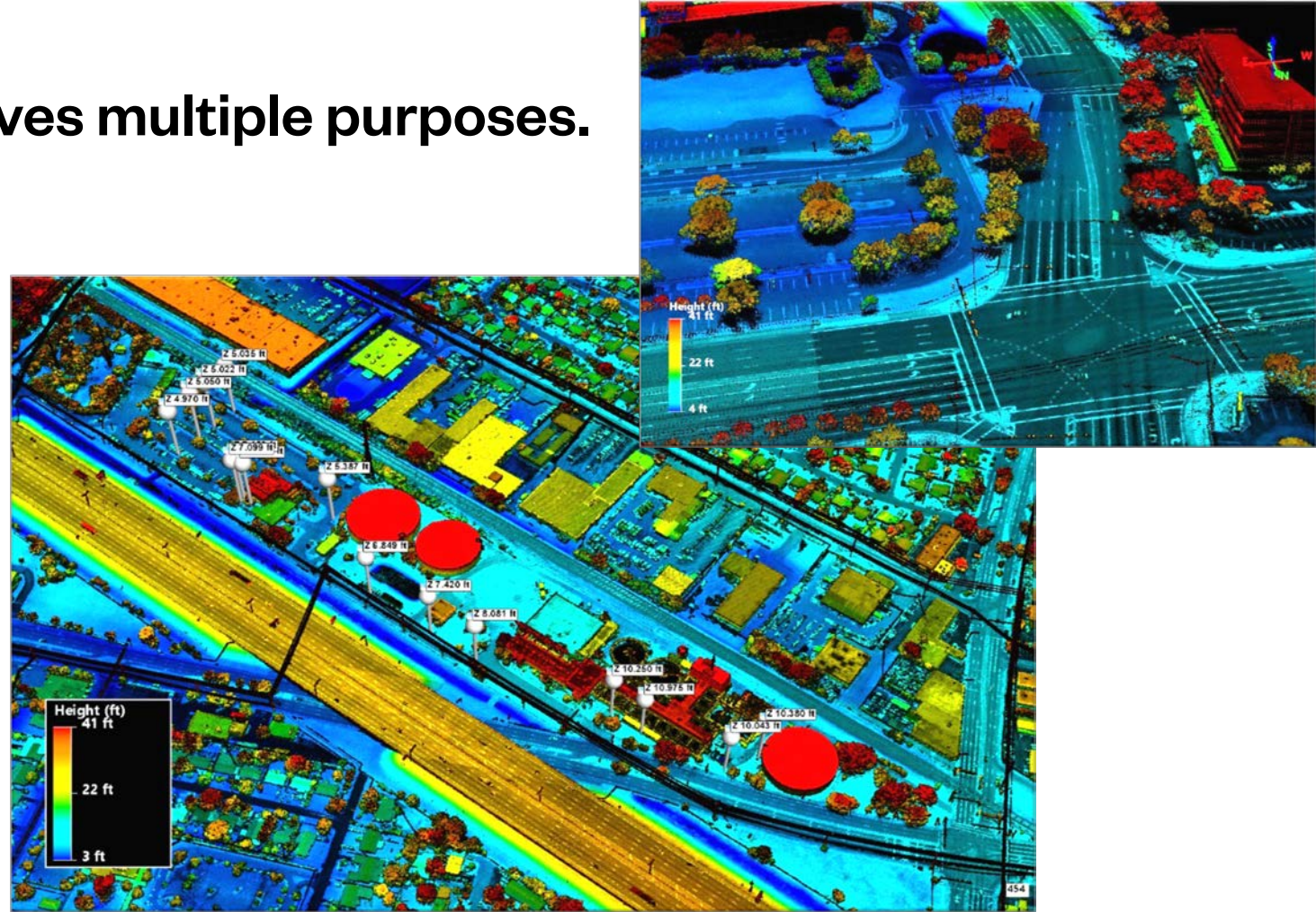
We collected new aerial LiDAR specifically for Fort Lauderdale.

- High Density
- Flown in two directions
- Vertical elevations accurate to within 0.15 ft.



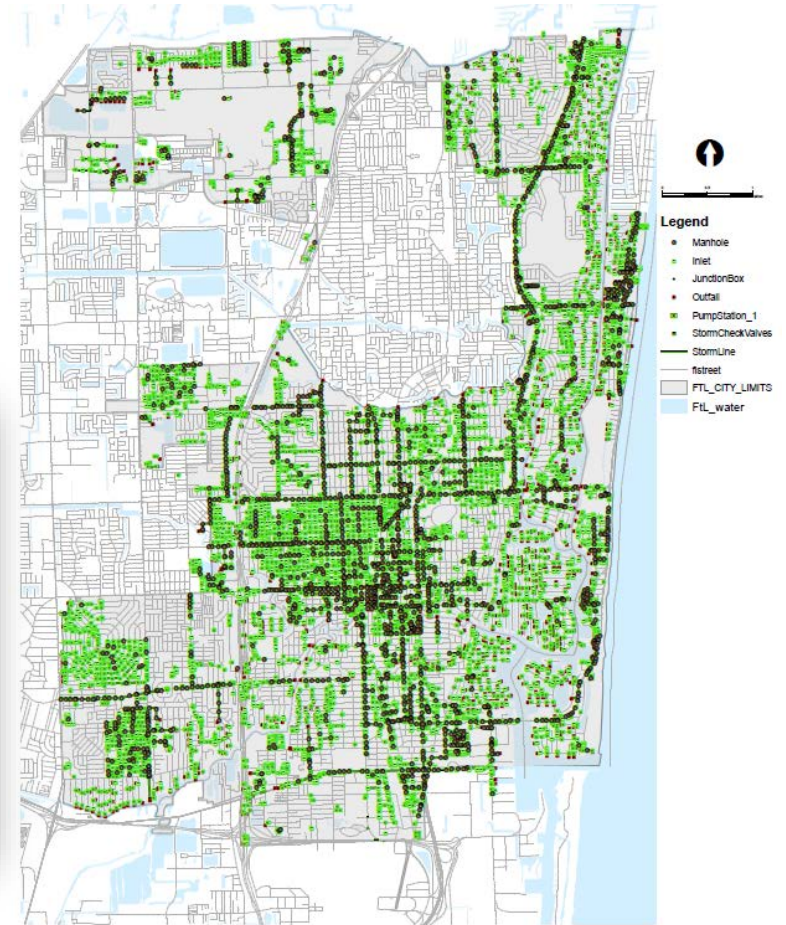
The LiDAR data **serves multiple purposes.**

- Construct Digital Elevation Model (DEM) for modeling/design
- Identify key elevations on assets like seawalls
- Visual inspection of other above ground assets



Five Ash Water Treatment Plant

Additional stormwater asset data were collected to aid model development.



