SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Context and Big Picture
Flood Protection Level of Service Program

A Systematic Approach to Ensure Infrastructure Readiness

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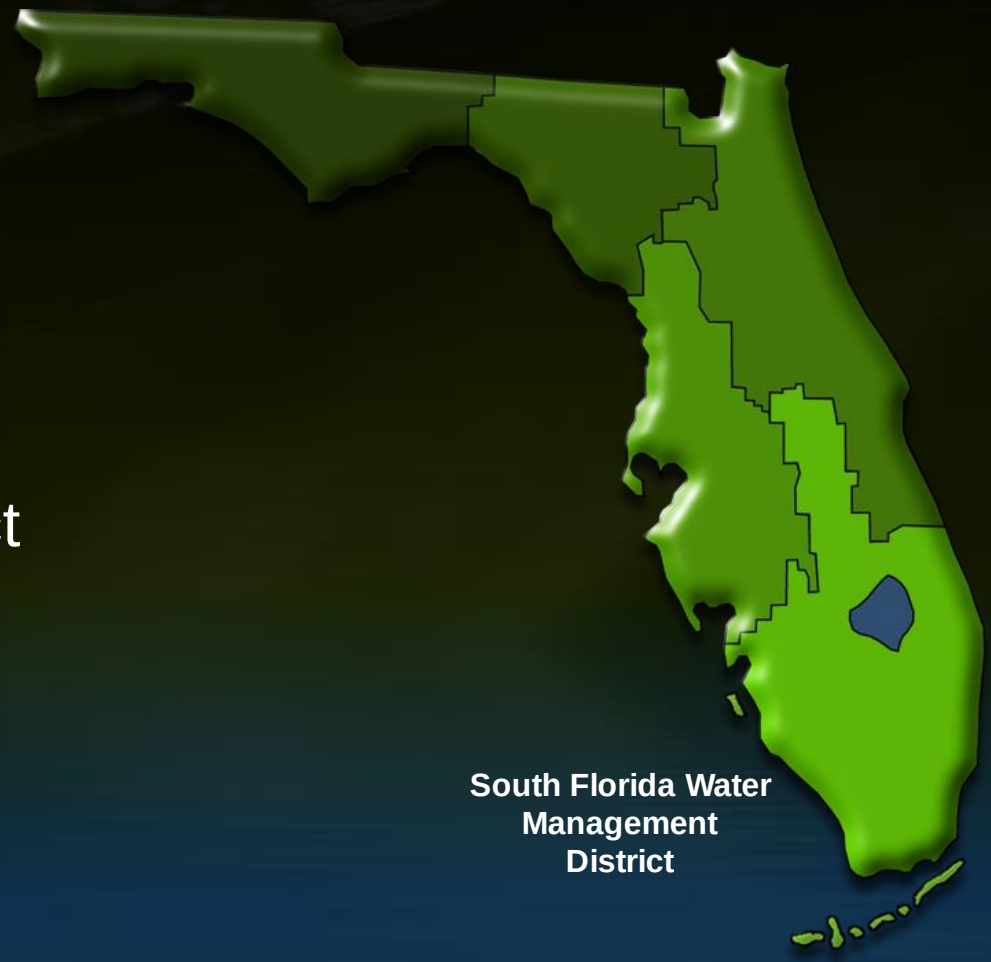
sfwmd.gov

Who We Are and What We Do

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

- Oldest and largest of the state's five regional water management districts
- Protecting water resources in the southern half of the state since 1949
- Our mission: To safeguard and restore South Florida's water resources and ecosystems, protect our communities from **flooding**, and meet the region's water needs while connecting with the public and stakeholders



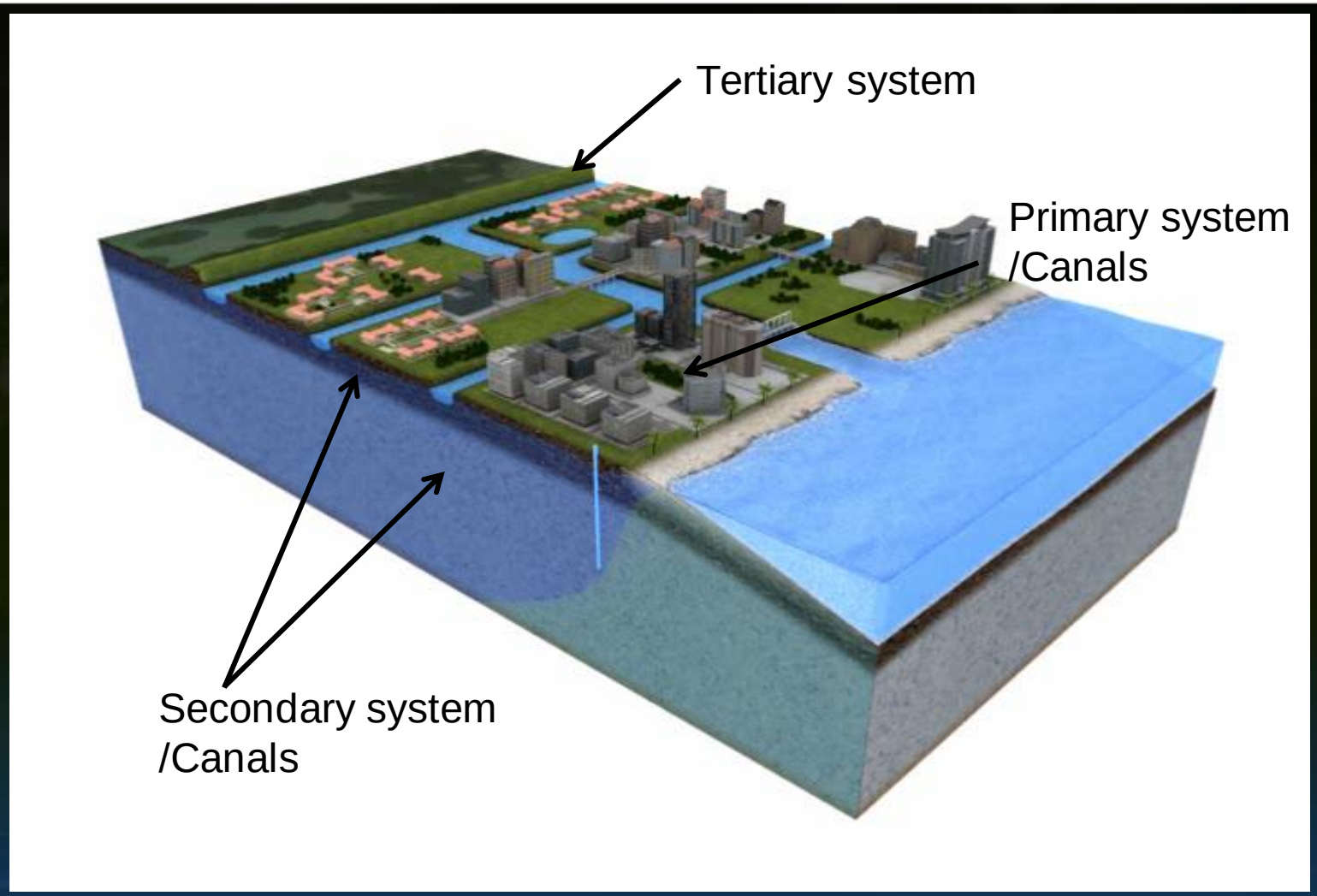
South Florida Water Management District

Water Management System

- 2,060 miles of canals
- 2,028 miles of levees
- 160 major drainage basins
- 1,413 water control **structures**
- 71 pumping stations
- 60,000 acres of regional wetland Stormwater Treatment Areas
- Lake Okeechobee
  - 450,000 acre surface area
- Water Conservation Areas
  - 959,000 acre water storage

Flood Protection Responsibility

- Primary
  - **USACE**
  - **SFWMD**
- Secondary
  - Local Governments
  - Special Districts
- Tertiary
  - Homeowners Associations
  - Private Land Owners



Changing Conditions

To address emerging and anticipated need

We have: Aging Infrastructure

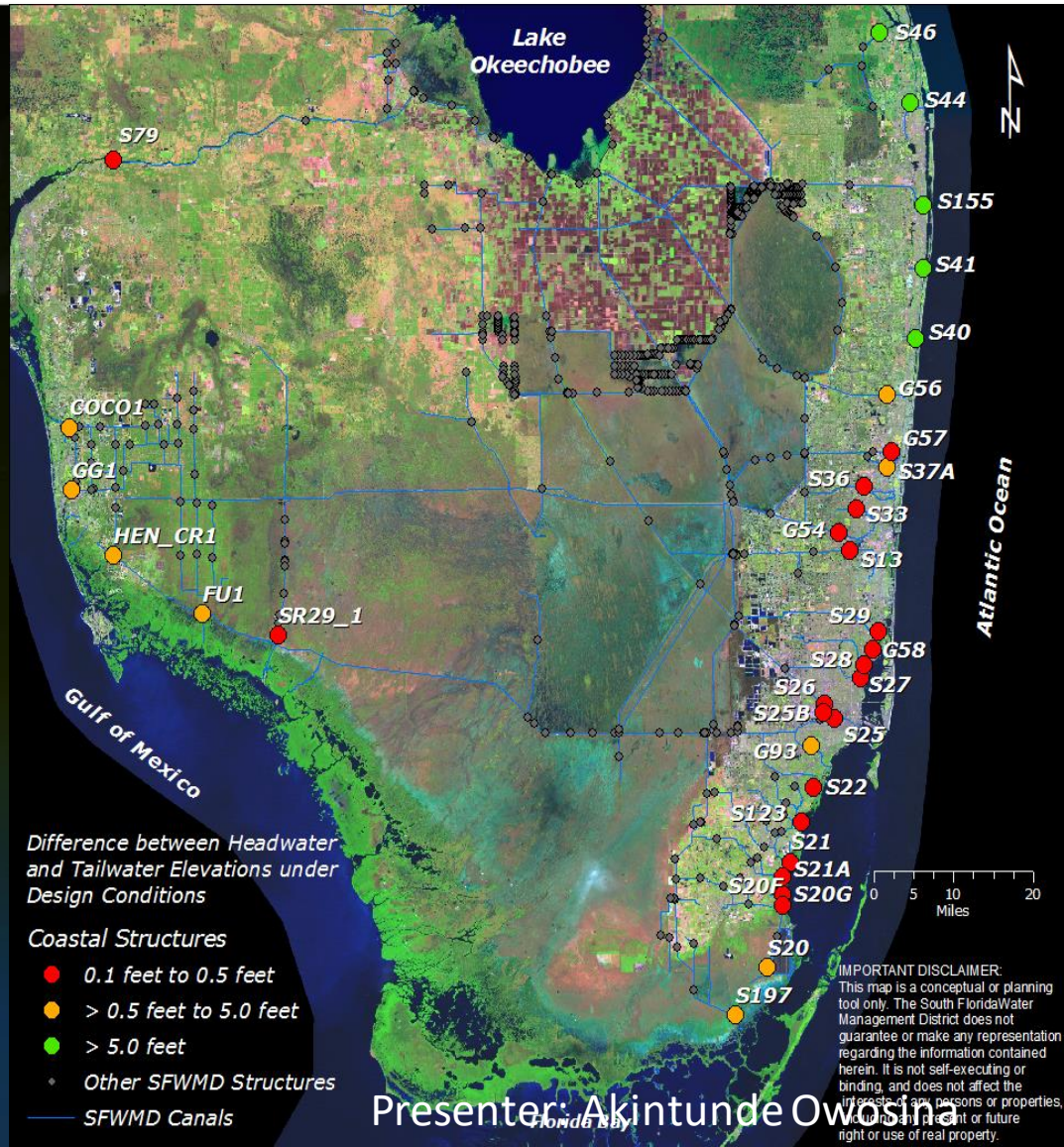
- C&SF Project designed and built 60+ years ago
- Approaching end of design life

With: Obsolete Assumptions

- Original design did not account for the sea level rise
- Original design for a population of 2 million people
- Original projections were for less urban development than has occurred over the years

And: Vulnerable to SLR

- Several low-lying structures determined to be vulnerable to S



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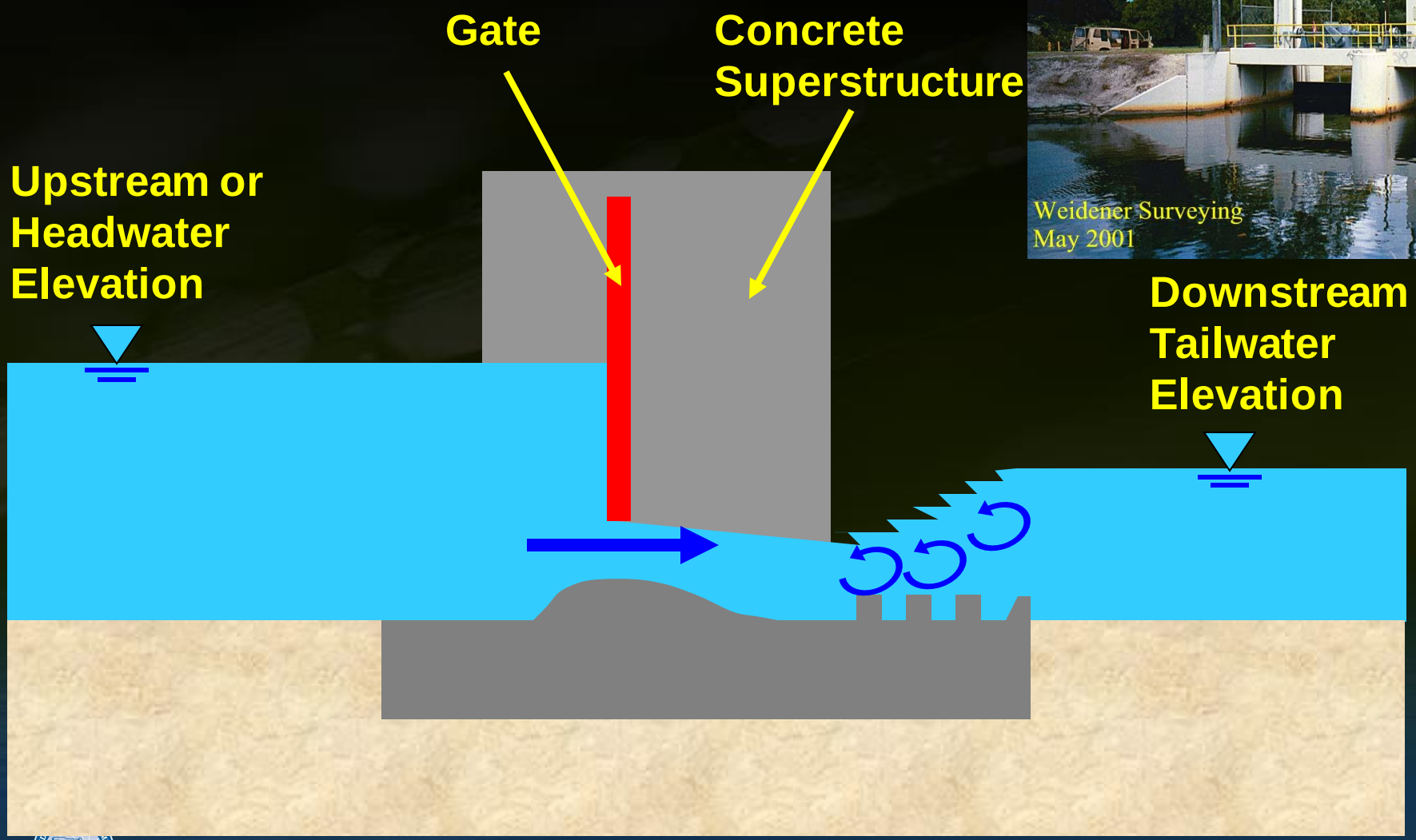
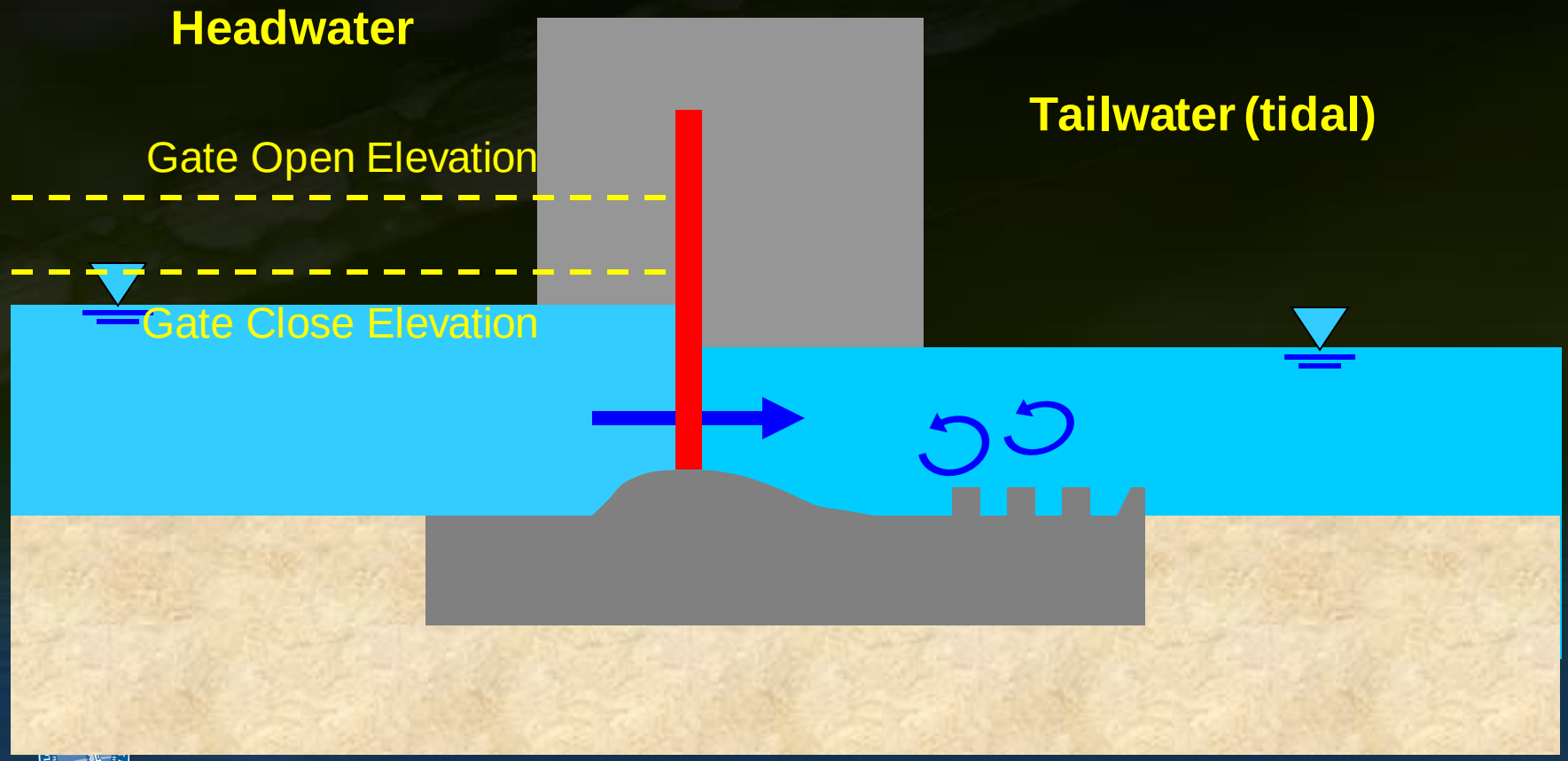
Gated Spillway Basics