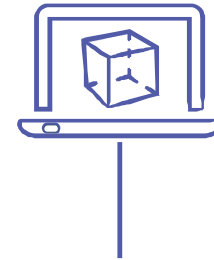
**Attributes field surveyed for over
5,000 stormwater features**

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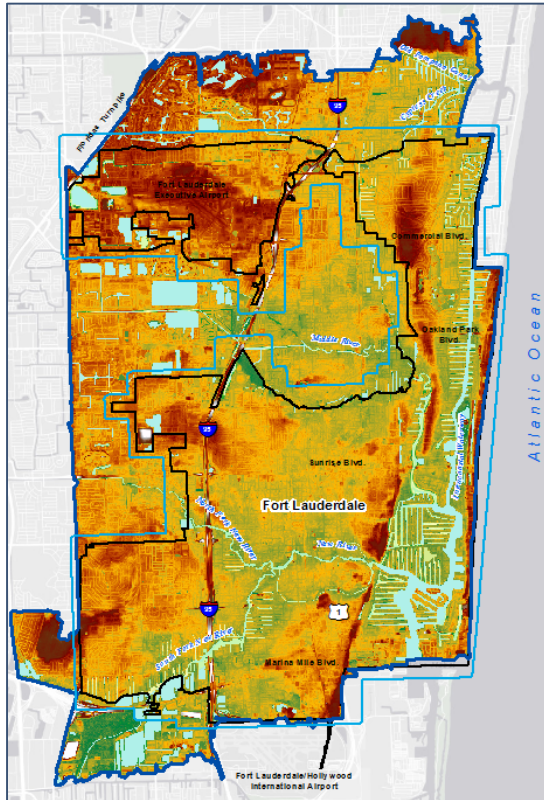
FUTURE



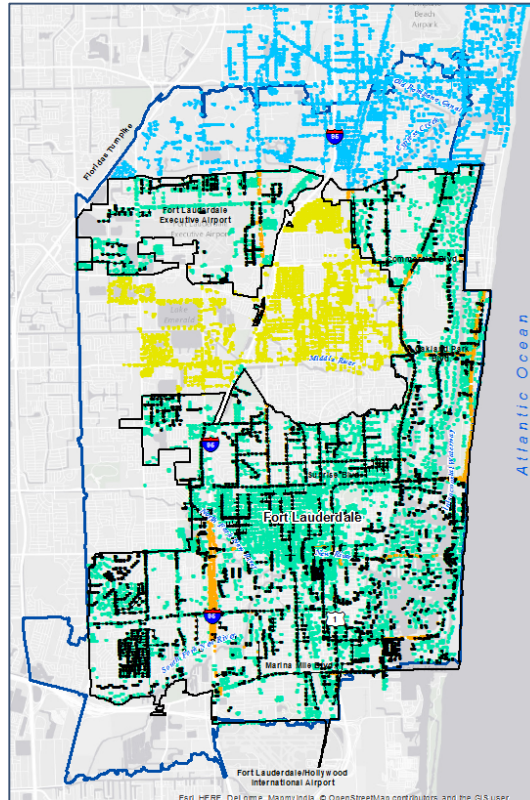
Modeling

Watersheds were delineated (as basis for the model)
using DEM, infrastructure and aerial imagery.