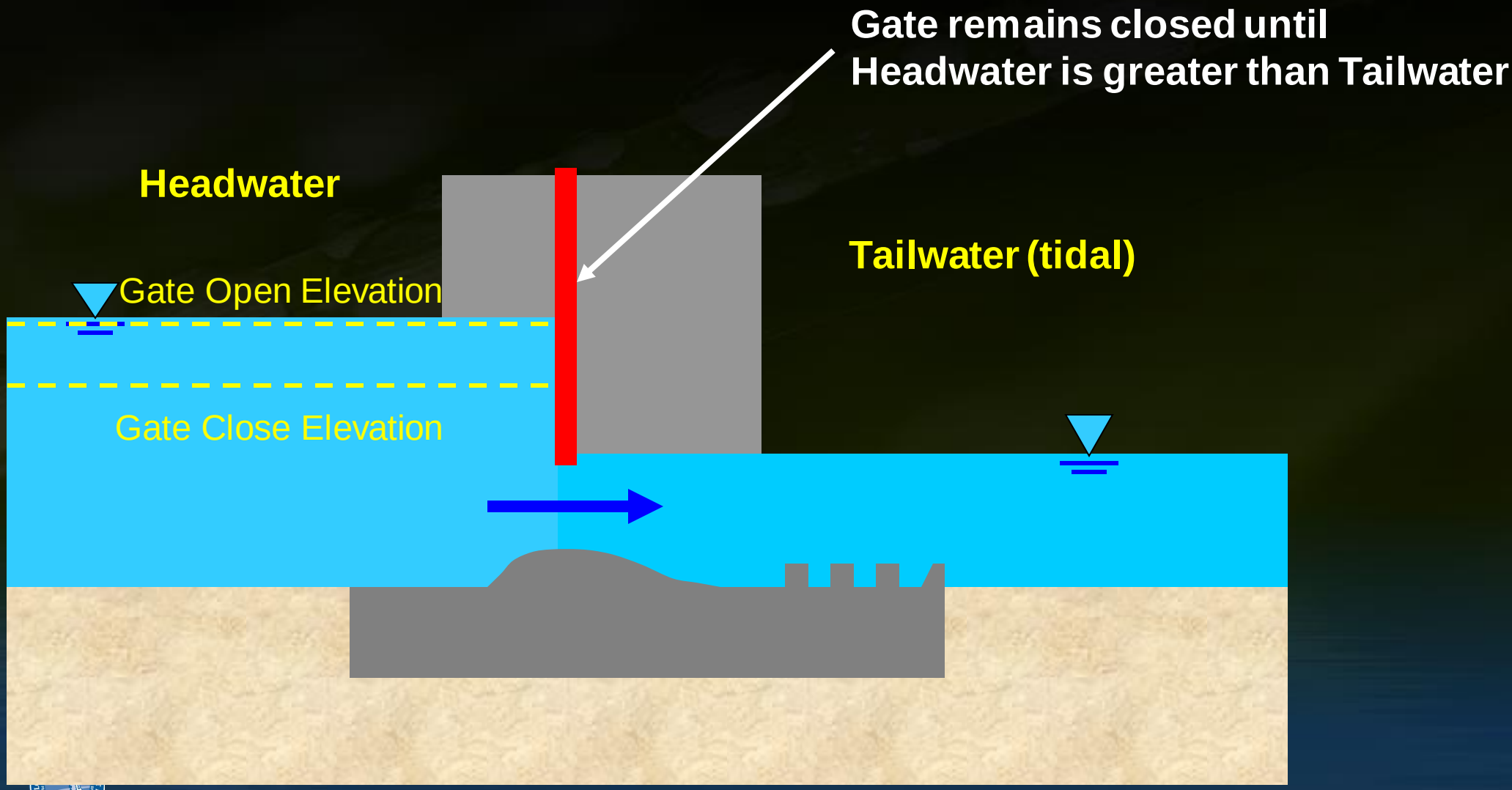
Gated Spillway

(coastal structures)



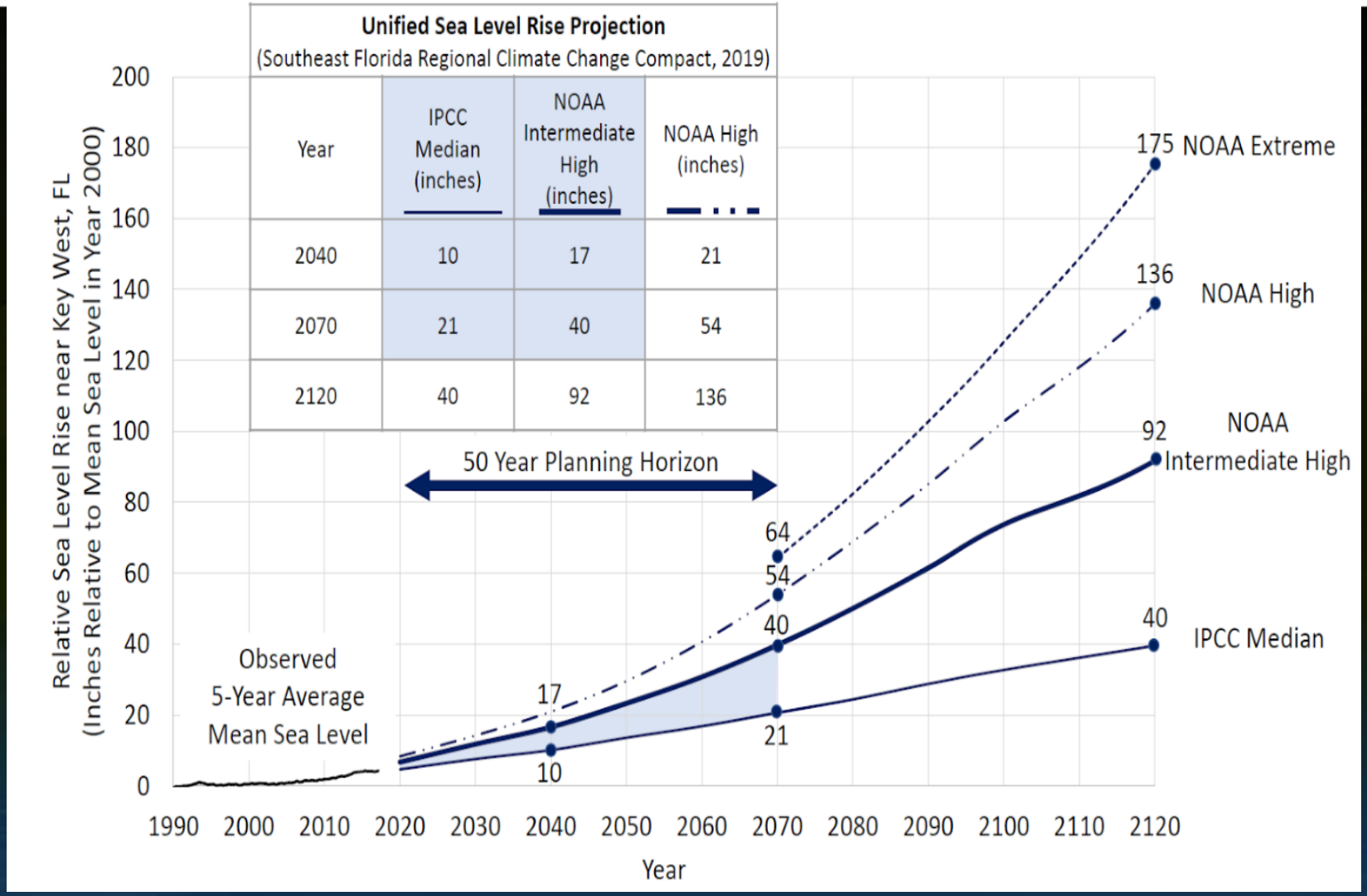
Gated Spillway

(coastal structures)



Unified SLR Projections 2019 (Climate Compact)

- Developed by the Four-County Compact
  - Palm Beach
  - Broward
  - Miami Dade
  - Monroe
- SFWMD staff provided technical assistance



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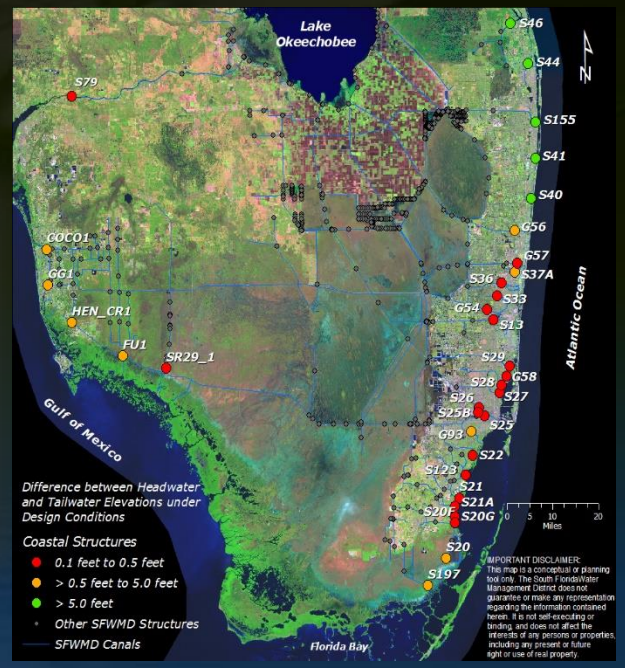
Coastal Structures and Flood Protection

Potentially impacted gravity coastal structure in Miami-Dade County

Aerial Map of Coastal Miami

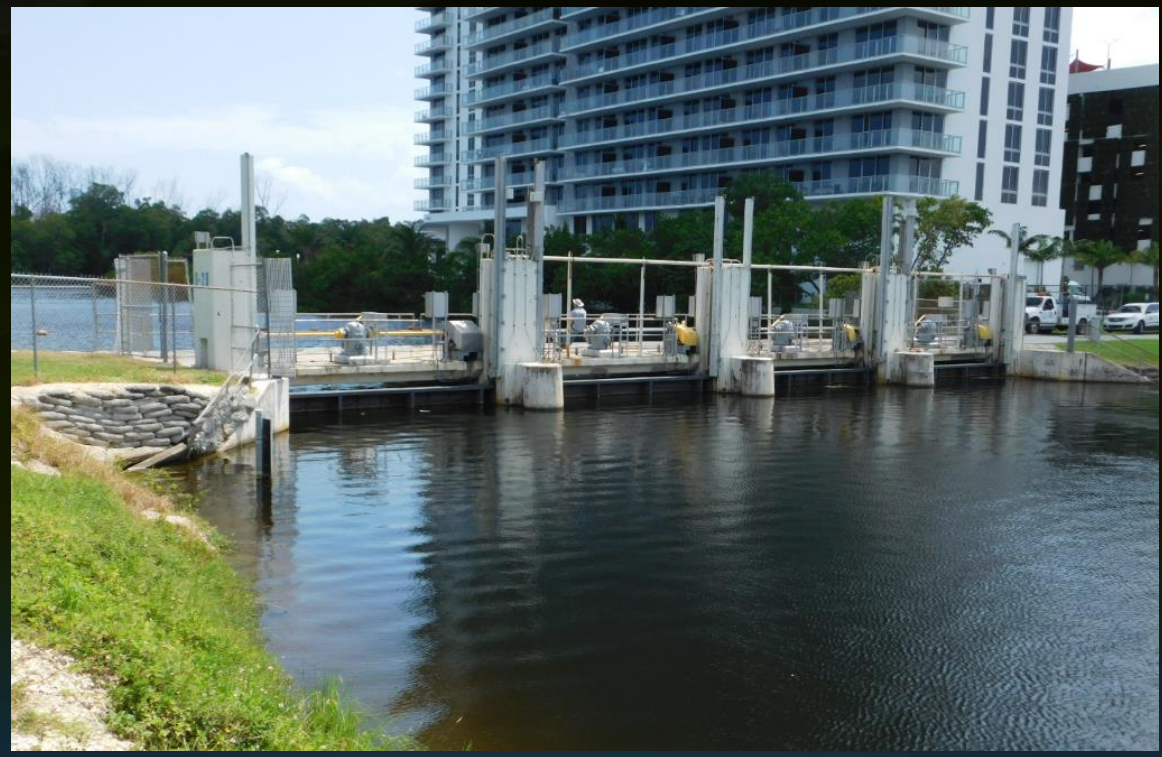


- Gravity Coastal structures on primary canals (also known as “Salinity Barriers”) showing inefficiency during high tide
  - Designed and built in the 1950s
  - Finding from initial screening: Miami-Dade County most potential to be impacted
- Future potential rise in water table due to sea level rise will further impact flood protection
- Future potential increase in extreme rainfall and the projected increase in intensity and frequency of hurricanes will exacerbate sea level rise impacts

… The Big Questions …

We have the aging infrastructure approaching or past design end of life:

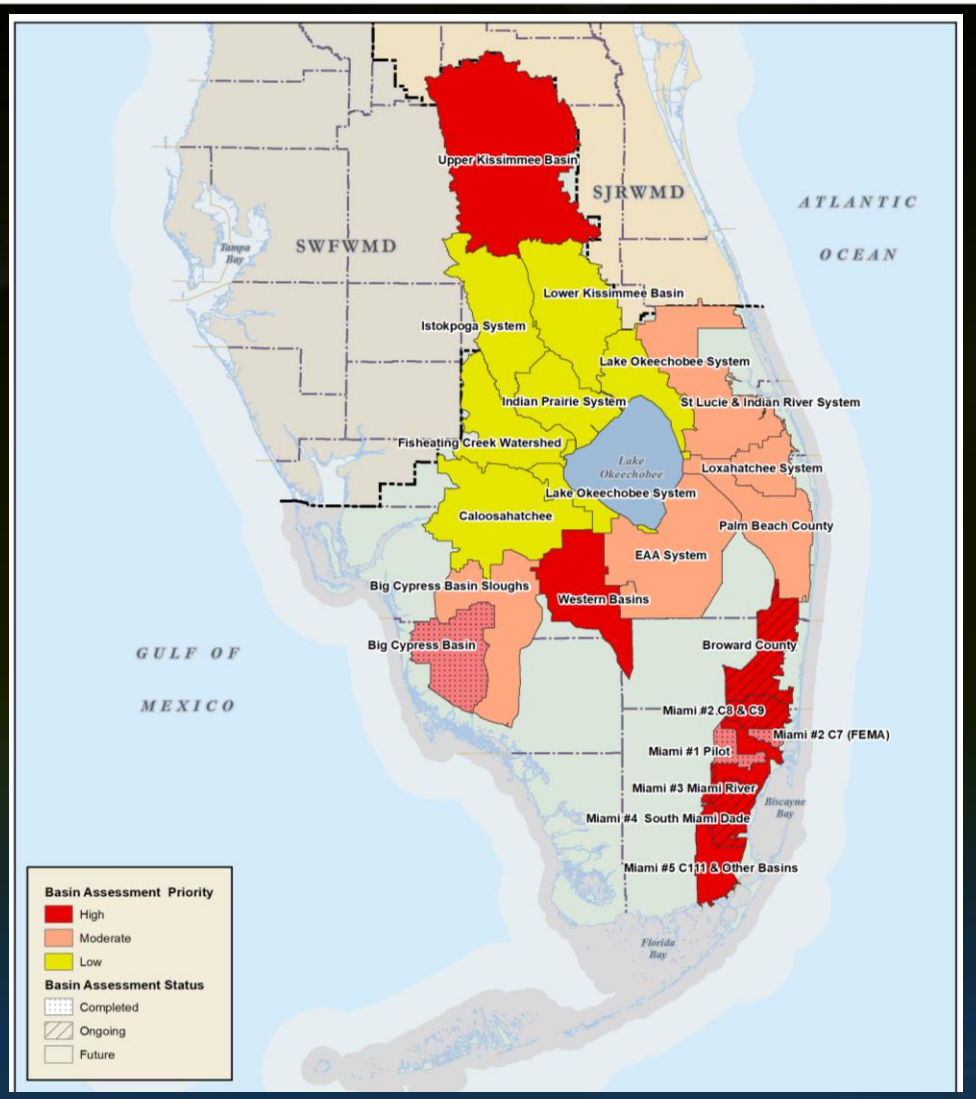
- Do we replace them and if so When do we replace them ?
- What do we replace them with ?
  - In kind - same as it was? or
  - Different to accommodate known changes since design and projected changes?
- Where and how ?
  - What goes first, what happens next?
  - What happens downstream of our current assets?



Flood Protection Level of Service Program

How we ensure that our flood control assets are up to the task considering development, land use change, SLR and climate change

- Identify and prioritize long-term District infrastructure needs
- Assess level of flood protection throughout the 16-counties of the SFWMD – relative to design
- Identify at-risk structures and needed improvements to operations, canal conveyance or structures
- Provide a **formal process** to initiate retrofit and adaptation efforts for future infrastructure improvements and/or modification of regulatory criteria
- Incorporate **resilient** design standards and construction
- Coordinated with SFWMD Operations, local government entities, drainage districts and other agencies with flood control or related responsibility



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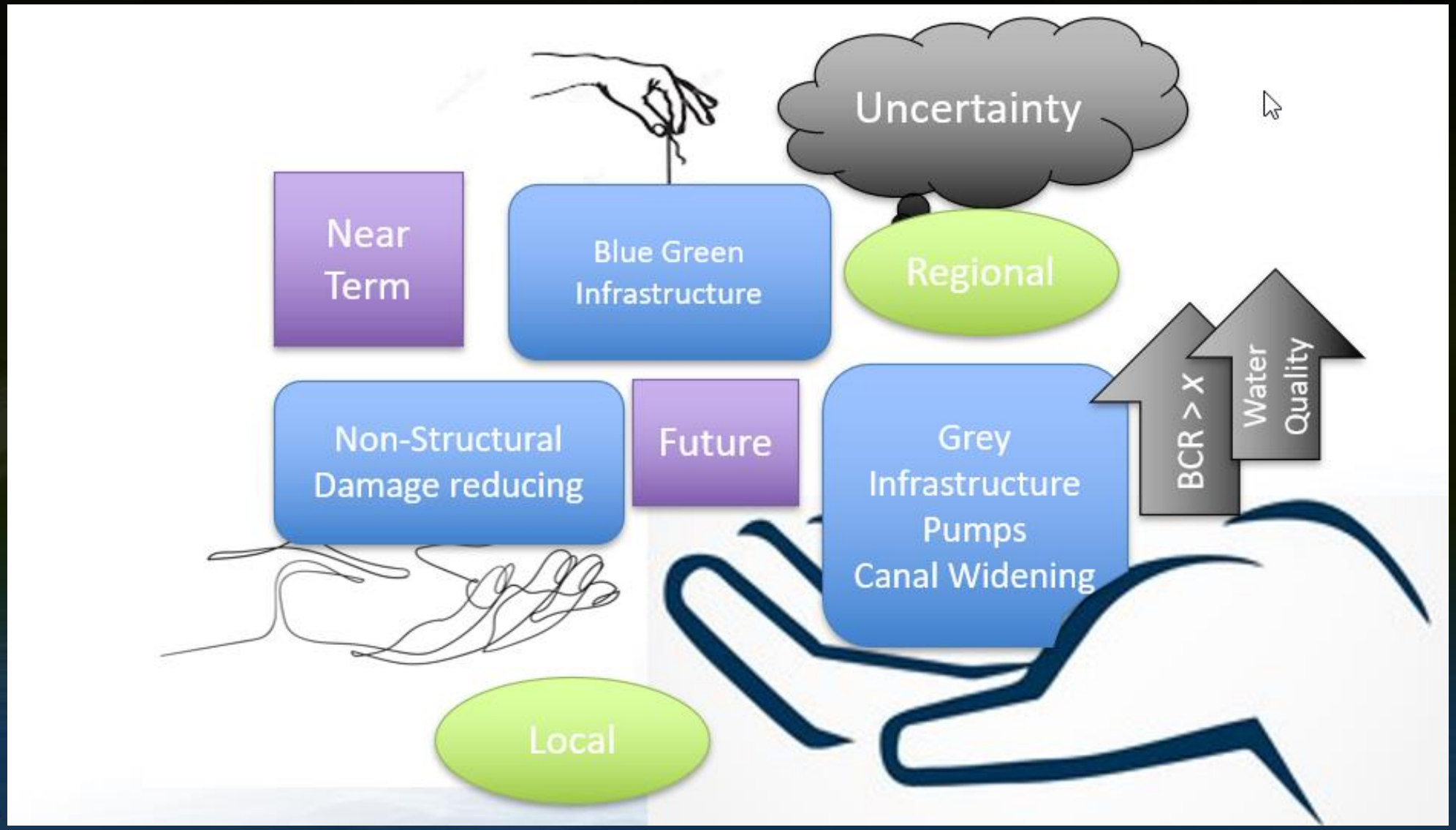
Three Phases of the FPLOS Program