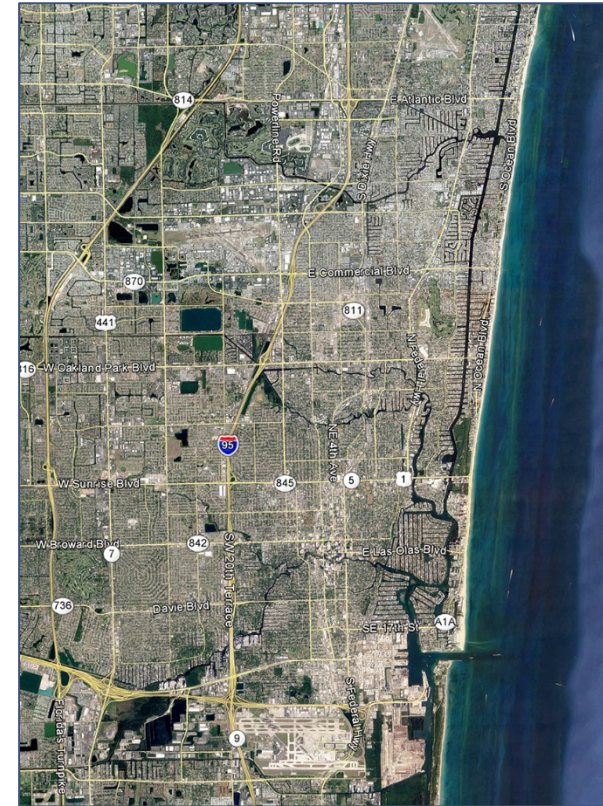
LiDAR/DEM













Infrastructure

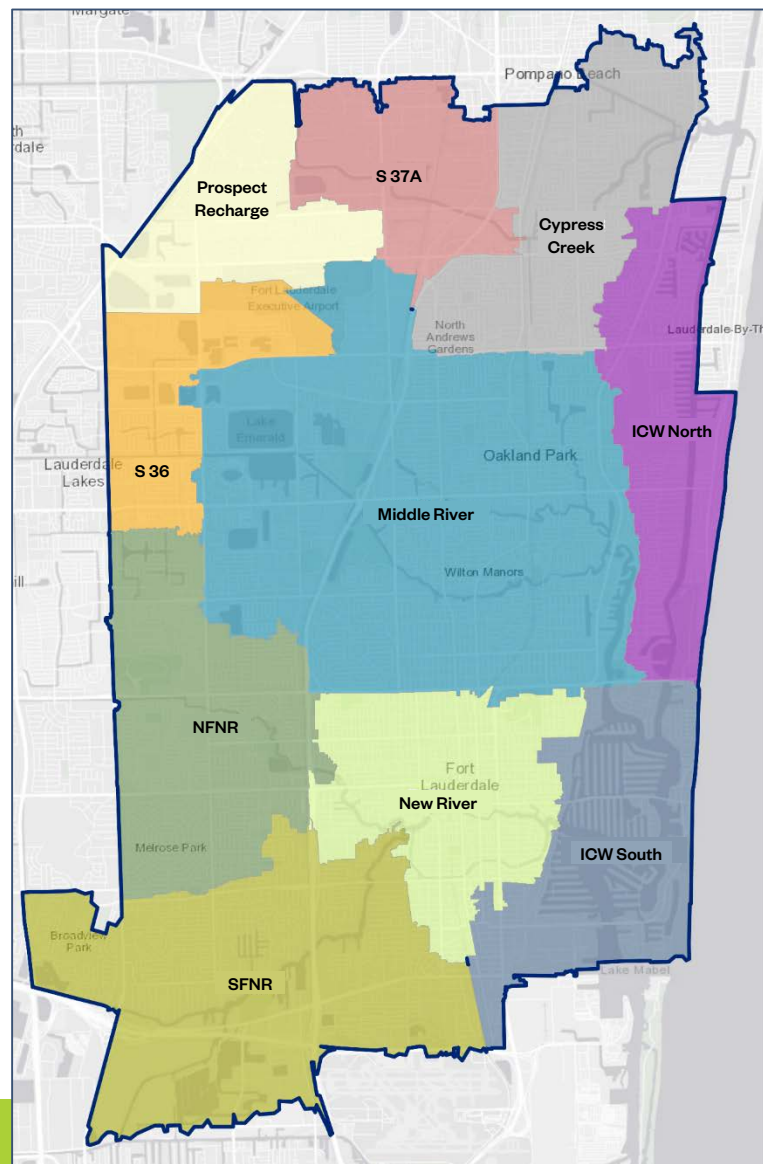


Aerial



Primary watersheds were identified...

-  Cypress Creek
-  ICW North
-  ICW South
-  Middle River
-  North Fork New River
-  New River
-  Prospect Recharge
-  S 36
-  S 37A
-  South Fork New River



... and a suite of **storm events, time horizons,**
and sea level rise conditions were modeled.



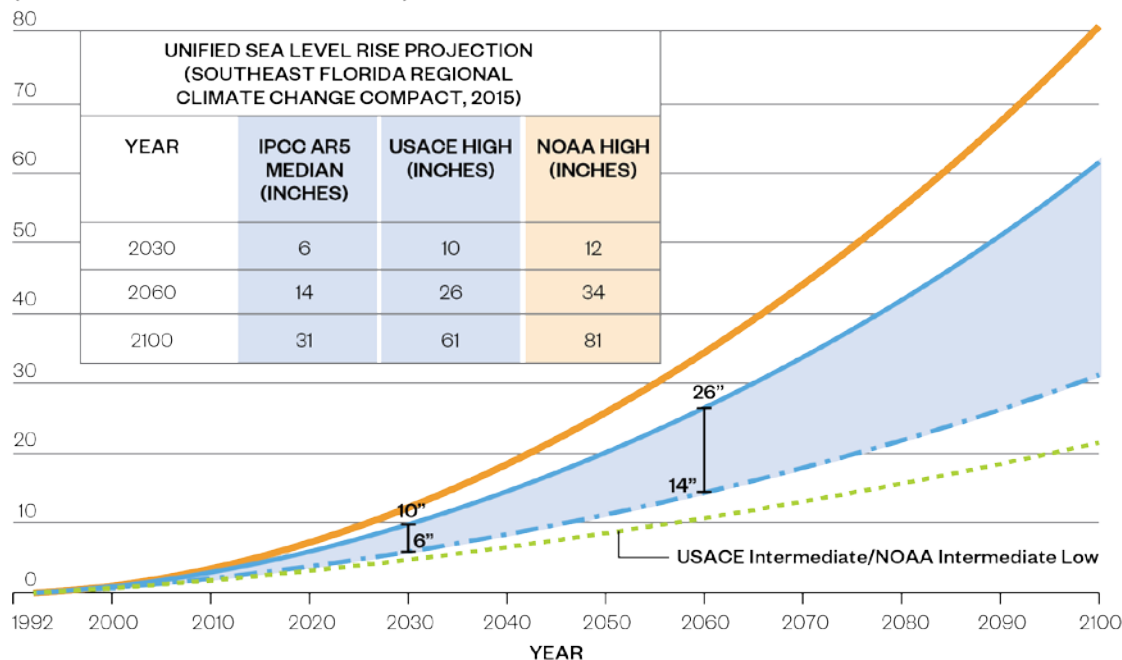
Storm Events

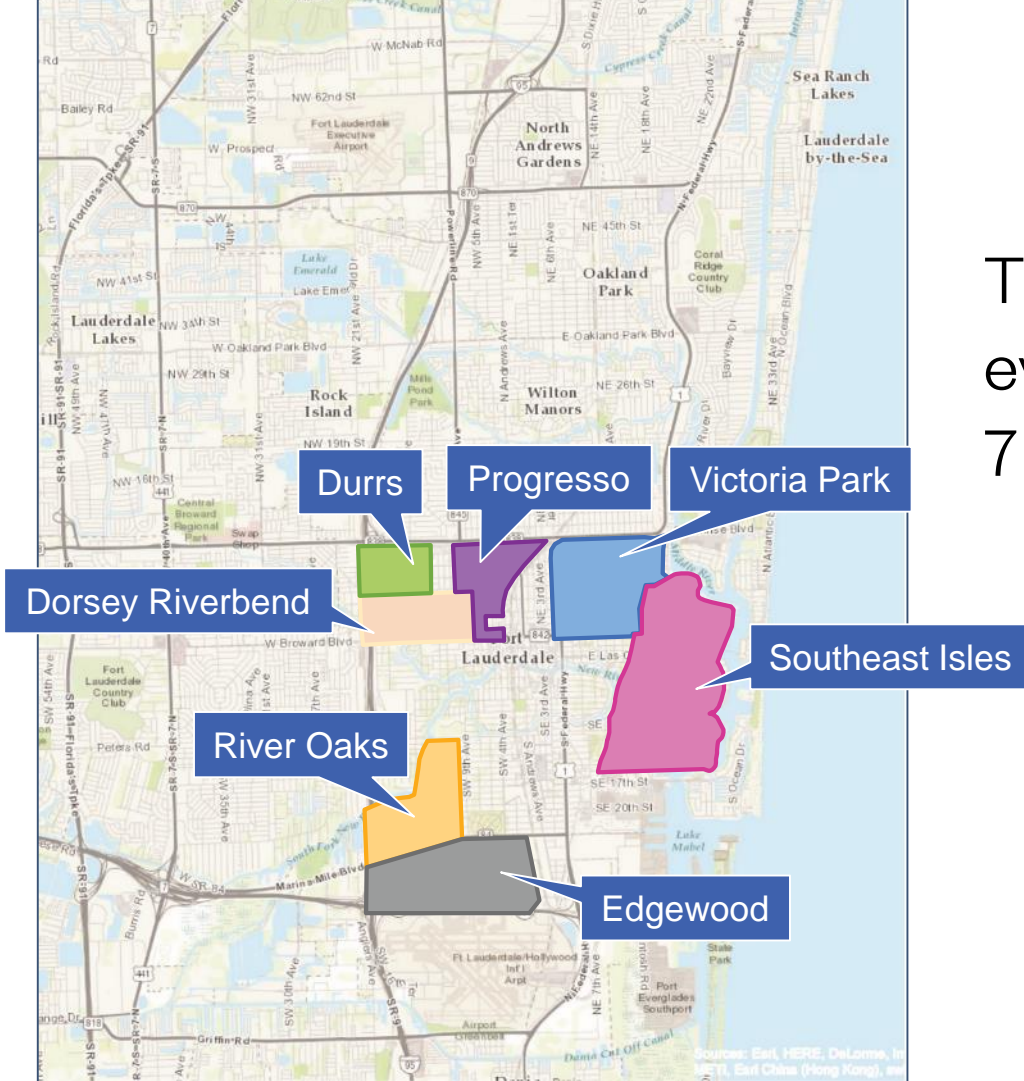
5 Year	24 Hour
10 Year	24 Hour
25 Year	24 Hour
25 Year	72 Hour
100 Year	72 Hour

Timeline

Existing
2030
2060

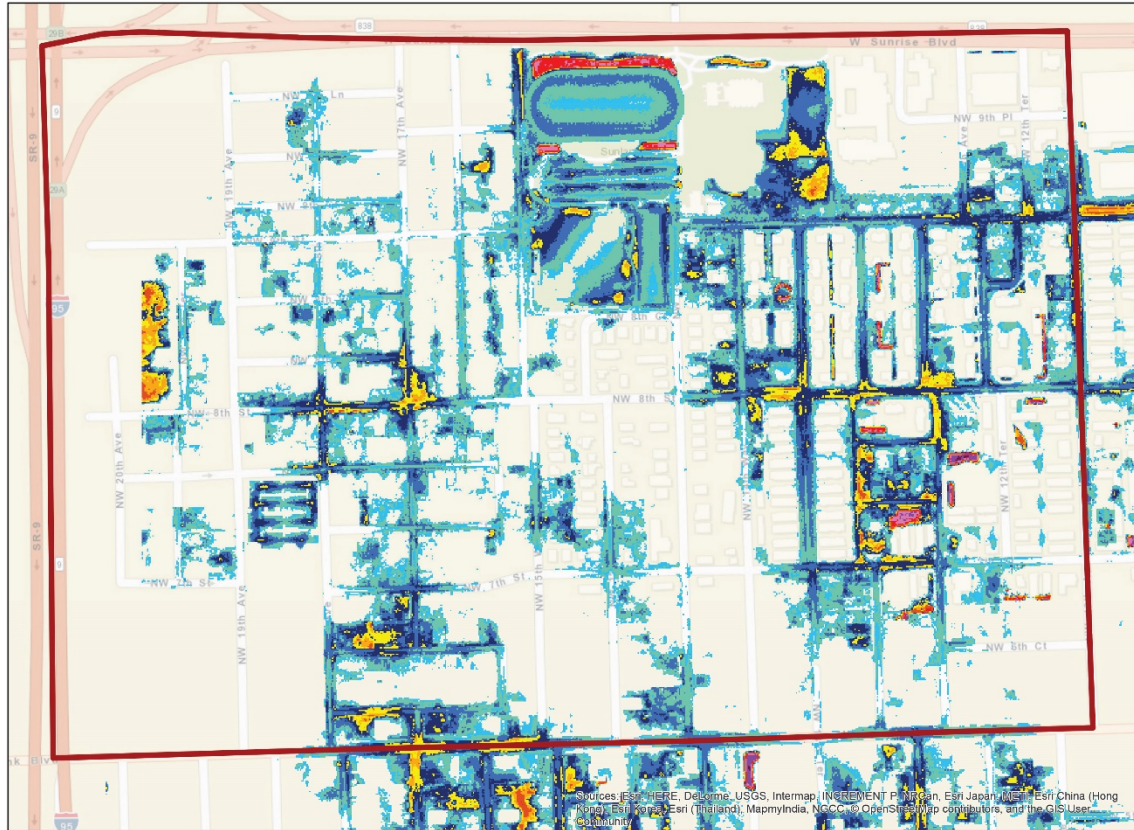
RELATIVE SEA LEVEL RISE NEAR KEY WEST, FL
 (INCHES RELATIVE TO MEAN SEA LEVEL)





The stormwater model was used to evaluate and inform design efforts in 7 initial neighborhoods.

Existing condition model results helped identify areas of concern and corroborate prior flooding reports.