Phase 1
Assessment

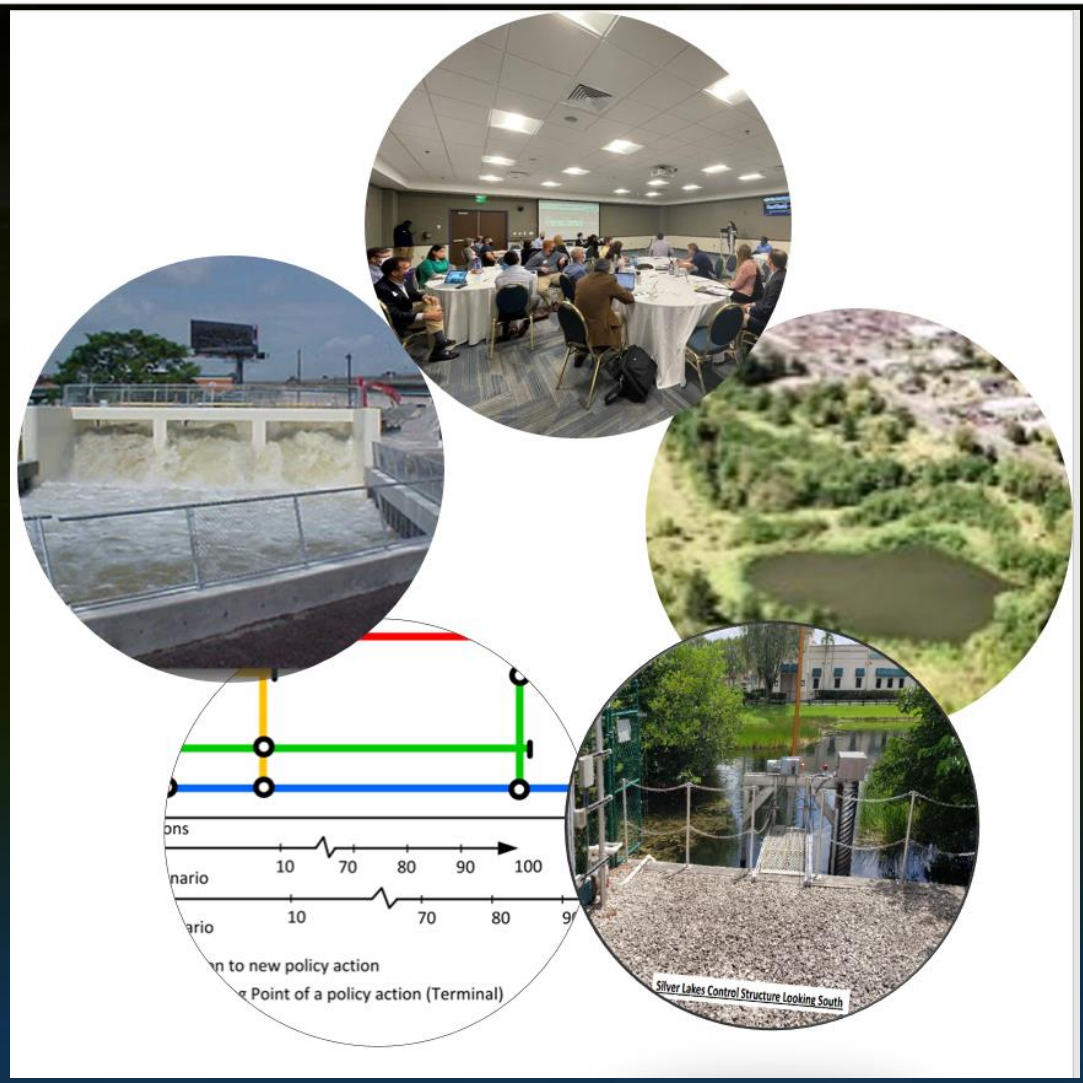
Comprehensive Approach: Mitigation and Adaptation



Collaborative Approach

What it is all about:

- Collaboration and partnership in planning and implementing
- Basin-wide coordinated approach, understanding and integrating local and regional priority needs
- Hybrid approach to solutions that include grey, blue and green infrastructure and strategies
- No regret action in the sort term but they are robust and adaptable or evolvable



Thank you!

Photo Credit: Miami Herald; Sea rise added to Hurricane Irma flooding

C-8 and C-9 Basins
FPLOS – Adaptation and Mitigation Study

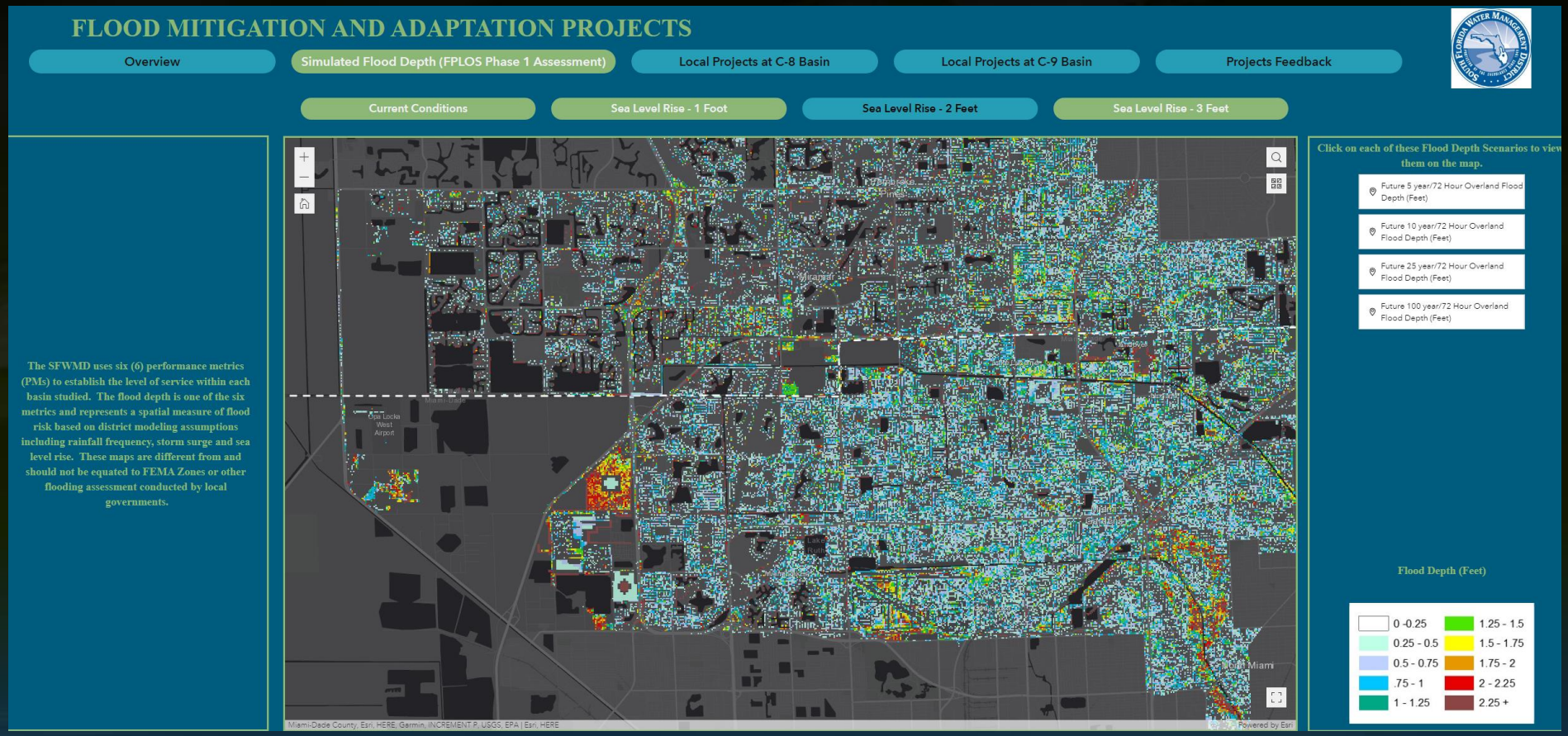
April 11, 2023

C-8/C-9 FPLOS Adaptation and Mitigation Study

Basin-wide Coordinated Approach: understanding local and regional priority needs

Working to identify local and regional solutions

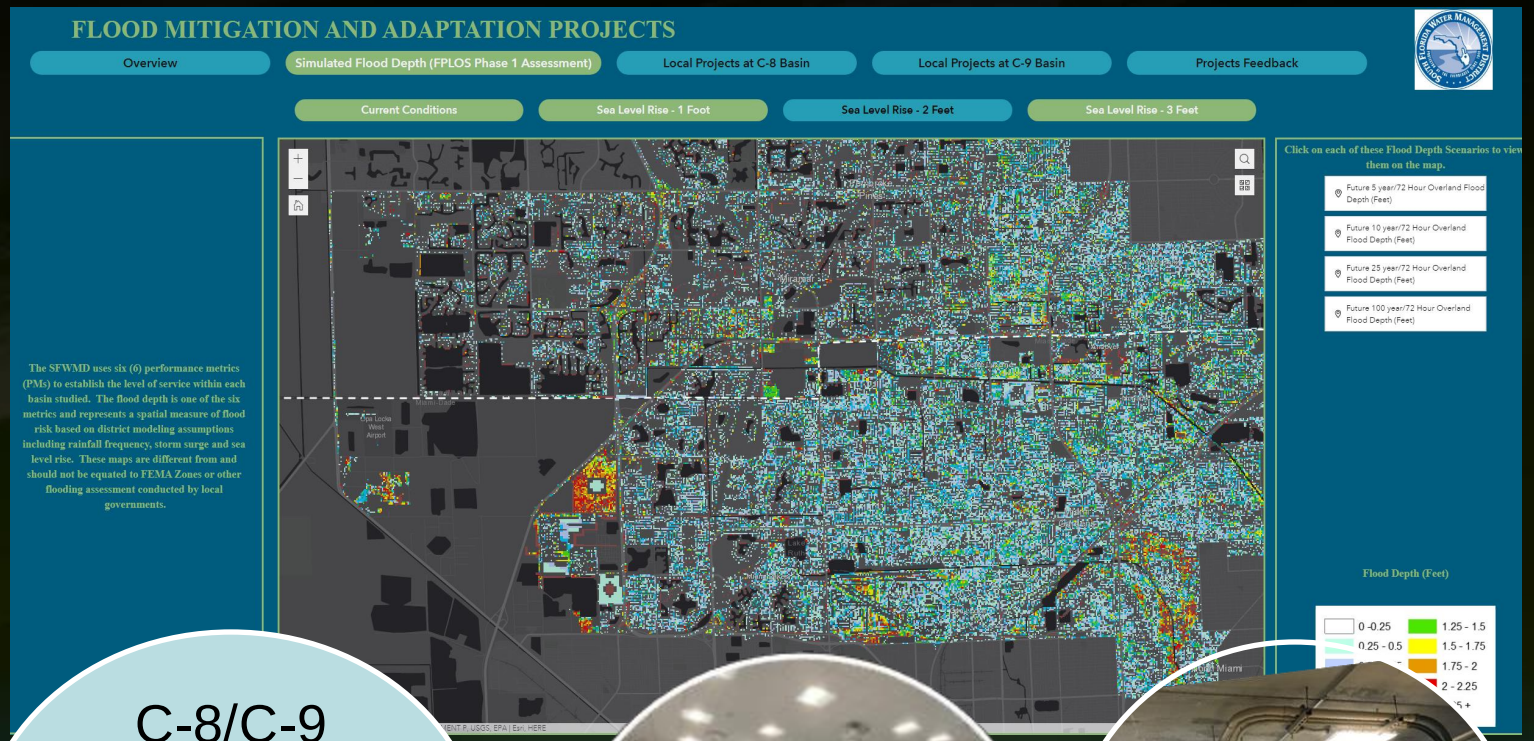
C-8/C-9 Watersheds: [C-8 C-9 Basins FPLOS (buildcommunityresilience.com)]



C-8/C-9 FPLOS Adaptation and Mitigation Study

Basin-wide Coordinated Approach: understanding local and regional priority needs

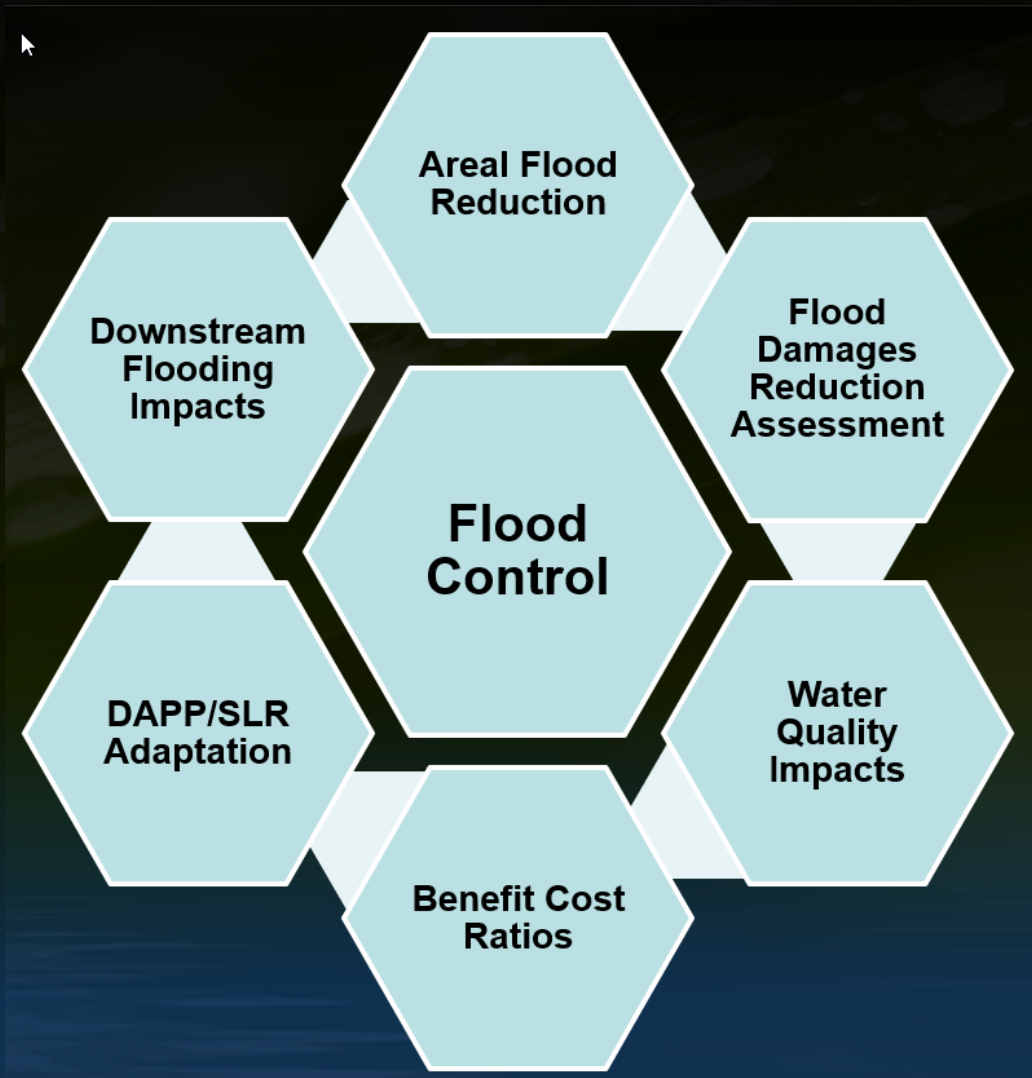
- Straddles Miami Dade and Broward County, Municipalities and 298 Districts
- Paradigm shift in stakeholder expectations flood protection strategies
- Public Planning Process:
  - Workshop
  - 41 technical team meetings
  - Present the findings in a public workshop
- Comprehensive Assessment Strategy



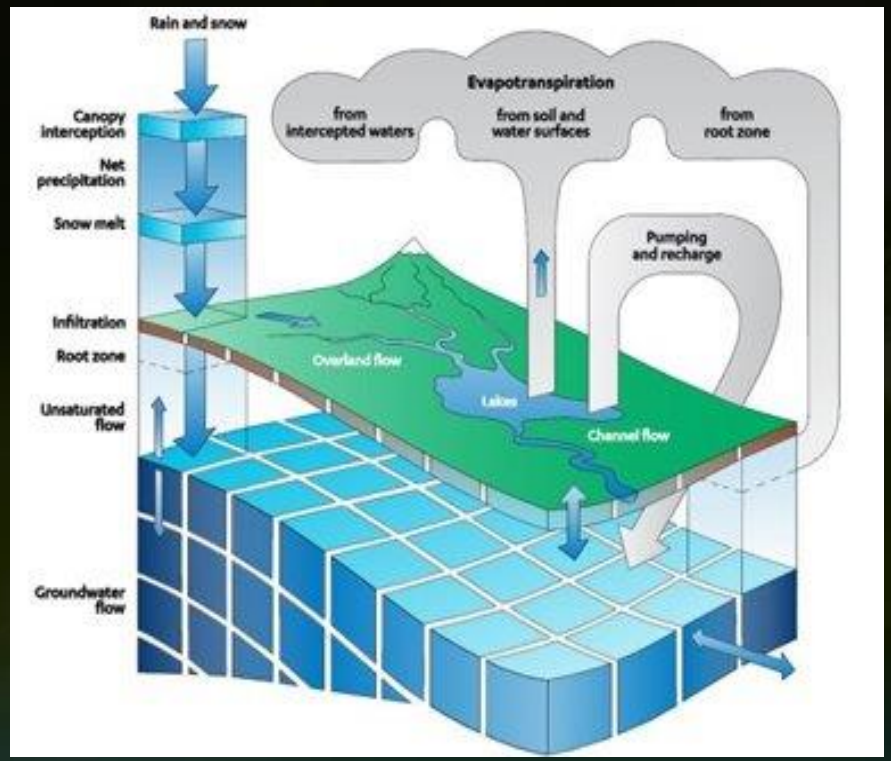
C-8/C-9 Watersheds: [C-8 C-9 Basins FPLOS (buildcommunityresilience.com)]

Comprehensive Assessment Strategy

- H&H modeling – Flood Reduction
- Flood Damages Reduction Assessment
- Cost/Benefit Assessment
- Downstream Impact of recommended strategy
- Water Quality Impact of recommended strategy
- Project sequencing using Adaptation Pathway Planning Approach



Model Tool and H&H Assessment



- Physics-based spatially distributed model tools

  Overland flow, Unsaturated flow, Groundwater flow, and fully dynamic channel flow

- Current Condition and Future without projects Simulation (Completed in Phase I)

  4 rainfall events paired with surge and different sea level rise conditions

- Future with projects (Phase II)

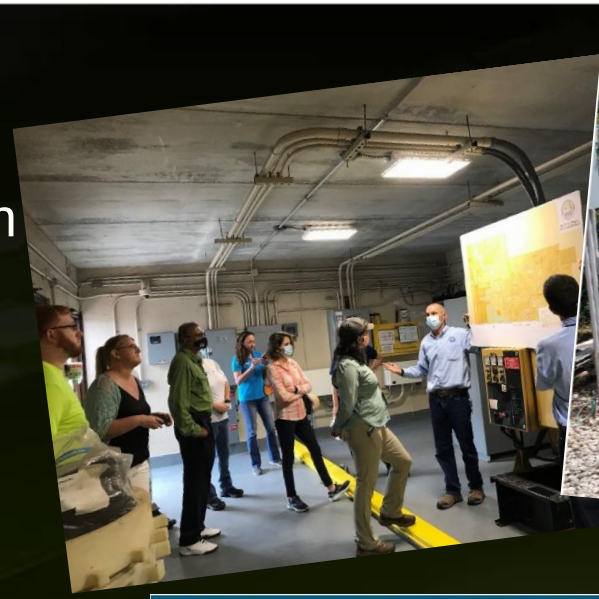
- H&H Objectives:
  - lower the peak stage profiles at the primary canal and
  - reduce flood inundation area, depth, and duration basin wide

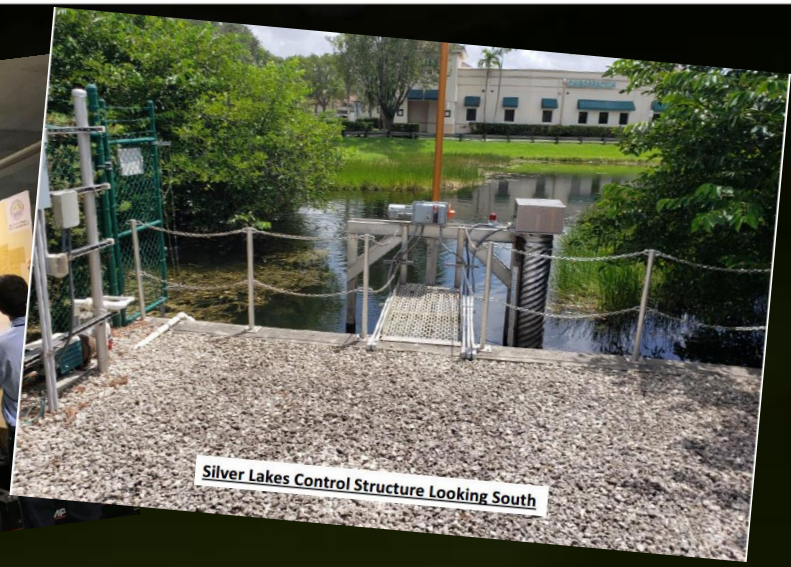
- 4 rainfall events paired with surge and different sea level rise conditions
  - M2A: forward pump, gate improvement, tieback levee, distributed storage
  - M2B: Additional pump units, canal improvement, internal drainage to the primary system
  - M2C: Additional pump units: canal widening
  - M1 (Local level projects): Analytical solutions