Durrs neighborhood 100-year flood map

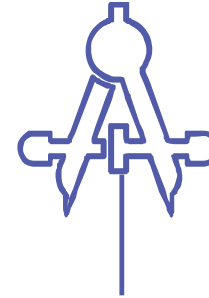


NEIGHBORHOODS

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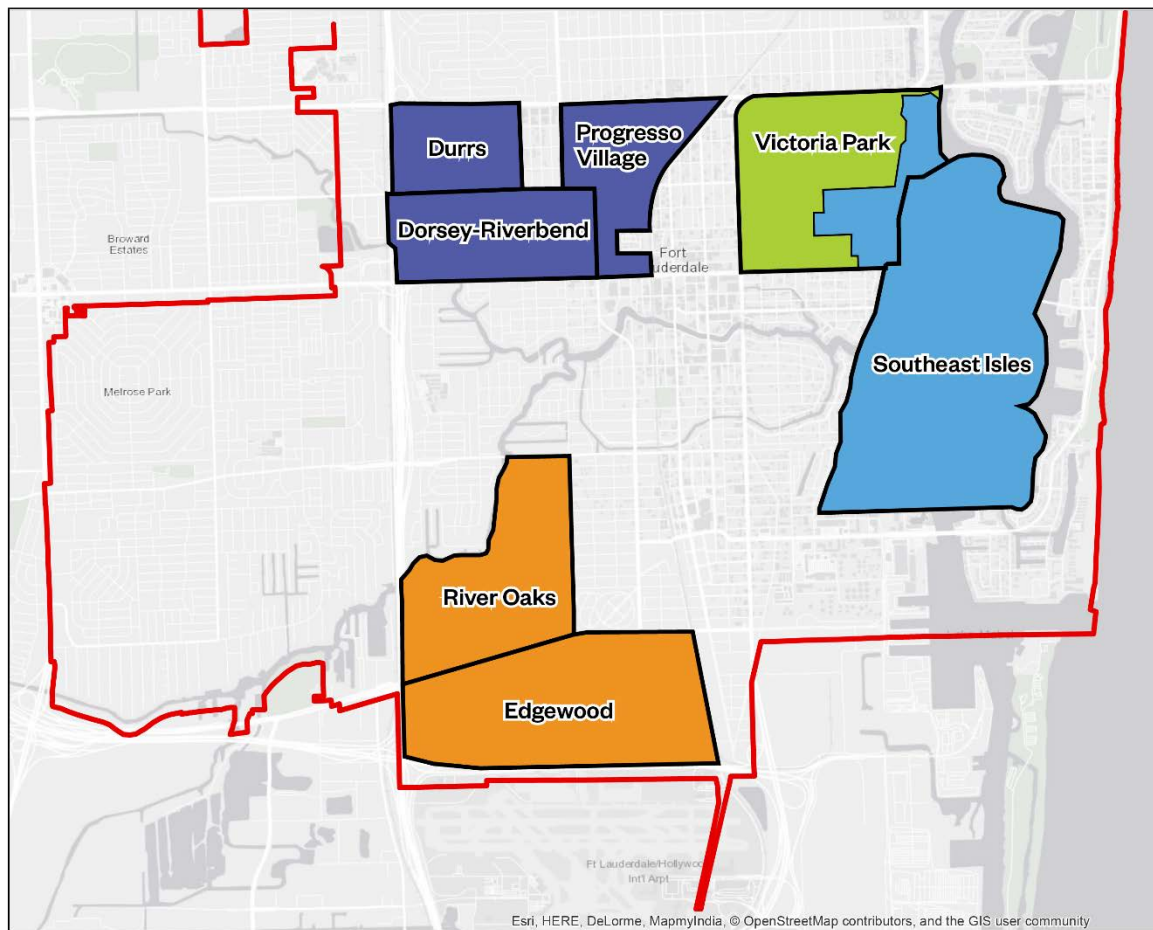
Design

Design Team Assignments were made to tackle the 7 neighborhoods.



Neighborhood	Watershed(s)	Design Consultant
Dorsey Riverbend	Middle River, North Fork New River	HDR
Durrs	North Fork New River	Craven Thompson & Associates
Edgewood	South Fork New River	Hazen
Progresso	New River	HDR
River Oaks	South Fork New River	Craven Thompson & Associates
Southeast Isles	ICW South, New River	Hazen
Victoria Park	New River, ICW South	Chen-Moore & Associates

Each neighborhood has specific flooding vulnerabilities.



Directly tidally influenced:



Indirectly tidally influenced:



Primarily aged and undersized infrastructure

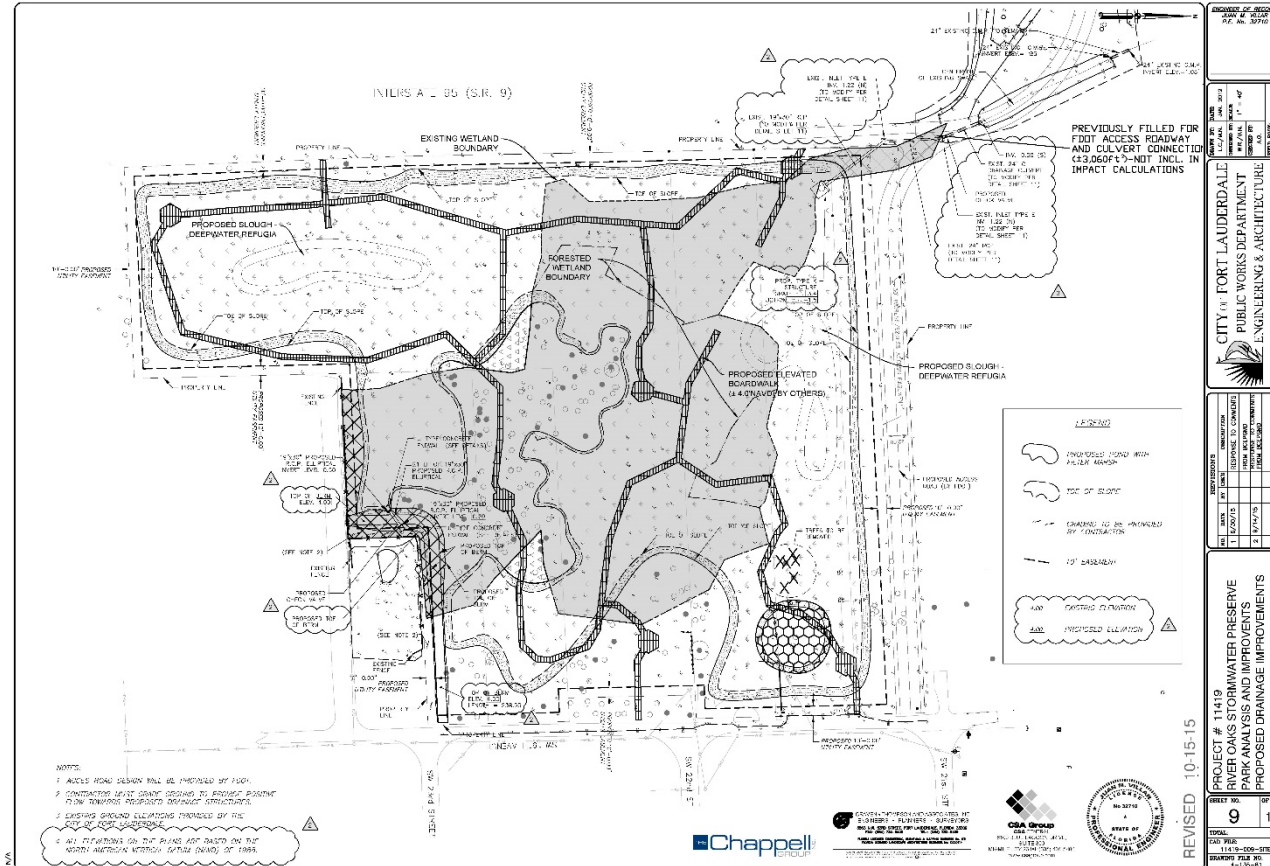


Certain underserved areas



Limited stormwater infrastructure

Proposed improvements designed to address water quality also.



- Water Quality Structures
- Permeable Pavement
- Exfiltration Trench
- Swales
- Created Wetland

Extensive **geotechnical investigation** and **design level survey** have been completed.