M1 Local Level Projects

General Categories

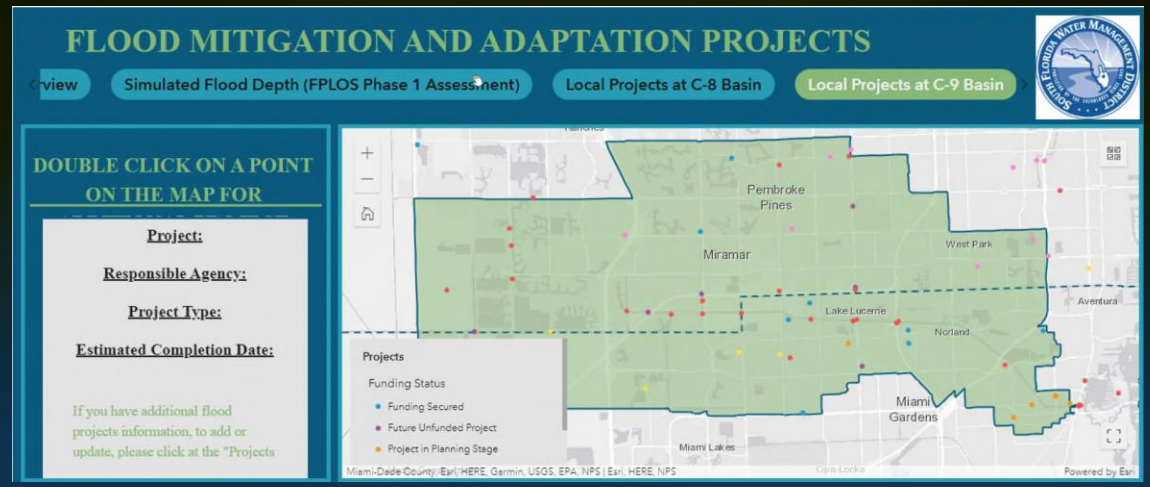
- Stormwater System Improvement/rehabilitation
- Sluice Gates
- Local Pumps
- Conveyance culverts





Benefits

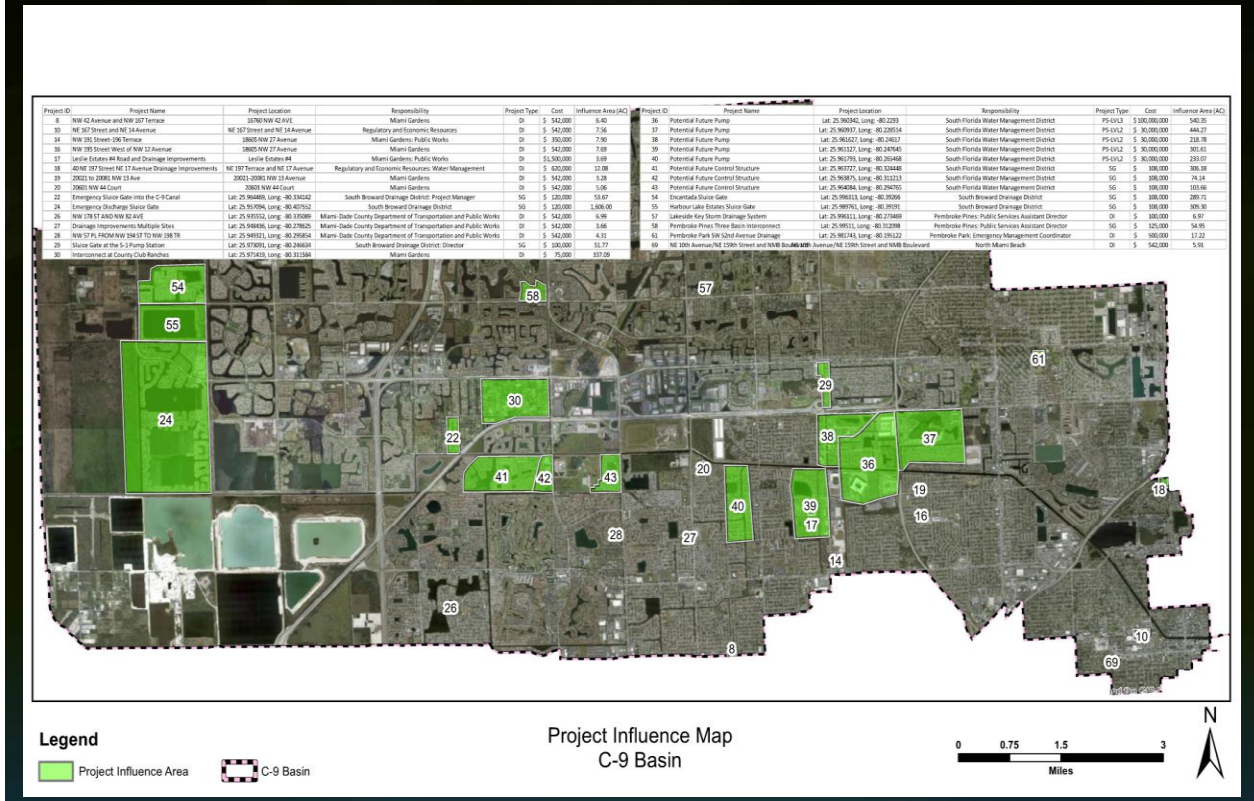
- Provide operational flexibility
- Enhance the local level flood control
- Improve secondary or tertiary conveyance
- Permit pre-storm drawdown
- Improve storage utilizing efficiency



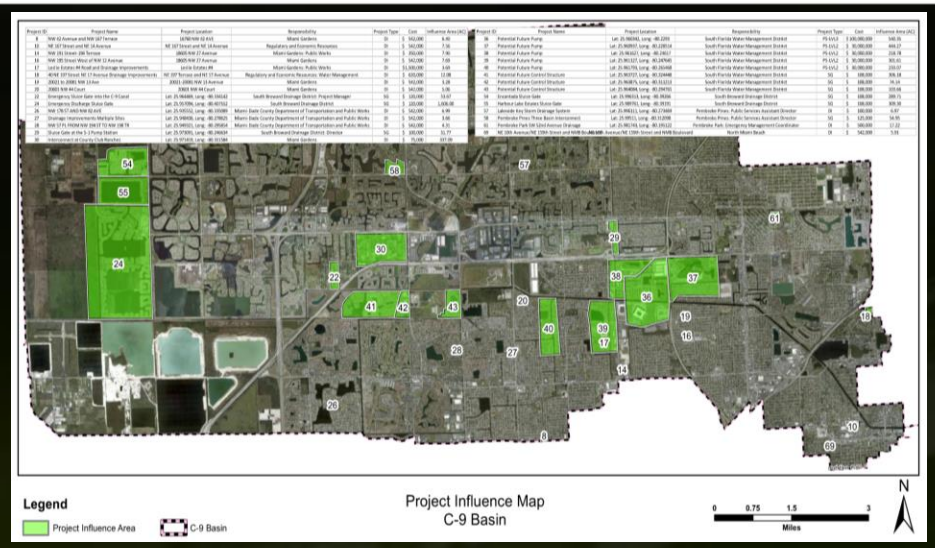
C-8/C-9 Adaptation and Mitigation Study – Local Scale (M1)

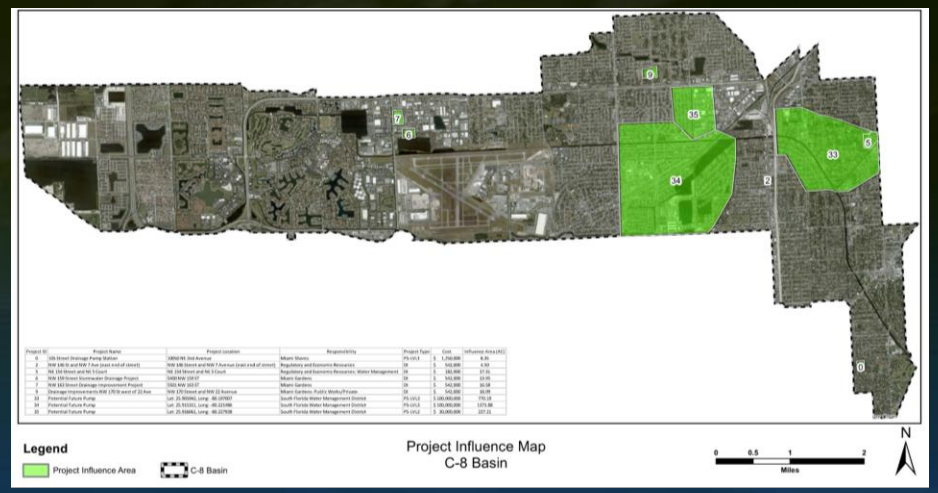
Local Projects in Broward County

22. Emergency Sluice Gate into the C-9 Canal (SBDD)
24. Emergency Discharge Sluice Gate (Lat/Long) (SBDD)
29. Sluice Gate at the S-1 Pump Station (SBDD)
30. Potential Future Pump
37. Potential Future Pump
38. Potential Future Pump
54. Encantada Sluice Gate (SBDD)
55. Harbour Lake estate Sluice Gate (SBDD)
57. Lakeside Key Storm Drainage System (Pembroke Pines)
58. Pembroke Pines Three Basin Interconnect (Pembroke Pines)
61. Pembroke Park SW 52nd Avenue Drainage (Pembroke Pines)



C-8/C-9 Adaptation and Mitigation Study – Local Scale (M1)





Local Projects at Miami Dade County

0. 105 Street Drainage Pump Station (Miami Shores)
2. NW 146 St and NW 7 Ave (Miami Dade County)
5. NE 154 Street and NE 5 Court (Miami Dade County)
6. NW 159 Street Stormwater Drainage Project (Miami Gardens)
7. NW 163 Street Drainage Improvement Project (Miami Gardens)
9. NW 170 St West of 22 Ave Drainage Improvement (Miami Gardens)
30. Interconnect at County Club Ranches (Miami Gardens)
33. Potential Future Pump
34. Potential Future Pump
35. Potential Future Pump
*. Secondary canal bank reconstruction (about 40 miles)
*. 28 Drainage improvements at various locations

C-8/C-9 Adaptation and Mitigation Study – Regional Strategies

Regional (M2A)

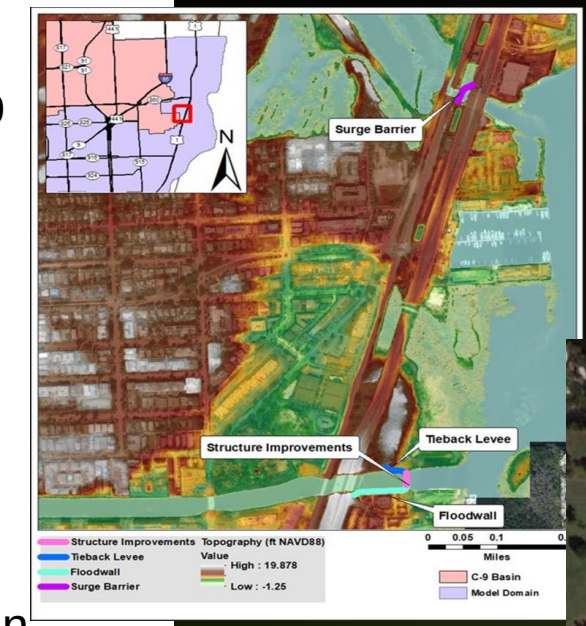
- S28 and S29 forward pumps (1550 cfs)
- Gate improvement- raised top elev. to 9.0 ft NGVD29
- Tieback levees/floodwalls
- Total of 500 ac-ft distributed storage

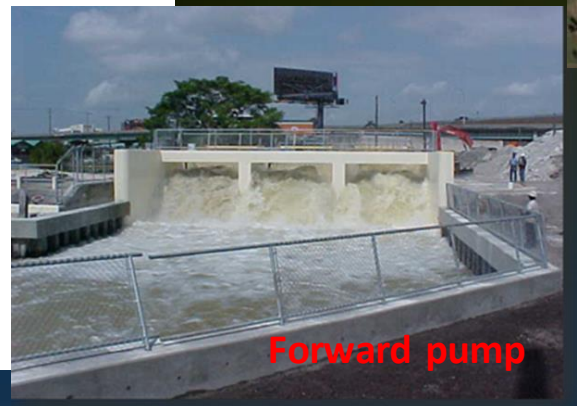
Regional (M2B)

- All the M2A components
- Additional 1000 cfs for S28 and S29 (2550 cfs)
- Canal improvements – improved geometry and raised banks
- Internal drainage system along primary canal to drain water through raised banks

Regional (M2C)

- All the M2B components
- additional 1000 cfs for S28 and S29 (3550 cfs)
- Canal improvements –widened cross sections





work in progress, subject to change

Distributed Storages / Green Infrastructures and Nature-Based Solutions

Potential Distributed Storages

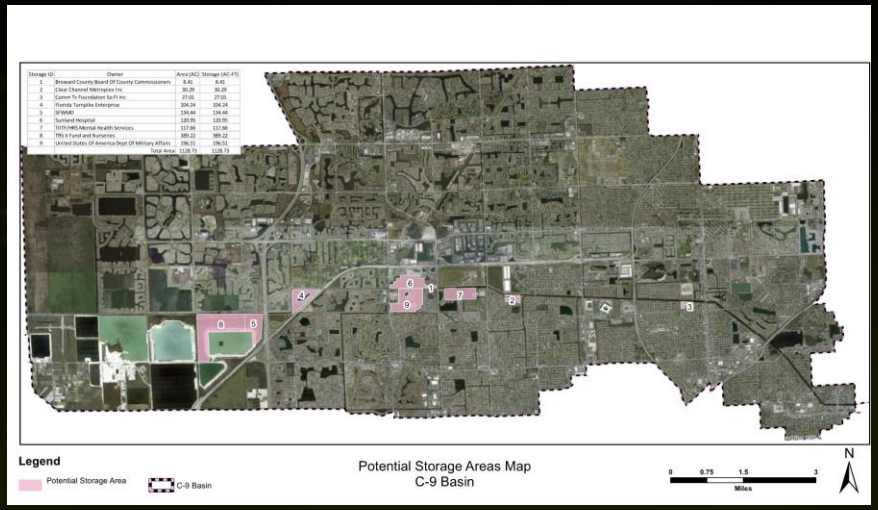
- Flood control benefits
- water quality benefit by capturing the pollutants from the first flush
- Identified 19 areas in C-8 watershed
- Identified 9 areas in C-9 watershed

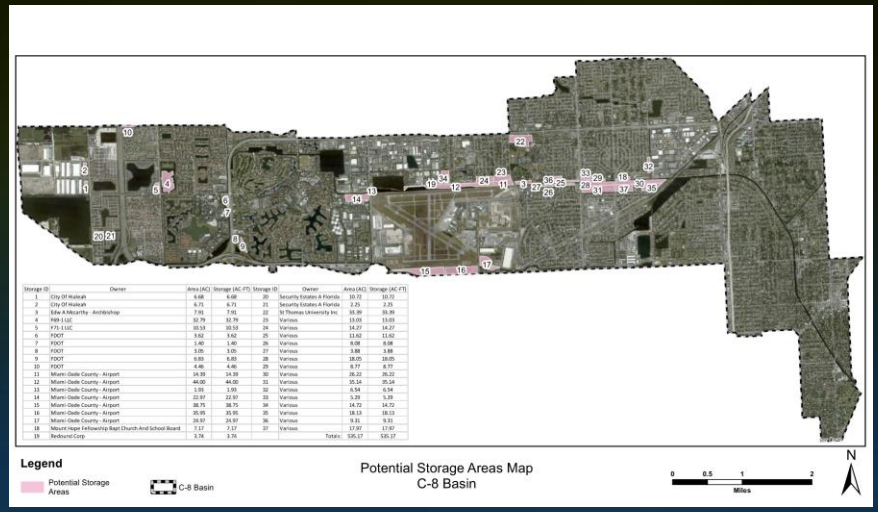
Green Infrastructures and Nature-Based Solutions

- Being constructed as a green infrastructure
- Vegetated flood berms to enhance flood protection through retention/detention
- Green Spaces (bioretention and infiltration)
- Enhanced infiltration/Groundwater recharge and storage

Other Opportunities for Green Infrastructures

- Installation of living shoreline along a canal
- Including more green features during implementation phase





Green Infrastructures and Natural and Nature-Based Solutions

- Retention/Detention Ponds
- Temporary storages in open areas
- Constructed wetlands and bioretention
- Linear BMPs: grassed swale, vegetated filter strip, infiltration trench
- Rain barrel, green roof, porous pavement

* Green features and nature and natural-based solutions should be incorporated into and further promoted/enhanced in the Phase III design phase.






H&H Assessment for Different Strategies
M2A - C-8 Watershed

- Significantly reduce the impact of sea level rise
- M2A 25-yr SLR1 canal peak stage profile is lower than M0 25-yr SLR1
- M2A 25-yr SLR1 canal peak stage profile is lowered to approximately the same level as M0 25-yr SLR0
- M2A 25-yr SLR3 canal peak stage profile is lower than M0 25-yr SLR2
- significantly less flood inundation for the M2A 25-year SLR1 event than the 25-year SLR1 event without mitigation
- With M2A, the system can maintain current LOS under 1 ft SLR.