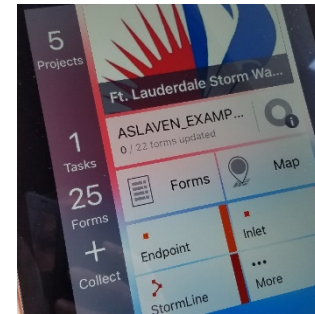
Geotechnical

- Over 100 borings completed/analyzed
- Hydraulic conductivity tested (exfiltration trench design)



Survey

- Over 40 miles of right-of-way surveyed
- Pump station properties
- Other specific stormwater features



Standard details and specifications were developed for the program.

1

General Civil Notes

General

2



Erosion and Sediment Control

3



Stormwater

4



Green

5



Water

6

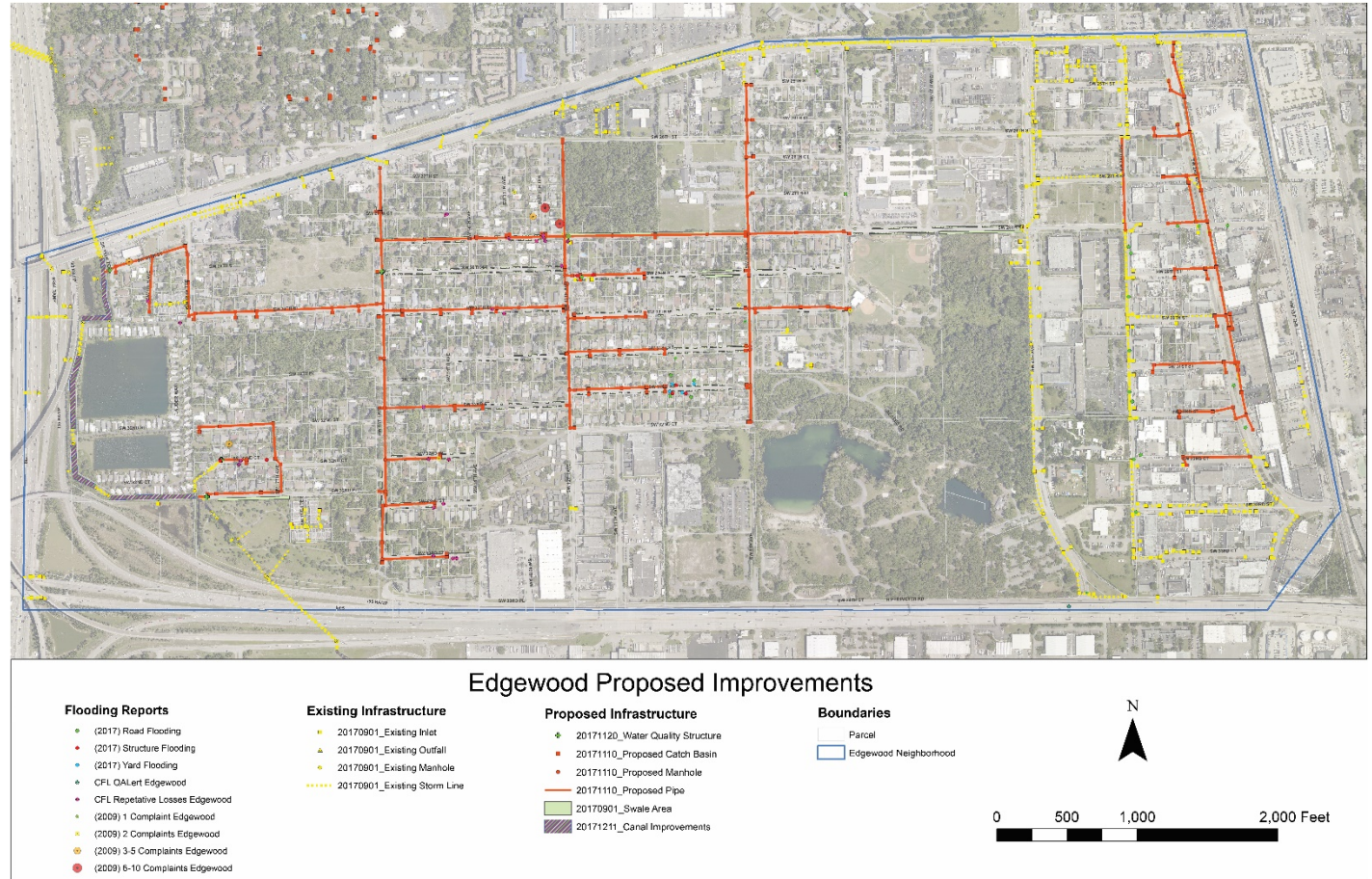


Road

Neighborhood designs were developed to address concerns surfaced.

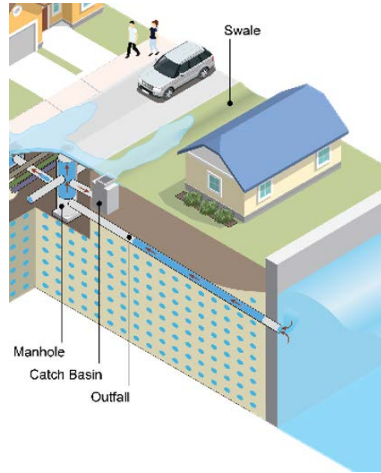
Via:

- Public input
- City records
(including repetitive loss properties)
- Modeling efforts

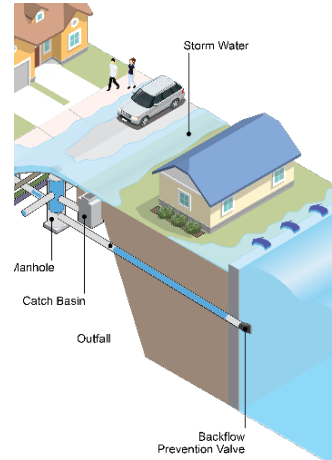


Certain areas will require a systematic, phased approach.

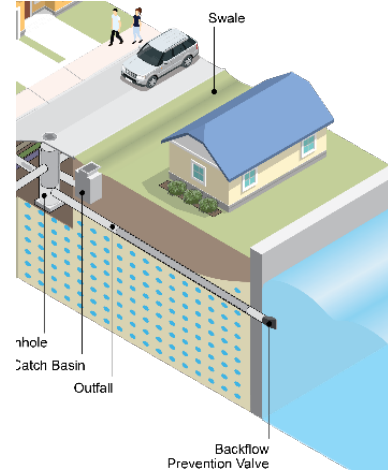
“Holding out the Tide” requires public and private property modifications.