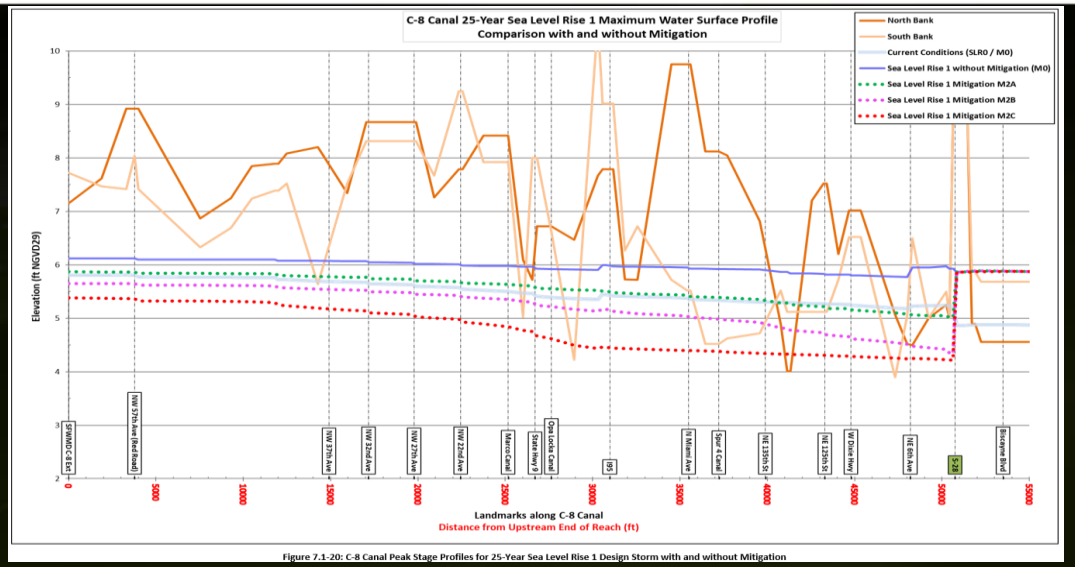


Figure 7.1-20: C-8 Canal Peak Stage Profiles for 25-Year Sea Level Rise 1 Design Storm with and without Mitigation

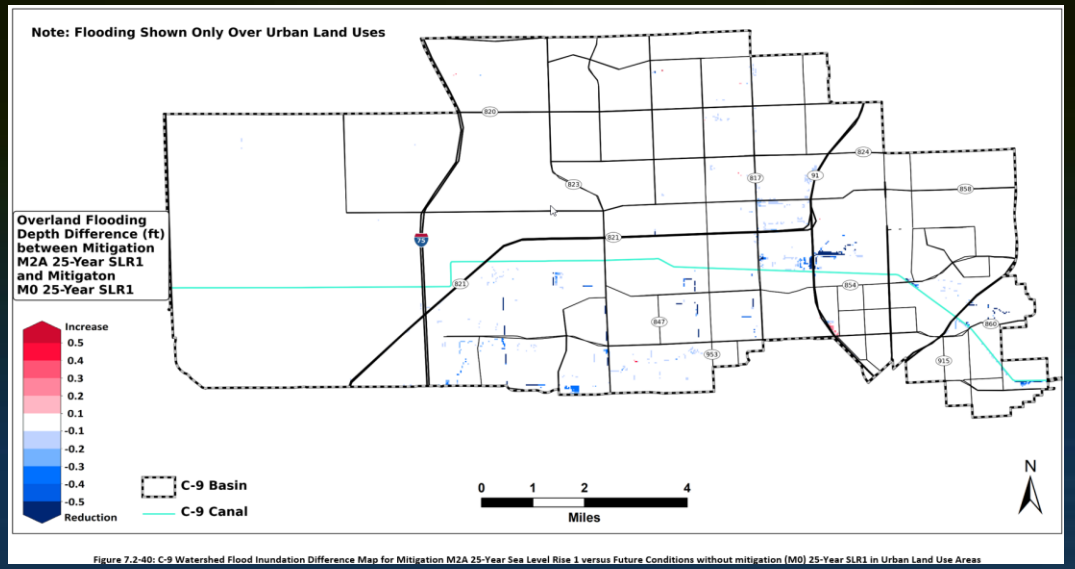
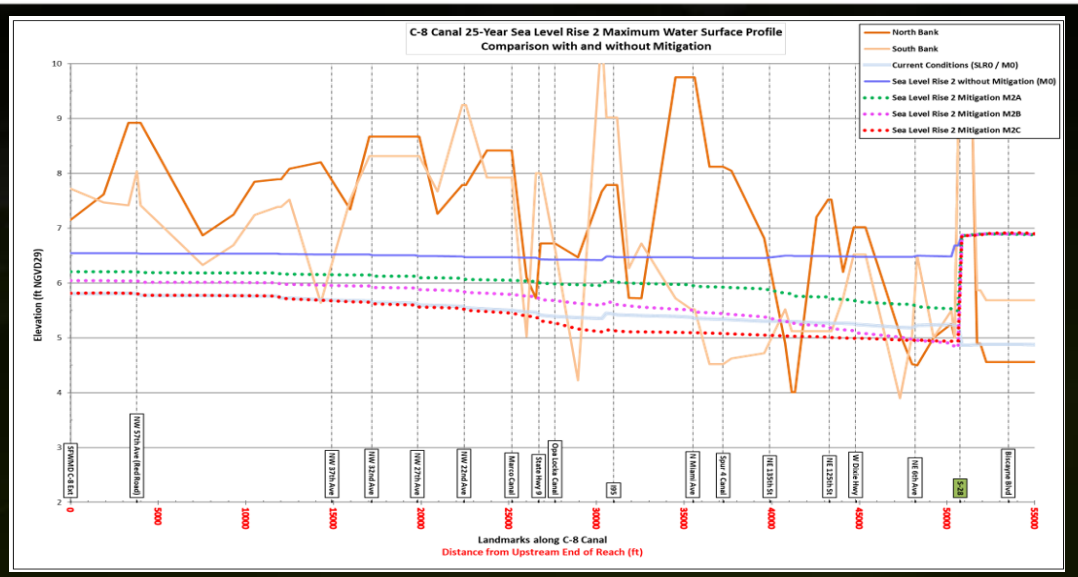


Figure 7.2-40: C-9 Watershed Flood Inundation Difference Map for Mitigation M2A 25-Year Sea Level Rise 1 versus Future Conditions without mitigation (M0) 25-Year SLR1 in Urban Land Use Areas

H&H Assessment: M2B - C-8 Watershed

- reduce the 5, 10, 25, and 100-yr SLR1 peak stage profile equal to or below the existing conditions
- reduce the 25-yr SLR2 peak elevations by 0.5 ~ 1.9 ft, or an average of 0.92 ft compared to future without mitigation
- significantly less flood inundation for the M2A 25-year SLR1 event than the 25-year SLR1 event without mitigation
- significantly reduce the impact of sea level rise
- With M2B, the current LOS can be maintained under 2 ft SLR.



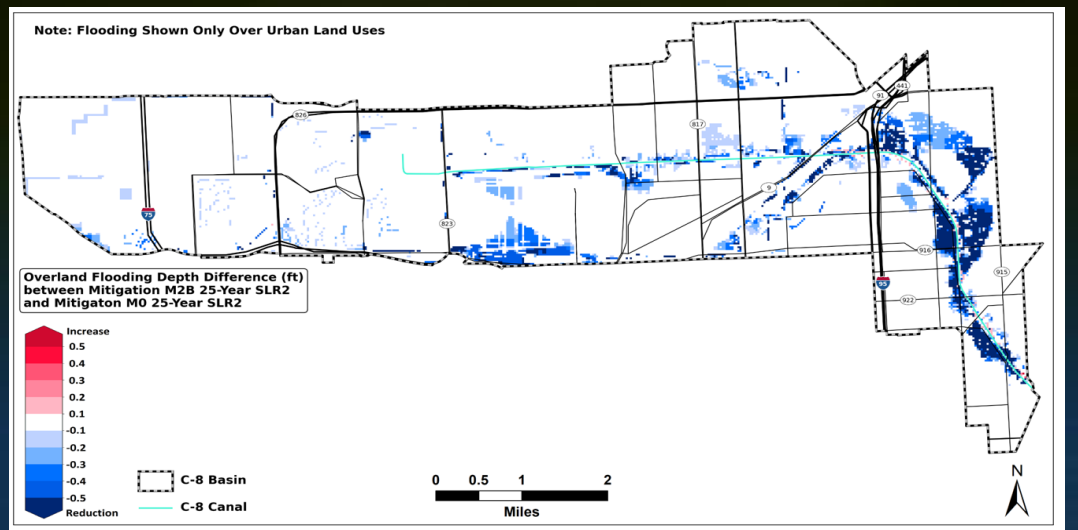
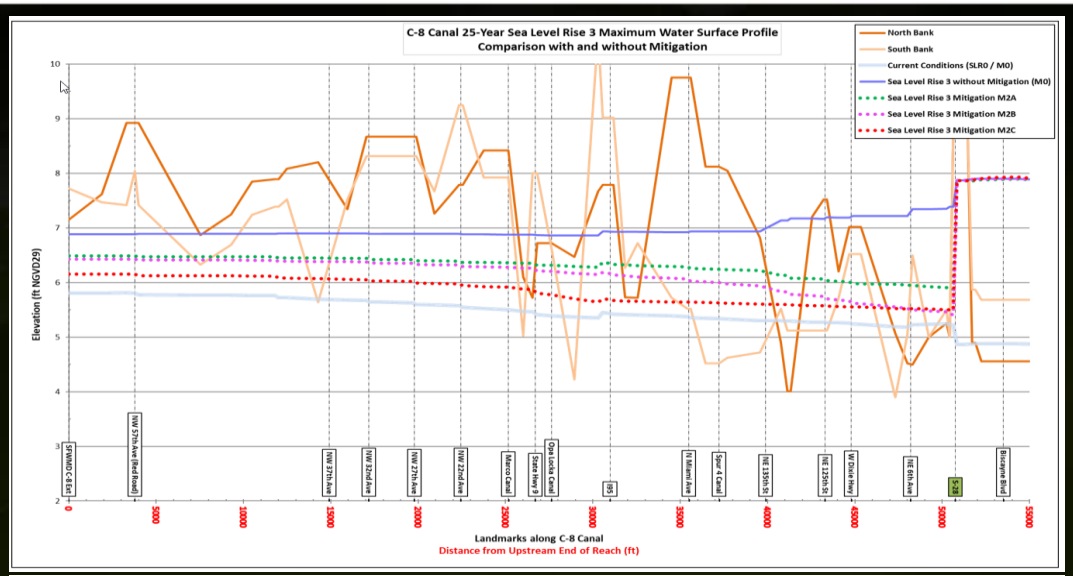
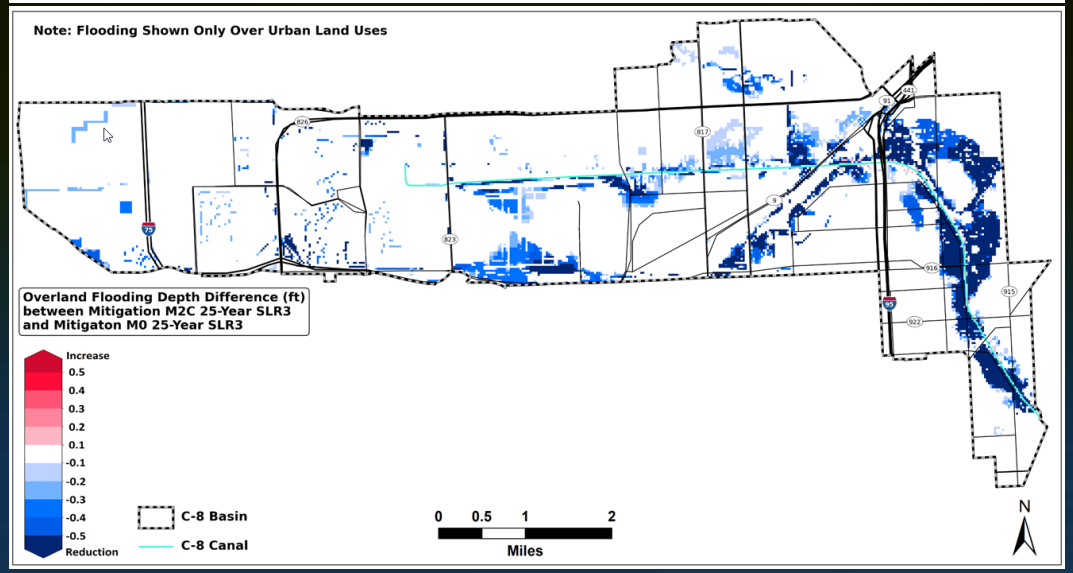


Figure 7.1-43: C-8 Watershed Flood Inundation Difference Map for Mitigation M2B 25-Year Sea Level Rise 2 versus Future Conditions without mitigation (M0) 25-Year SLR2 in Urban Land Use Areas

H&H Assessment: M2C - C-8 Watershed

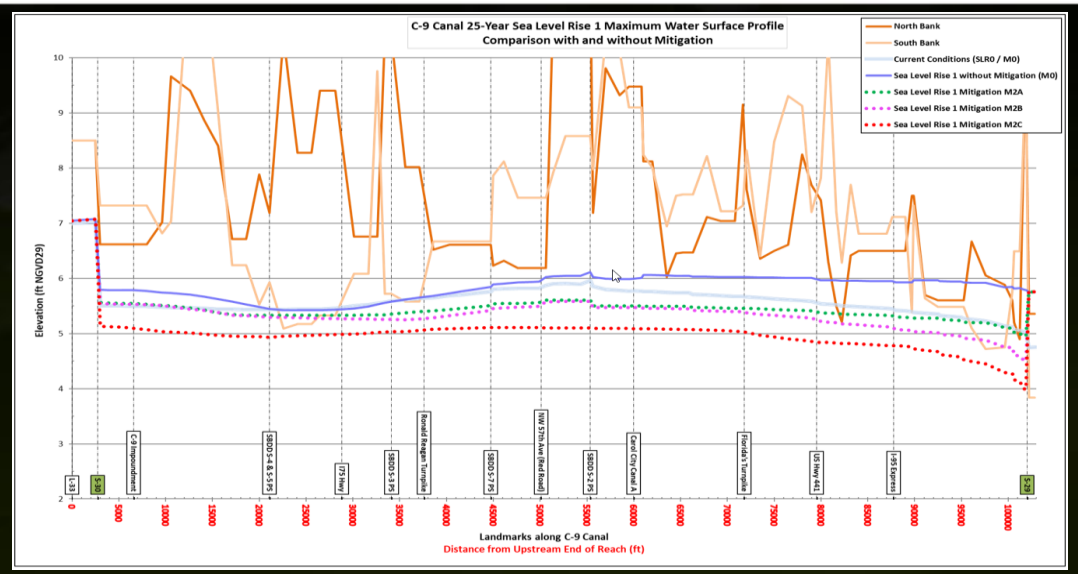
- will not reduce the peak stage profile to a level equal to or below the existing conditions
- reduce the 25-yr SLR3 peak elevations by 0.7 ~ 1.9 ft, compared to future without mitigation
- 25-year SLR3: maintain approximately the same level of flood inundation as current conditions
- 25-year SLR3 event: significantly less flood inundation compared to future without mitigation
- significantly reduce the impact of sea level rise





H&H Assessment for Different Strategies
M2A - C-9 Watershed

- Remove the effect of SLR by about 1 ft
- M2A 25-yr SLR3 peak stage profile: lower than M0 25-yr SLR2
- M2A 10-yr SLR2 peak stage profile: lower than M0 10-yr SLR1
- M2A 25-year SLR1 flood inundation is not predicted to be significantly better or worse than existing conditions
- M2A 25-year SLR1 flood inundation is less than the M0 25-year SLR1 event



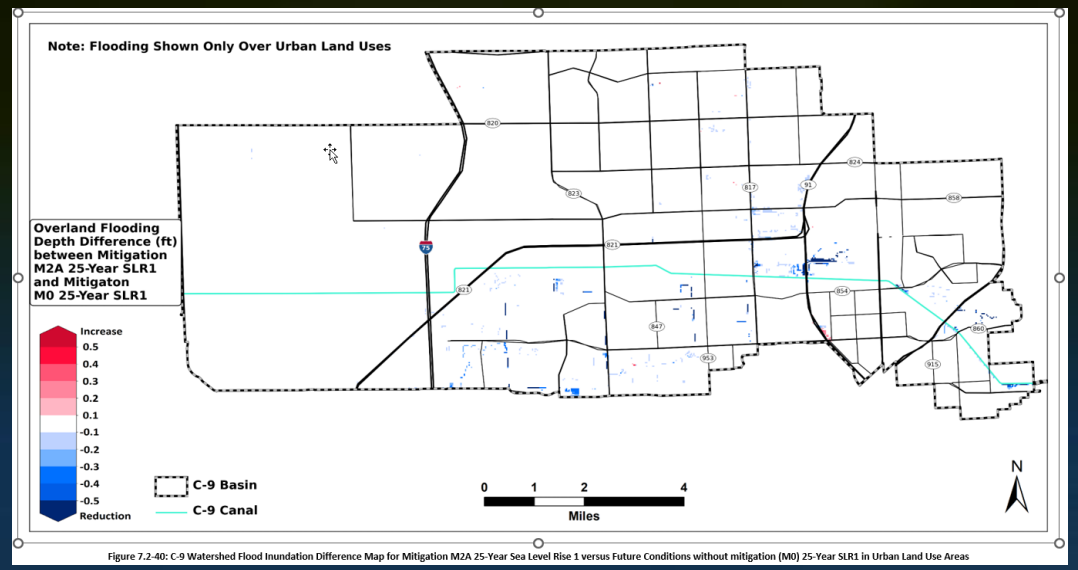
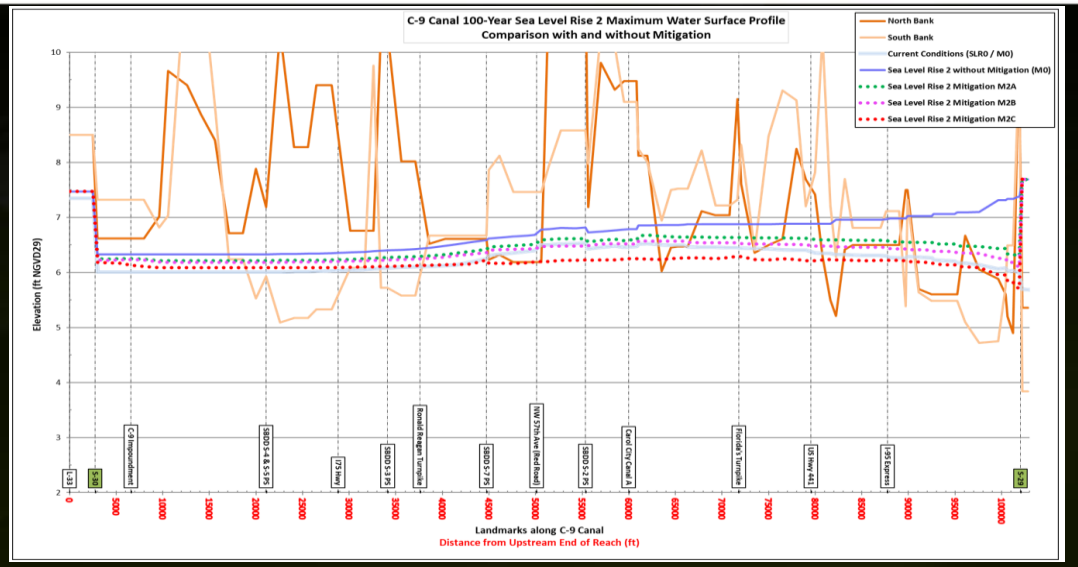


Figure 7.2-40: C-9 Watershed Flood Inundation Difference Map for Mitigation M2A 25-Year Sea Level Rise 1 versus Future Conditions without mitigation (M0) 25-Year SLR1 in Urban Land Use Areas

H&H Assessment: M2B - C-9 Watershed

- reduce the 5, 10, 25, and 100-yr SLR1 peak stage profile equal to or below the existing conditions
- reduce the 25-yr SLR2 peak elevations by 0.2 ~ 1.4 ft, or an average of 0.56 ft compared to future without mitigation
- With M2B, can maintain current LOS under SLR2 conditions
- significantly less flood inundation for the M2B 25-yr SLR2 event than the 25-yr SLR2 event without mitigation
- significantly reduce the impact of sea level rise



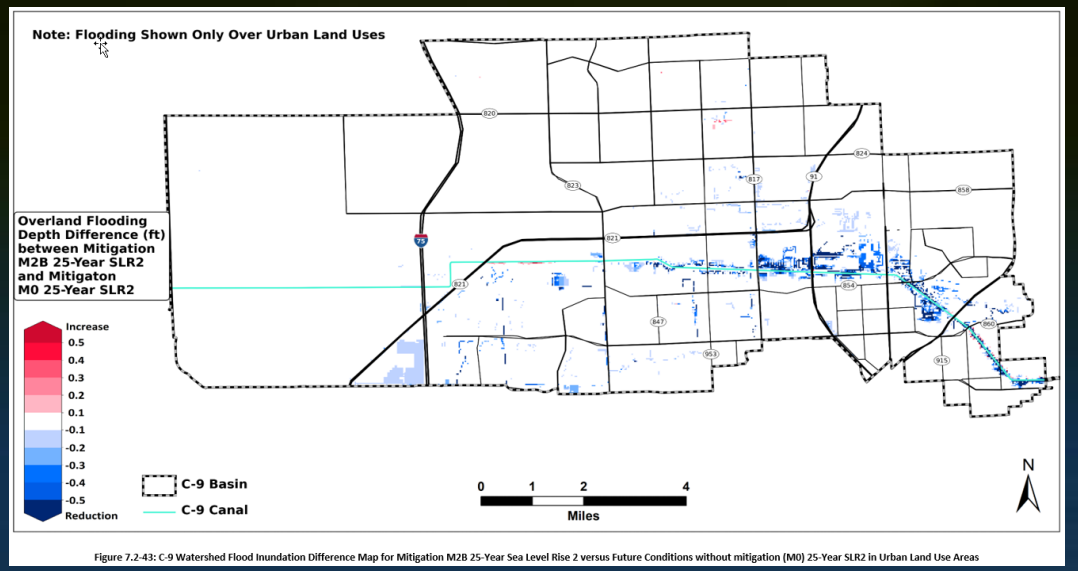
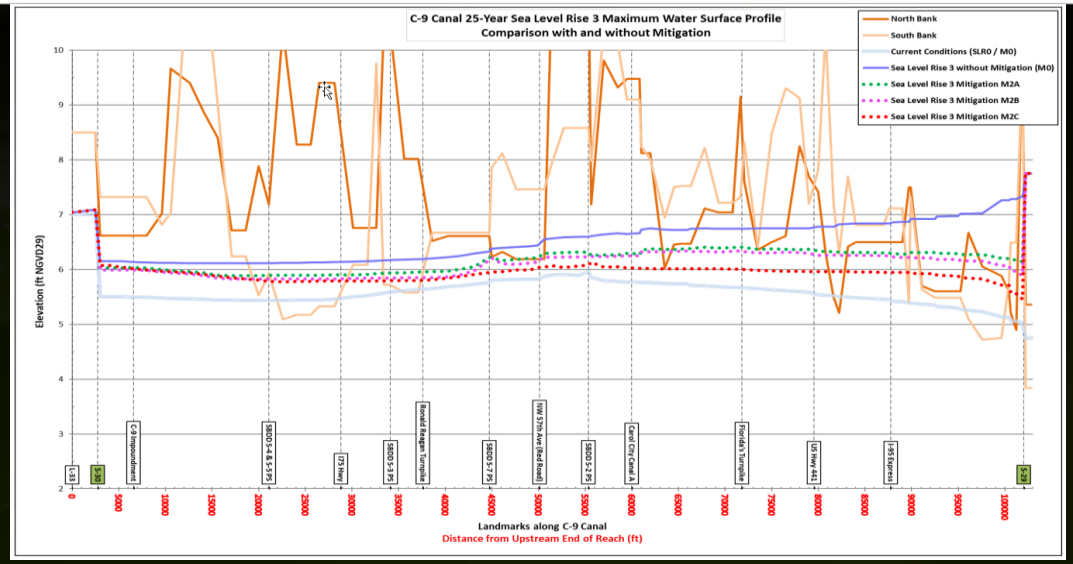


Figure 7.2-43: C-9 Watershed Flood Inundation Difference Map for Mitigation M2B 25-Year Sea Level Rise 2 versus Future Conditions without mitigation (M0) 25-Year SLR2 in Urban Land Use Areas

H&H Assessment: M2C - C-9 Watershed

- reduce the 25 and 100-yr SLR2 peak stage profile equal to or below the existing conditions
- reduce the 25-yr SLR3 peak elevations by 0.1 ~ 1.9 ft, or an average of 0.67 ft compared to future without mitigation
- With M2C, maintain current LOS under SLR3 conditions
- significantly less flood inundation for the M2C 25-yr SLR3 event than the 25-yr SLR3 event without mitigation
- significantly reduce the impact of sea level rise



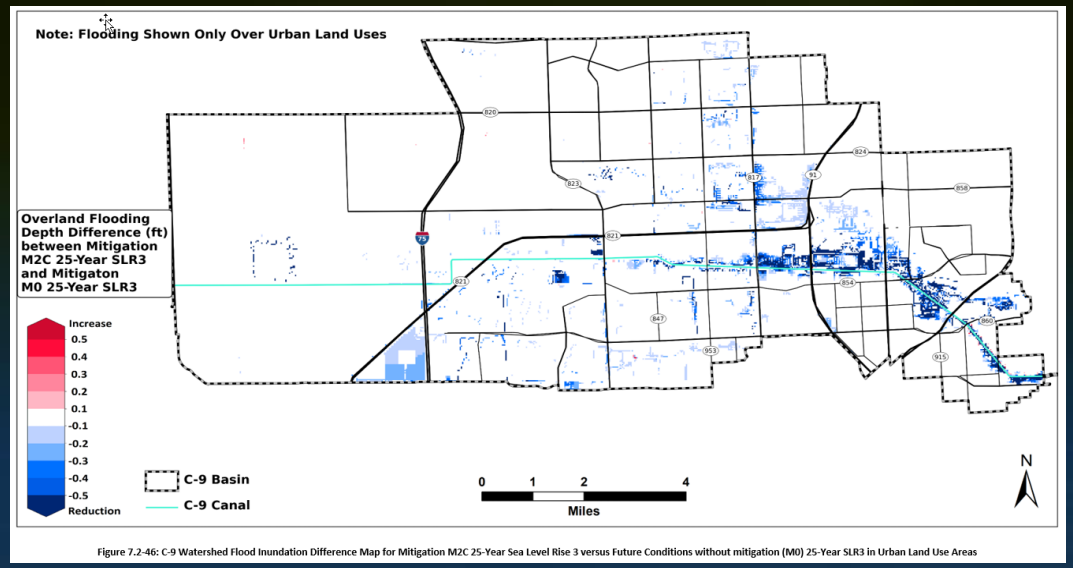
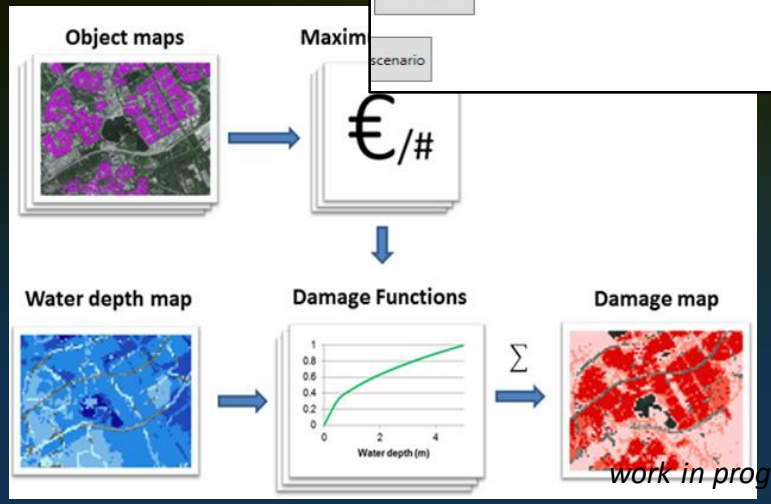


Figure 7.2-46: C-9 Watershed Flood Inundation Difference Map for Mitigation M2C 25-Year Sea Level Rise 3 versus Future Conditions without mitigation (M0) 25-Year SLR3 in Urban Land Use Areas

FIAT-SFWMD Application & Damage assessments

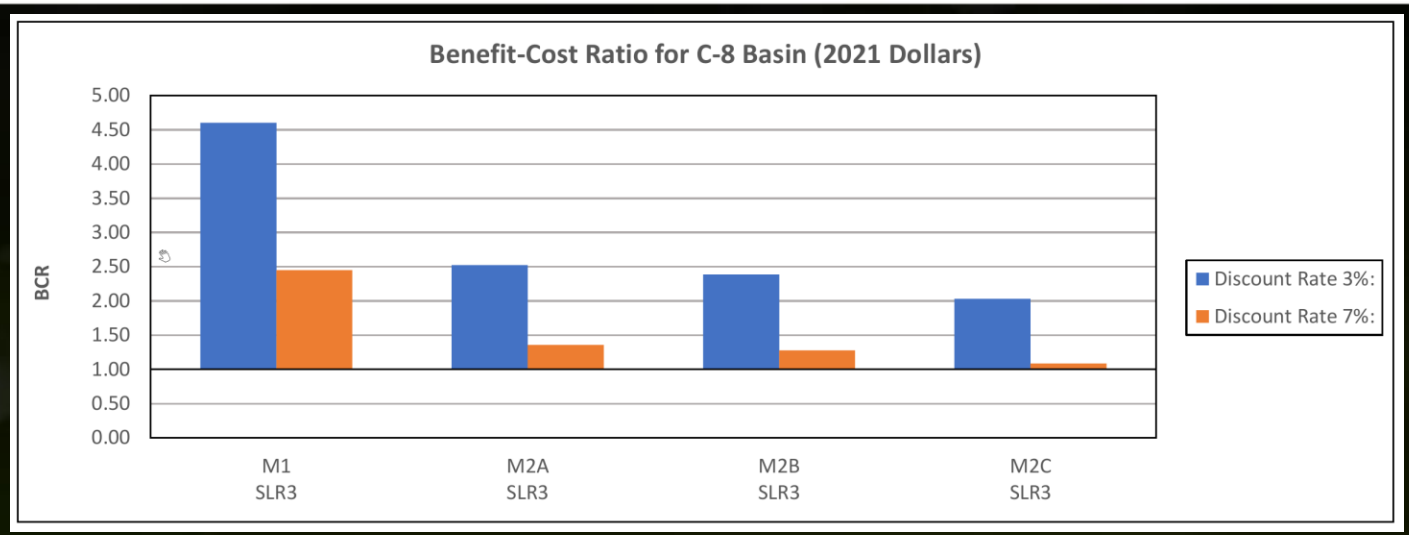
- FIAT-SFWMD tool to estimate the expected annual property damage due to flooding
- What liability or risk is the system exposed to – due to action or inaction?
- What is the cost/benefit ratio for different mitigation strategies
- Provide strong support in selecting the best cause of action
- A full spectrum of economic analysis including social and environmental benefits are not conducted in this study.

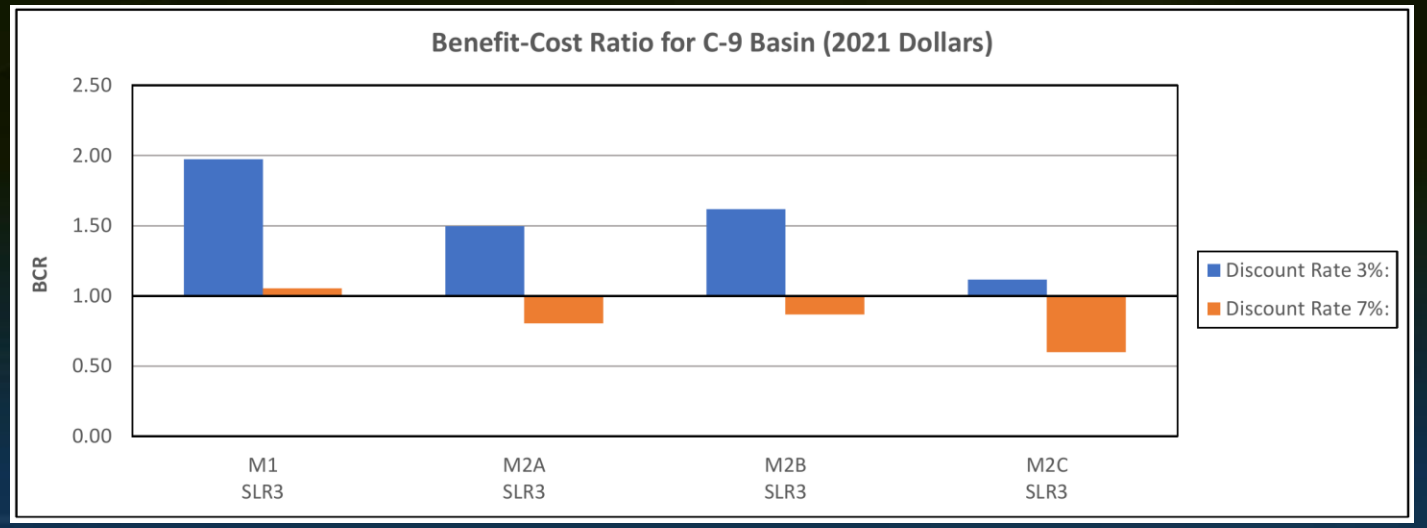


work in progress, subject to change

Mitigation Projects – Benefit/Cost Assessment

- Favorable BC ratios for M1 Projects at both discount rates (3% and 7%)
- C-8 Basin, The M2 projects achieved a favorable result at both discount rates (3% and 7%) (BCR>1)
- C-9 Basin, The M2 projects achieved a favorable result at 3% rate (BCR>1)



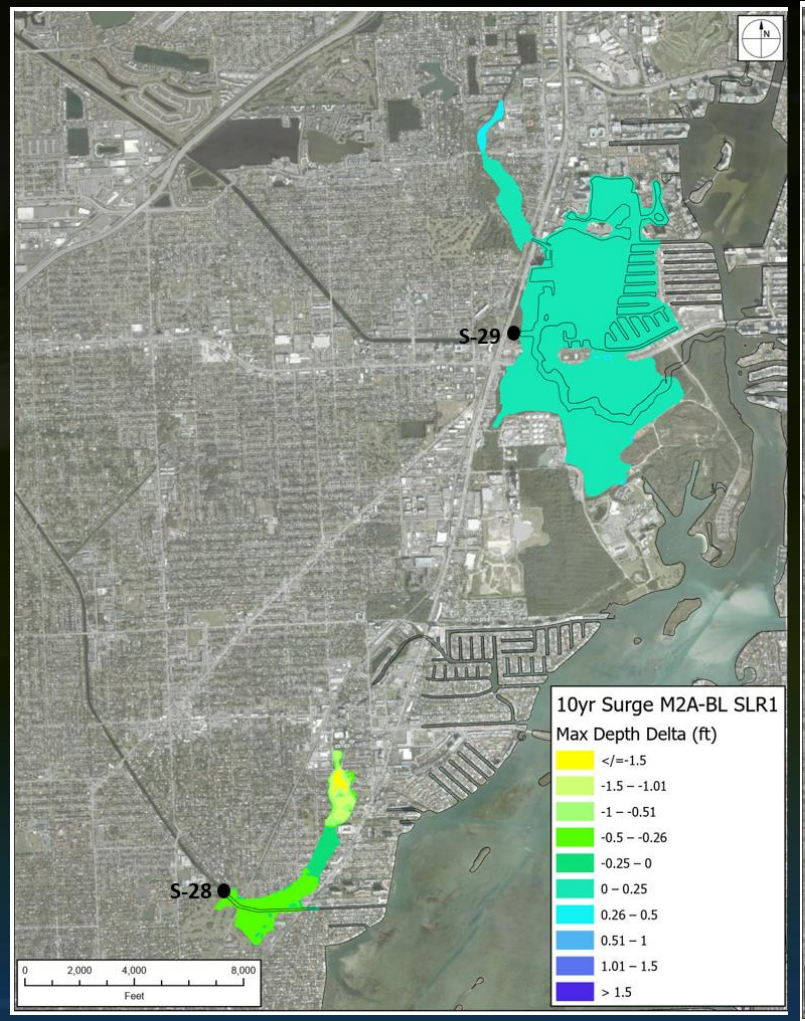


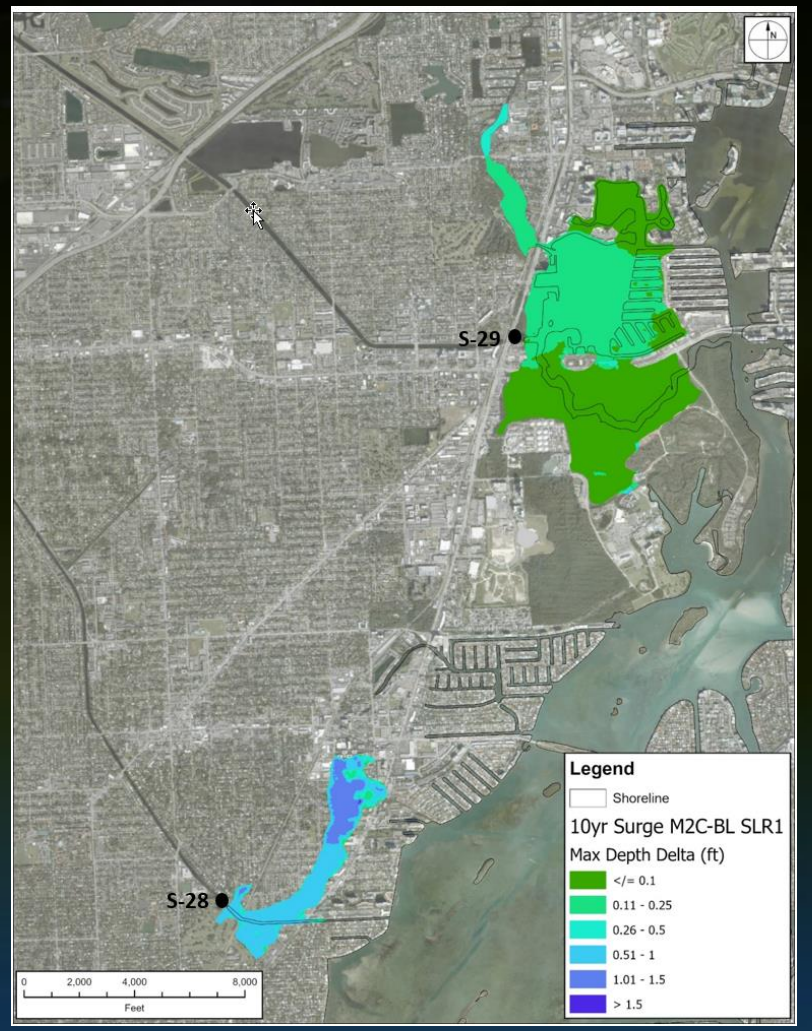
Mitigation Projects - Flood Impact to the Downstream Areas

- Analyzed the flood impacts on downstream area resulting from the proposed strategies
  - leverage ADCIRC model data and output sourced from effective Federal Emergency Management Agency (FEMA) modeling
  - leverage an existing Florida Inland Navigation District (FIND) MIKE21 Hydrodynamic Model for Biscayne Bay to evaluate the impacts

- M2A and M2B: little to no increase in the peak stage profiles for the canal segment downstream of the tidal structures, thereby preserving the conveyance from the secondary and tertiary systems to the primary system

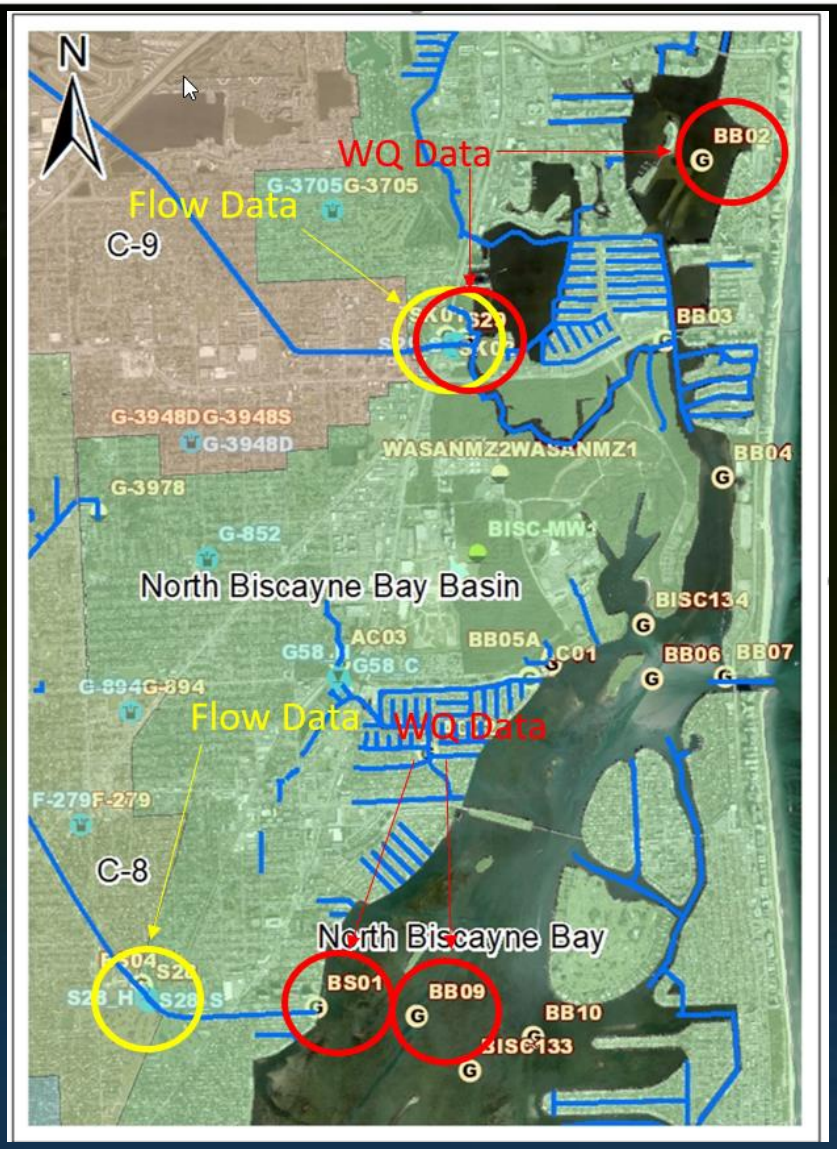
- M2C: potential negatively impact the downstream urban areas. Additional mitigation strategies need to be developed to address the downstream impacts





Mitigation Projects – Impact to the Water Quality on North Biscayne Bay

- Regression based approach to evaluate potential impact on water quality to North Biscayne Bay from proposed mitigation projects
- Not a comprehensive water quality modeling assessment
- Contaminants of concern analyzed based on the data availability
  - Salinity
  - ChlorophyII a
  - DO
  - TN (C-8 watershed)
- Assessment Locations
  - C-9 Watershed: NNB-A
  - C-8 Watershed: NNB-B