**High Tide
Backflow**



**Seawall
Breaching**

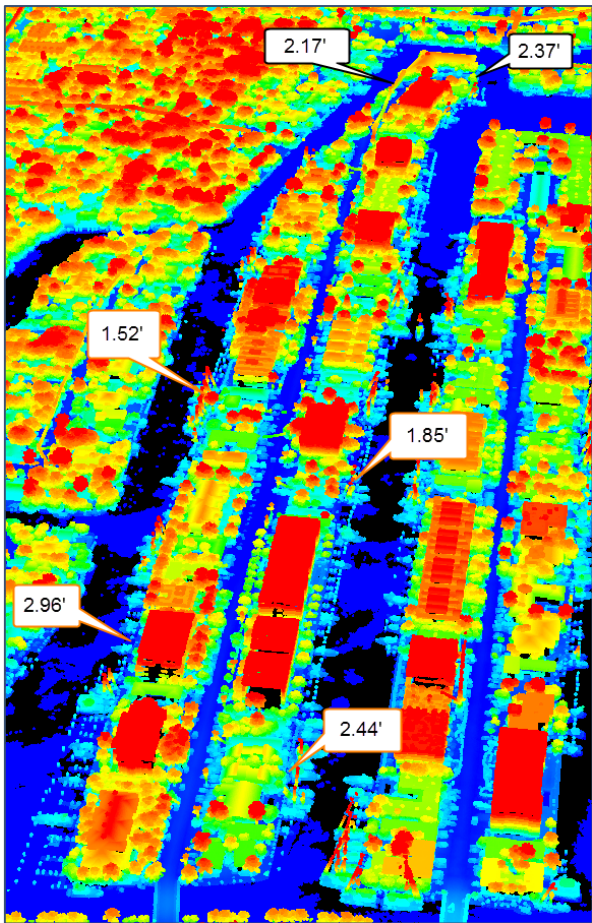
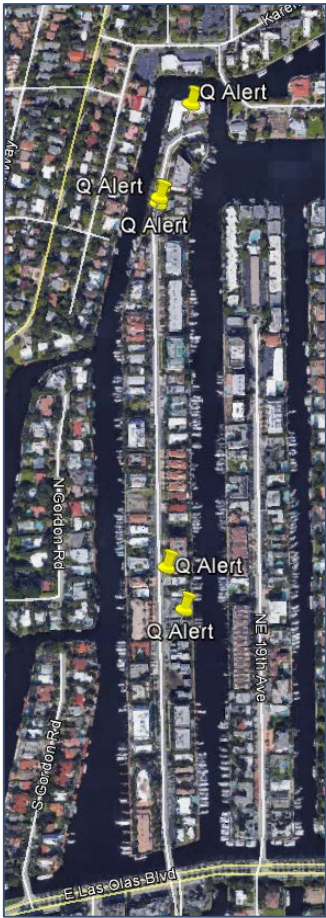
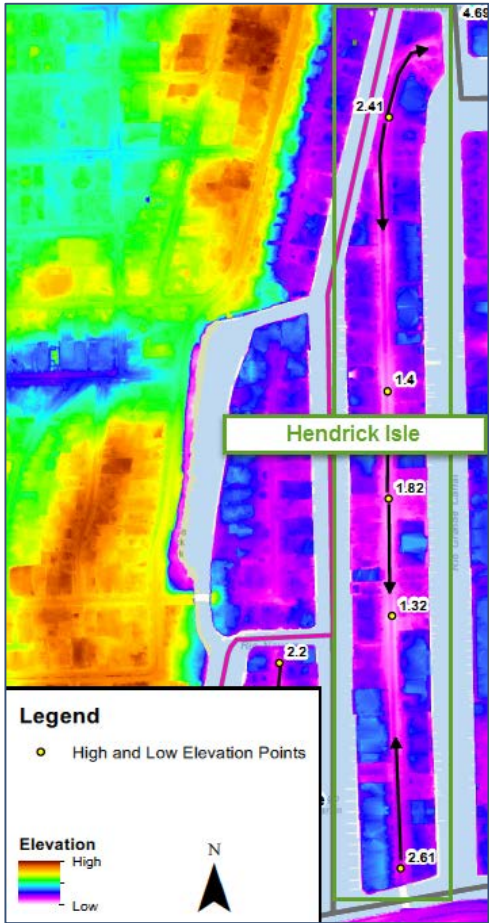


**Tidal Flow
Control**

**INSTALL
Tidal Valves
(this Phase = 104)**

**RAISE
Seawalls
(14 City Owned to 5' NAVD)**

But some areas will ultimately require **raising private seawalls too.**



Significant improvements are proposed across the 7 neighborhoods.

Improvement	Dorsey Riverbend	Durrs	Edgewood	River Oaks	Progresso	Southeast Isles	Victoria Park
New storm sewer (LF)	2,400	7,500	27,105	12,550	1,282	9,296	9,300
Replaced storm sewer (LF)	2,350	26,150	5,395	4,850	13,377	30	3,600
Exfiltration trench (LF)	4,700	3,850	2,820	2,640	0	0	9,000
New/restored swale (SY)	7,050	6,850	12,000	7,900	1,450	0	36,000
Drainage wells (#)	24	0	0	0	37	0	0
Water quality structures (#)	2	2	5	4	2	2	6
Pump Stations (#)	1	0	0	2	1	2	1
Back flow preventers (#)	1	0	3	0	1	104	6
Permeable pavement (SY)	9,800	3,520	32,500	3,000	9,400	0	0
Created wetlands (AC)	0	0	0	8.4	0	0	0
Seawall replacement (LF)	0	0	0	0	0	5,262	120
Canal/Creek maintenance (LF)	0	0	2,100	0	0	0	0

Proposed investments in the 7 neighborhoods expected to range from **\$150-\$200M** in total construction costs.

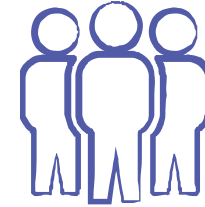
Improvement	Total	Unit
New Storm Sewer	69,433	LF
Replaced Storm Sewer	55,752	LF
Exfiltration Trench	23,010	LF
New/Restored Swale	71,250	SY
Drainage Wells	61	#
Water Quality Structures	23	#
Pump Stations	7	#
Backflow Preventers	114	#
Permeable Pavement	58,220	SY
Created Wetlands	8	AC
Seawall Replacement	5,382	LF
Canal/Creek Maintenance	2,100	LF

NEIGHBORHOODS

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Public Outreach

Neighborhood meetings have been held in the affected areas.