Mitigation Projects – Impact to the Water Quality on North Biscayne Bay

C-8 Watershed

- M2A: Doesn't present negative impact on WQ compared to existing conditions and M2C scenarios
- M2B: negative impact on Chlorophyll a; negative impact on TN for 10yr & 100 yr events
- M2C: negative impact on Chlorophyll a, TN, and/or DO for different events

C-9 Watershed

- M2A: Doesn't present negative impact on WQ compared to existing conditions and M2C scenarios
- M2B: Doesn't present negative impact on WQ compared to existing conditions and M2C scenarios
- M2C: negative impact to Chlorophyll a

Table 8-7: Summary of Results for the 25-Year Storm in NNB-B

	Percent Change Relative to Existing Conditions (M0-SLR0)											
Variable	M0-SLR1	M0-SLR2	M0-SLR3	M2A-SLR1	M2A-SLR2	M2A-SLR3	M2B-SLR1	M2B-SLR2	M2B-SLR3	M2C-SLR1	M2C-SLR2	M2C-SLR3
Salinity	1.2	2.4	4.3	0.5	1.1	3.0	-1.2	-0.5	1.8	-4.2	-3.6	-2.8
Chlorophyll a	-5.1	-14.3	-30.2	-2.4	-7.0	-16.0	2.8	-3.8	-14.2	10.2	3.6	-1.3
TN	-4.9	-13.2	-24.6	-2.7	-7.0	-15.4	2.0	-4.2	-13.9	8.4	2.4	-2.8
DO	3.5	9.4	17.4	1.9	4.9	10.9	-1.4	2.9	9.8	-5.9	-1.7	2.0

Table 8-8: Summary of Results for the 100-Year Storm in NNB-B

	Percent Change Relative to Existing Conditions (M0-SLR0)											
Variable	M0-SLR1	M0-SLR2	M0-SLR3	M2A-SLR1	M2A-SLR2	M2A-SLR3	M2B-SLR1	M2B-SLR2	M2B-SLR3	M2C-SLR1	M2C-SLR2	M2C-SLR3
Salinity	1.0	1.8	3.9	0.4	0.8	3.2	-1.9	-1.6	0.6	-7.1	-6.8	-5.4
Chlorophyll a	-3.4	-11.0	-25.8	0.6	-3.4	-11.3	5.8	0.3	-7.6	16.5	10.9	5.7
TN	-3.4	-10.2	-19.2	0.2	-3.7	-11.2	5.0	-0.4	-8.0	14.3	9.0	3.9
DO	3.2	9.7	18.3	-0.2	3.5	10.7	-4.7	0.4	7.7	-13.7	-8.6	-3.7

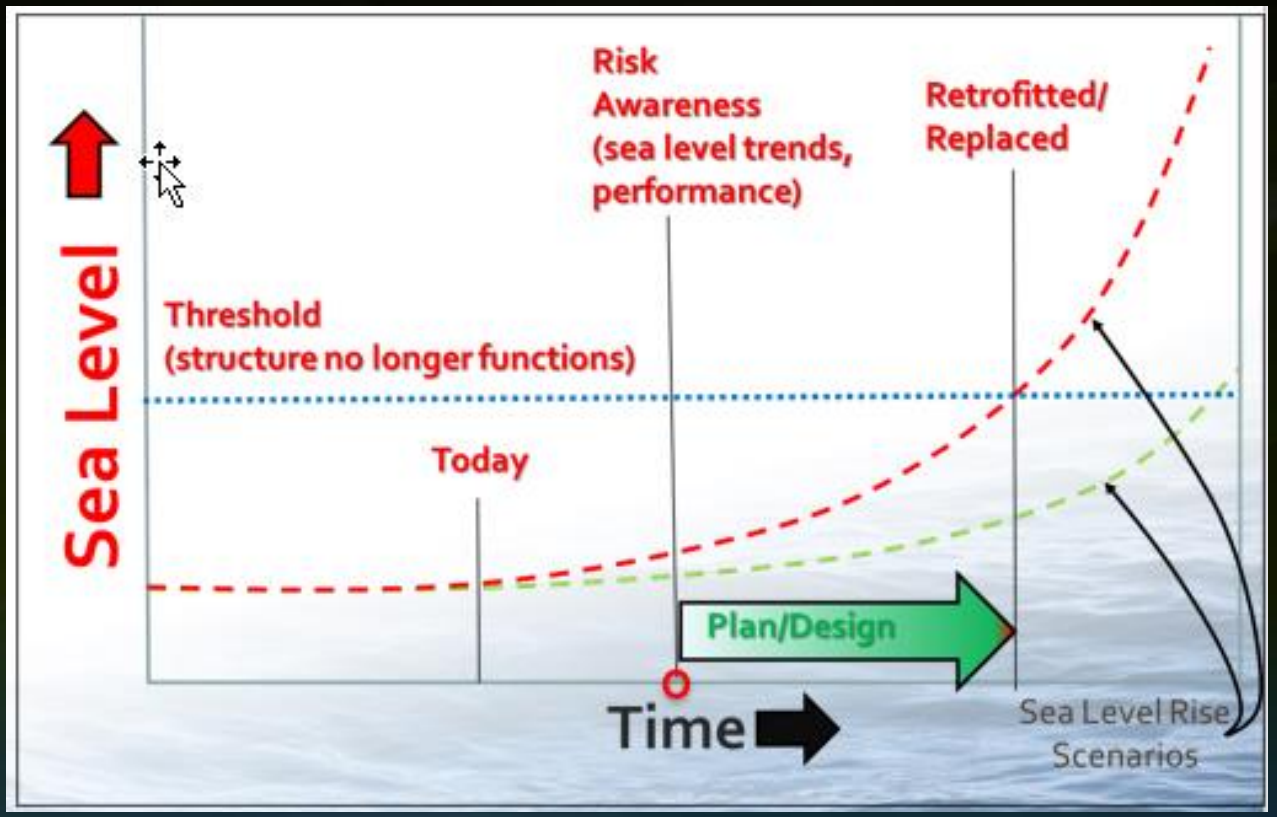
Table 7-7: Results for the 25-Year Storm in NNB-A

	Percent Change Relative to Existing Conditions (M0-SLR0)											
Variable	M0-SLR1	M0-SLR2	M0-SLR3	M2A-SLR1	M2A-SLR2	M2A-SLR3	M2B-SLR1	M2B-SLR2	M2B-SLR3	M2C-SLR1	M2C-SLR2	M2C-SLR3
Salinity	23.5	48.7	83.4	23.5	43.6	70.6	10.6	29.1	59.1	-17.3	5.5	39.0
Chlorophyll a	-8.0	-17.6	-28.6	-5.2	-11.2	-19.7	-2.5	-8.3	-17.8	3.9	-2.8	-11.7
DO	2.3	5.1	9.6	1.5	3.2	5.5	0.1	1.7	4.5	-1.1	0.8	3.4

Table 7-8: Results for the 100-Year Storm in NNB-A

	Percent Change Relative to Existing Conditions (M0-SLR0)											
Variable	M0-SLR1	M0-SLR2	M0-SLR3	M2A-SLR1	M2A-SLR2	M2A-SLR3	M2B-SLR1	M2B-SLR2	M2B-SLR3	M2C-SLR1	M2C-SLR2	M2C-SLR3
Salinity	51.7	118.8	233.1	60.7	113.6	176.5	30.4	71.2	139.2	-59.6	-11.0	62.0
Chlorophyll a	-8.2	-17.9	-28.1	-4.8	-10.6	-17.6	-2.0	-7.0	-15.0	5.5	-0.3	-7.6
DO	2.8	6.4	11.7	1.7	3.7	6.0	-0.2	1.5	4.3	-1.9	0.1	2.6

Dynamic Adaptive Policy Pathways and Sea Level Rise Planning



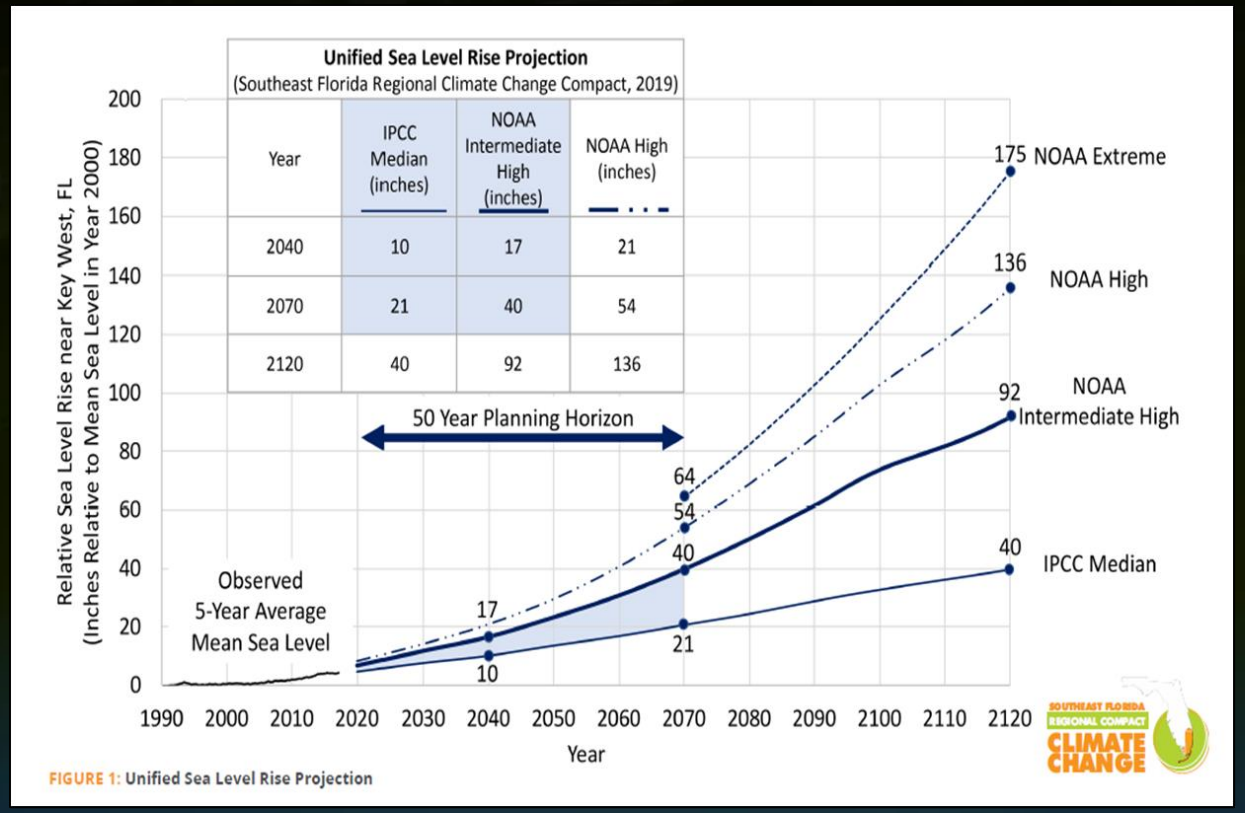
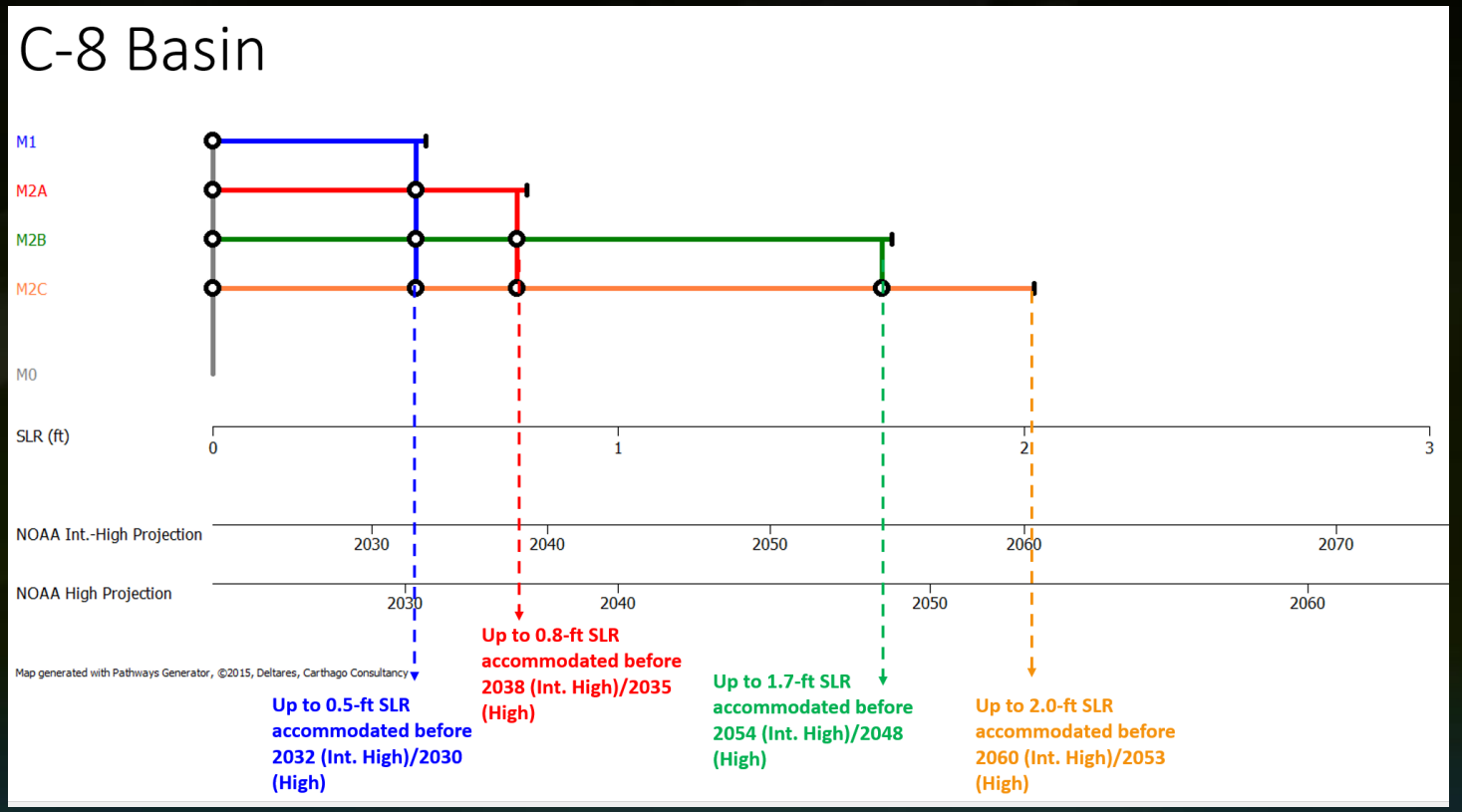


FIGURE 1: Unified Sea Level Rise Projection

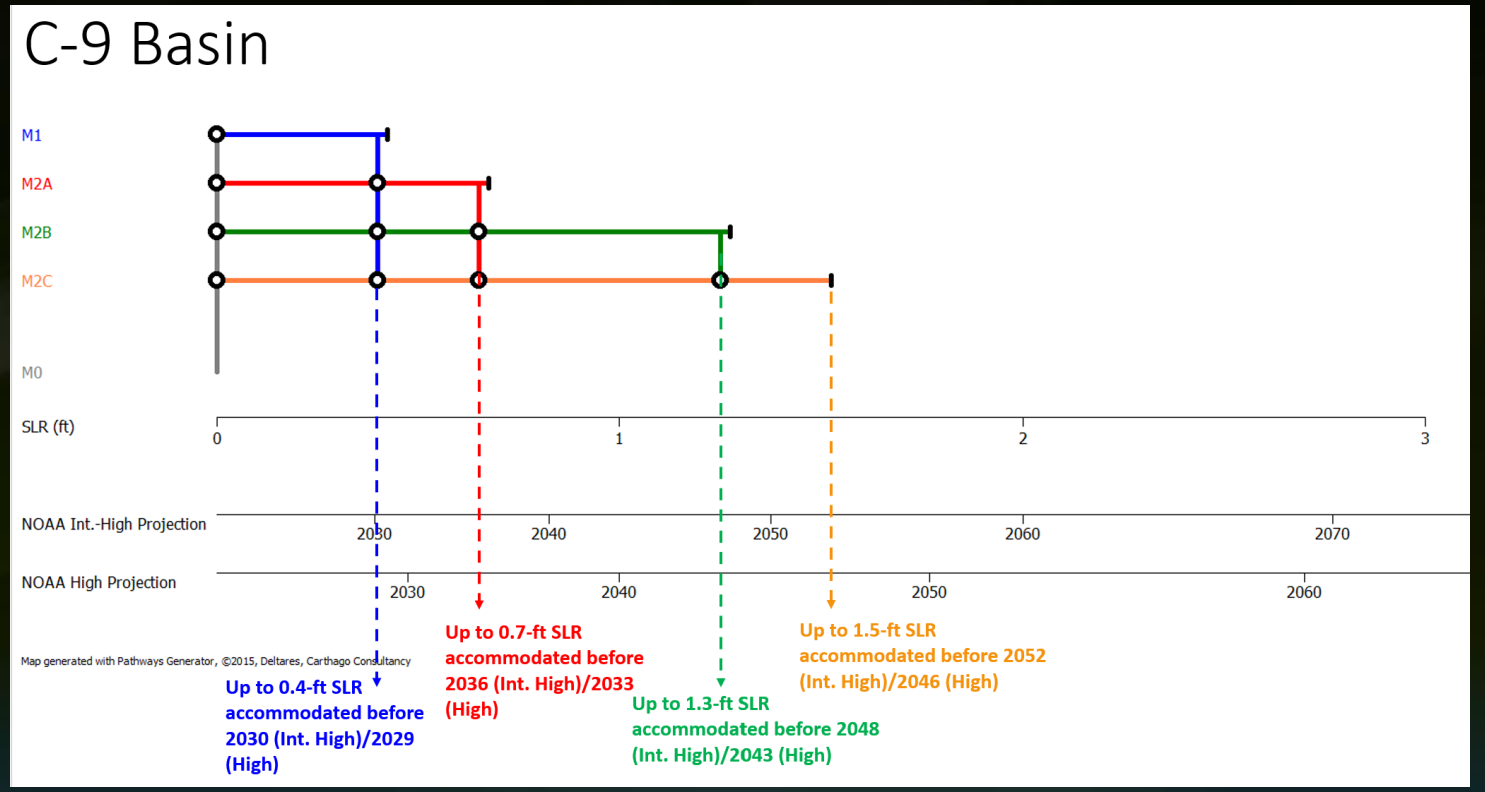
Mitigation Projects – Adaptation Pathway Planning – C-8 Watershed

- M1: It can accommodate up to 0.5 ft SLR
  - As early as 2030 based on NOAA High and as late as 2032 based on Intermediate High
- M2A: It can accommodate up to 0.8 ft SLR
  - As early as 2035 based on NOAA High and as late as 2038 based on Intermediate High
- M2B: It can accommodate up to 1.6 ft SLR
  - As early as 2048 based on NOAA High and as late as 2054 based on Intermediate High
- M2C: It can accommodate up to 2.0 ft SLR
  - As early as 2053 based on NOAA High and as late as 2060 based on Intermediate High



Mitigation Projects – Adaptation Pathway Planning – C-9 Watershed

- M1: It can accommodate up to 0.4 ft SLR
  - As early as 2029 based on NOAA High and as late as 2030 based on Intermediate High
- M2A: It can accommodate up to 0.7 ft SLR
  - As early as 2033 based on NOAA High and as late as 2036 based on Intermediate High
- M2B: It can accommodate up to 1.3 ft SLR
  - As early as 2043 based on NOAA High and as late as 2048 based on Intermediate High
- M2C: It can accommodate up to 1.5 ft SLR
  - As early as 2046 based on NOAA High and as late as 2052 based on Intermediate High



Final Recommended Mitigation Projects

- Promote implementation of the local level projects throughout the watersheds
- Promote early implementation of the distributed storage projects to maximize the flood control and water quality improvement benefits
- Progressive Mitigation from M2A to M2C at the regional level
  - No-regret strategy:
    - C-8 Watershed: Accelerate immediate implementation of M2A components
    - C-9 Watershed: Accelerate immediate implementation of M2A components
  - Build pump facilities to allow increased pump sizes – adaptable and evolvable
  - Opportunistically implement elements of M2B and/or M2C as feasible – canal improvement and widening
- Fully integrate the green features or NNBS during the implementation phase to maximize the water quality improvement benefits
- Continue to promote pre-storm draw-down operations for additional temporary storages
- Integrate the recommended mitigation projects into the SFWMD Sea Level Rise and Flood Resilience Plan