Neighborhood	First Meeting	Second Meeting
Dorsey Riverbend	February 27, 2017	May 22, 2017
Durrs Area	April 3, 2017	May 22, 2017
Edgewood	March 8, 2017	June 15, 2017
Progresso	February 20, 2017	June 19, 2017
River Oaks	March 8, 2017	June 15, 2017
Southeast Isles	March 6, 2017	June 5, 2017
Victoria Park	March 1, 2017	June 7, 2017

Final design meetings to occur in **Jan/Feb 2018.**

Neighborhood Meeting Purposes



First Meeting

Get to know neighbors, share vision, gather input



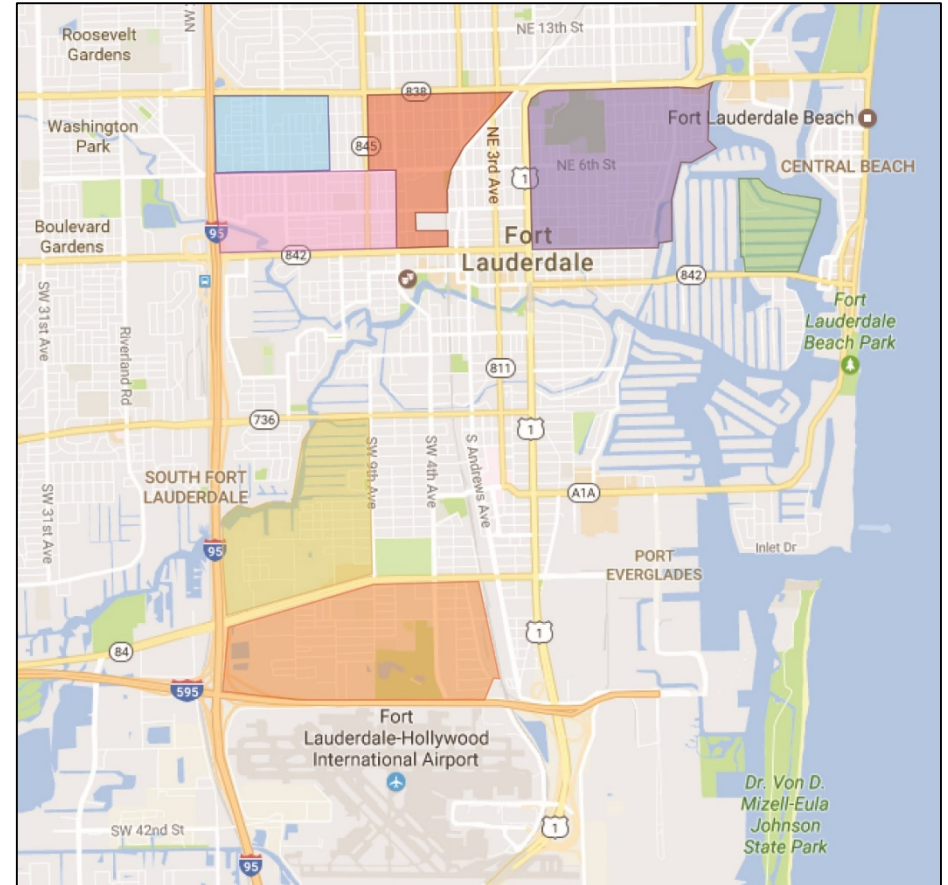
Second Meeting

Present preliminary design



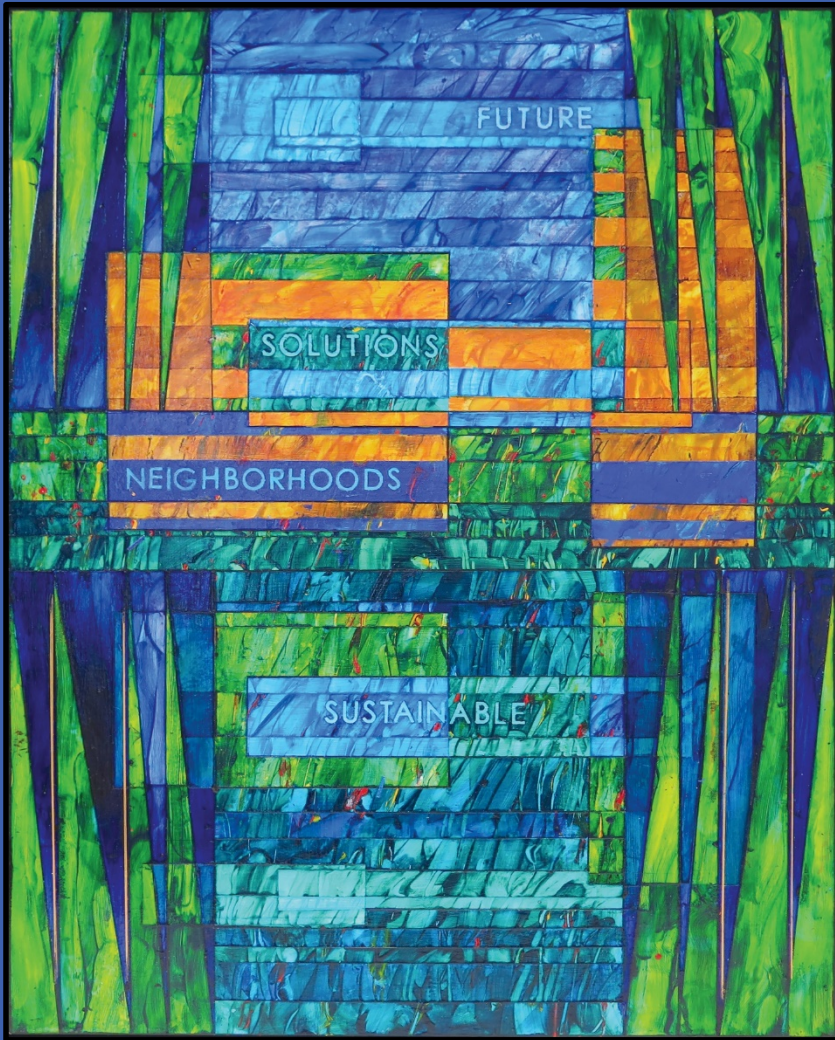
Third Meeting

Share final design



Next steps moving forward include:

- Final design meetings with 7 neighborhoods
- Complete conceptual permitting of City-wide model
- Complete permitting of improvements in 7 neighborhoods
- Complete JPA with FDOT; seek other grant funding
- Finalize design documents based on regulatory comments
- Prepare for bidding once funding is in place
- Use model to evaluate future improvements beyond the initial neighborhood projects



The Hazen Team



City of Fort Lauderdale

Thank you.