Mitigation Strategies – Additional Considerations

- Continue to investigate the potential of using western mine pits as storage: Lake Belt Storage Project
- Continue to investigate potential additional inter-basin flow
- Continue to investigate potential of deep well Injection
- Continue to explore nested solutions: interdependency of local and regional solutions
- Conduct comprehensive economic assessment

Thanks to the team

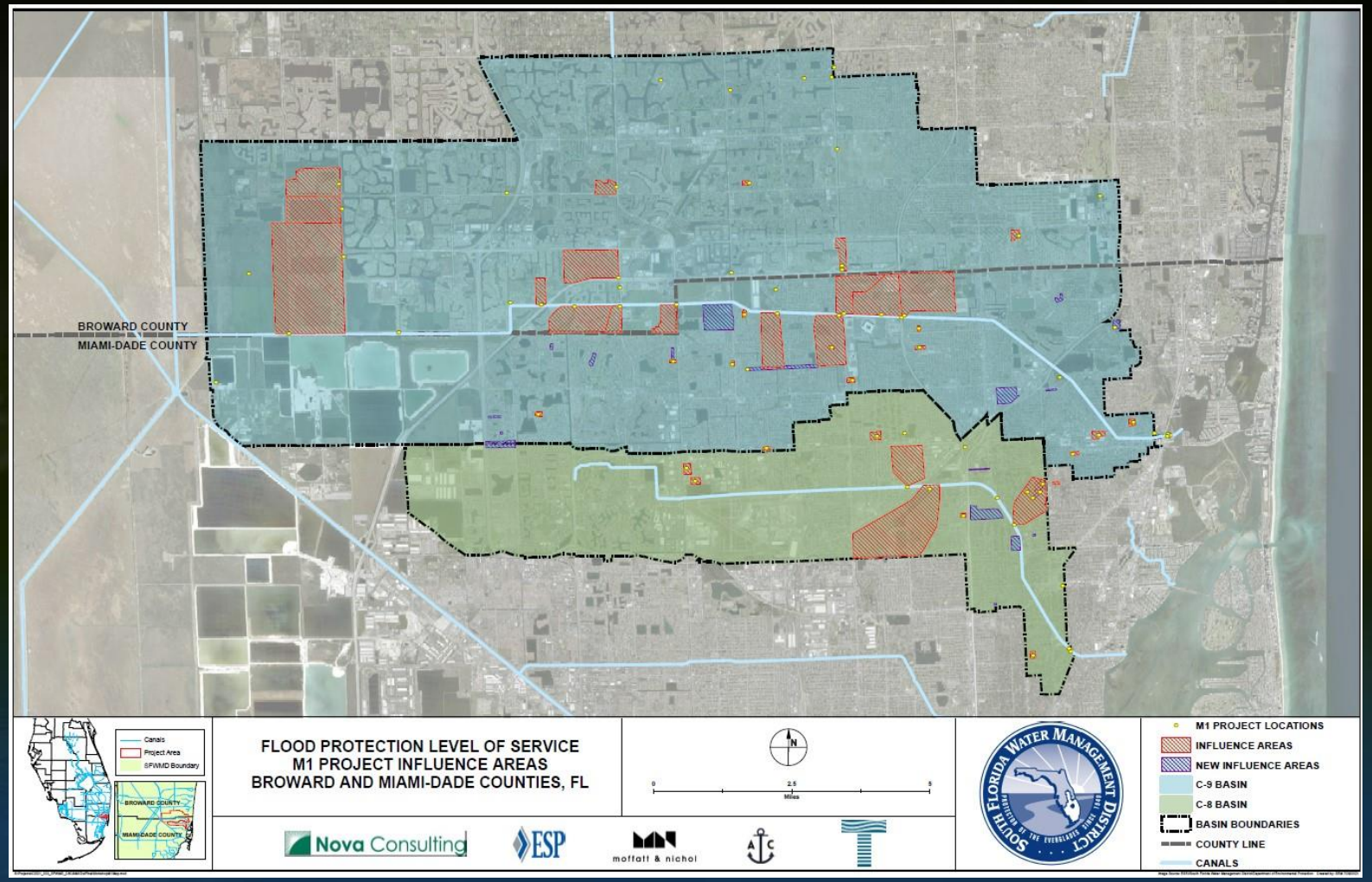
Consultants

- Taylor Engineering
- Moffatt & Nichol
- Nova Consulting
- Anclote Consulting
- ESP Florida

Thanks to Miami Dade County, Broward County, South Broward Drainage District, Pembroke Pine, Miami Gardens, Miami Shores and other municipal cities.

Questions?

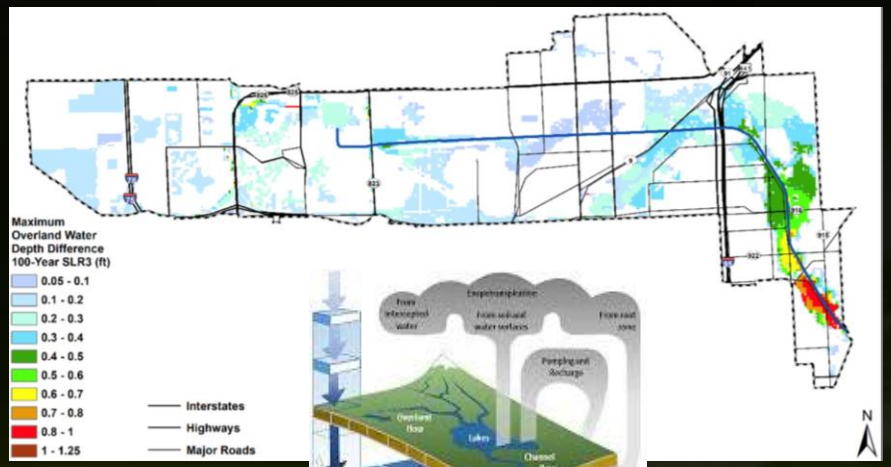
C-8/C-9 Adaptation and Mitigation Study – Local Scale (M1)

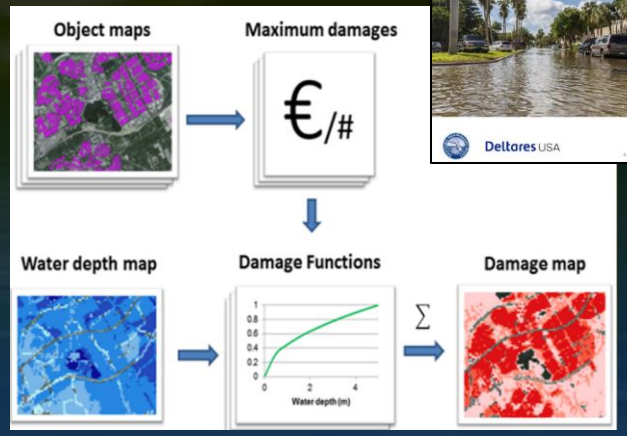


Next Steps & District Resiliency

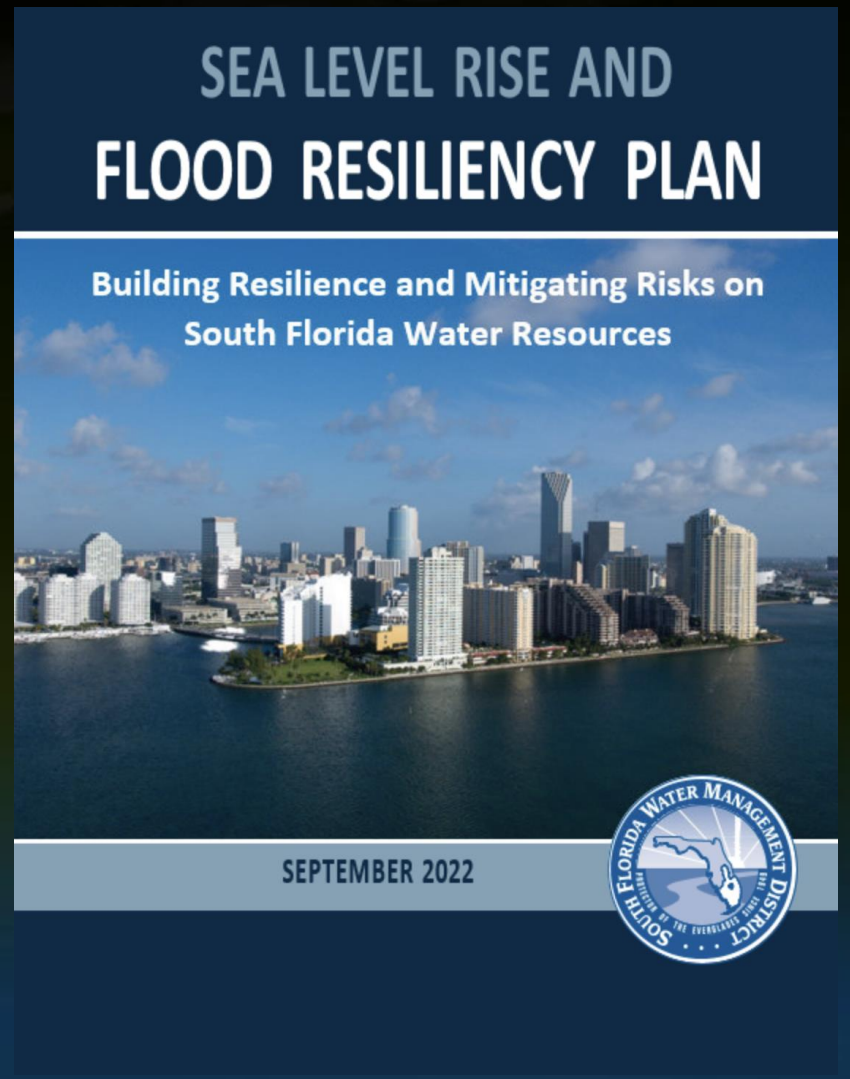
Carolina Maran, P.E., Ph.D., District Resiliency Officer
April 13, 2023

Sea Level Rise and Flood Resiliency Plan





Reducing the risks of flooding, sea level rise and other climate impacts on water resources and increasing community and ecosystem resiliency in South Florida



Priority Projects and Sources

- **FPLOS Phase II Recommendations**
- FPLOS Phase I Recommendations – Non Regret Strategies
- Event Response Recommendations (i.e. Hurricane Ian – Upper Kissimmee Basin)
- O&M Needs / CIP Projects (& bundling strategies)
- Grant Requirements & Overarching Goals (i.e. NBS recommendations, renewable energy projects)

Governor DeSantis' Executive Order 23-06:
Achieving Even More Now for Florida's Environment

Exec. Order further advances the protection of Florida's environment and water quality.

Ramps up efforts to accomplish even more by securing $3.5 billion over four years for:

- Everglades restoration and the protection of water resources
- Continuing to expedite the Comprehensive Everglades Restoration Plan projects
- Strengthening resiliency efforts, through the Resilient Florida Program

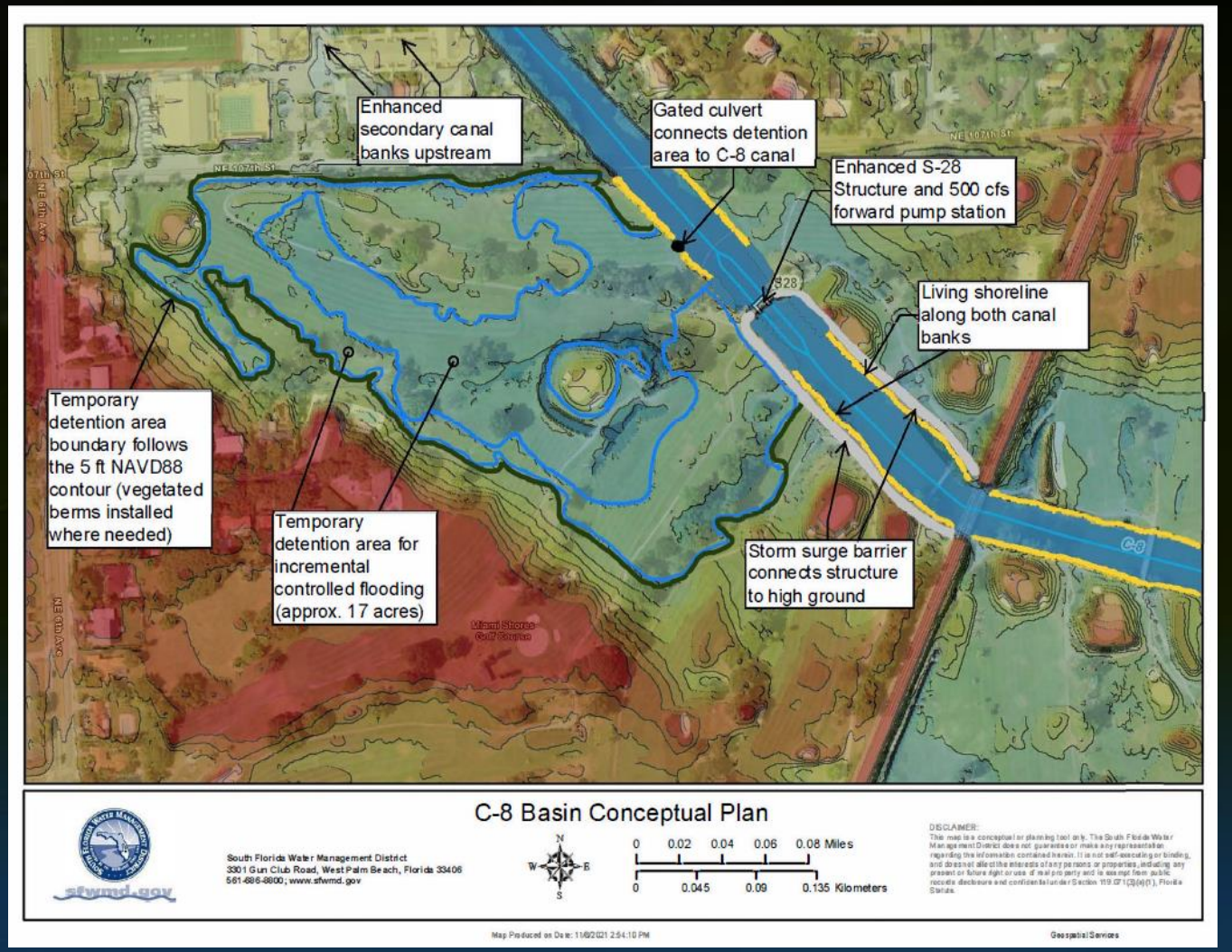
Coastal Structures Hardening and Self Preservation Mode

Additional Programing; storm resilient Back Up Controller instrument and platform	Install Backup Controller and other automation features	Modify gates for added high tide protection against reverse flow	Modify Structure by adding seals	Other automation and floodproofing needs	Control Panel Upgrades / Hardening

- Recent Award from Resilient Florida Program – 20+ Coastal Structures
- Urgent need to optimize and harden operation of structures during storm surge and higher tide events, addressing Hurricane Irma/Matthew/Dorian/Ian gate-open lockouts
- Water Supply exposure to saltwater intrusion: wellfield protection zones vulnerability – **Regional Significant Assets (RSA)**
- Exacerbated upstream flood risks
- Focus on enhancing electronic/mechanical components, modifying gates, remote automation and floodproofing of RSAs

Moving into Implementation: C-8 Basin Resiliency

- Recent Award Recommendation from FDEM/FEMA BRIC
- Basin-wide strategy to reduce flood risks due to sea-level rise and extreme rainfall; protect water resources and water supply
- Combination of Green and Gray Infrastruct.
- Restores S-28 Structure discharge capacity
- Increases water management flexibility
- Increases the basin's flood protection level of service, including Miami Dade's secondary canal enhancements
- Enhances quality of life in the region



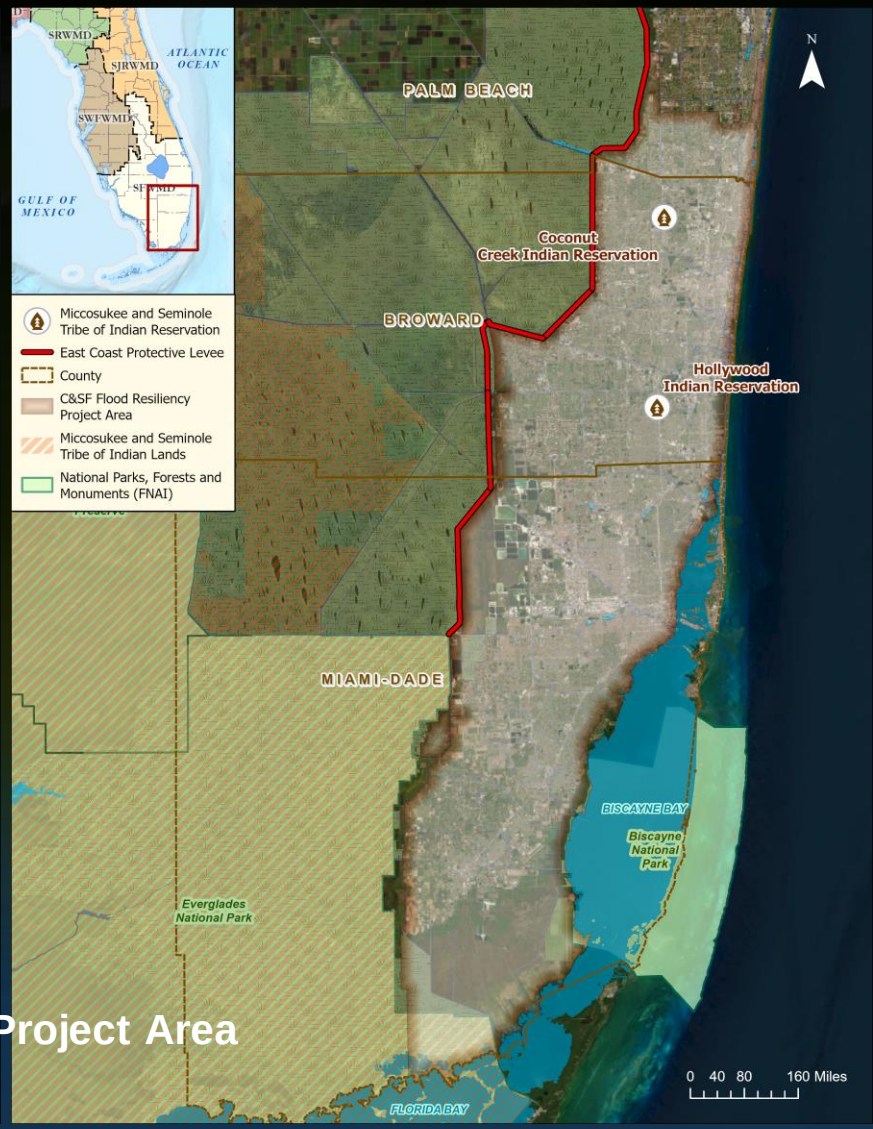
C&SF Flood Resiliency Study

Under the Authority of Section 216 of the Flood Control Act of 1970

- Reduce flood risk and increase flood resiliency in high-risk urban watersheds in southeast Florida, while looking to enhance the overall benefits of the multipurpose C&SF Project
- Improve the C&SF Project and enhance SEFL Communities' quality of life
- Ongoing study phase: Final Scoping and Round 1 Development of Alternatives

Presenter: Carolina Maran

Study Area



Project Area

Public and Stakeholder Engagement

- Introductory Public Meetings: 26-27 OCT 2022
- NEPA Scoping Meetings: 28 NOV 2022
- Miami-Dade County Meeting: 29 NOV 2022
- Seminole Tribe of Florida Meeting: 30 NOV 2022
- Broward County Meeting: 30 NOV 2022
- Interagency Meeting: 5 DEC 2022
- Internal PDT Workshops:13-15 DEC 2022
- Planning Charrette: 11-12 JAN 2023
- USACE Internal Review Meetings: JAN-FEB-MAR 2023
- Alternative Development Meeting: 15-17 FEB 2023
- Alternative Milestone Meeting – 27 MAR-10 APR

60+ Partner Agencies
280+ Stakeholders Engaged

Study Scope & Schedule

Measures: Structural, Non-Structural and Nature-Based

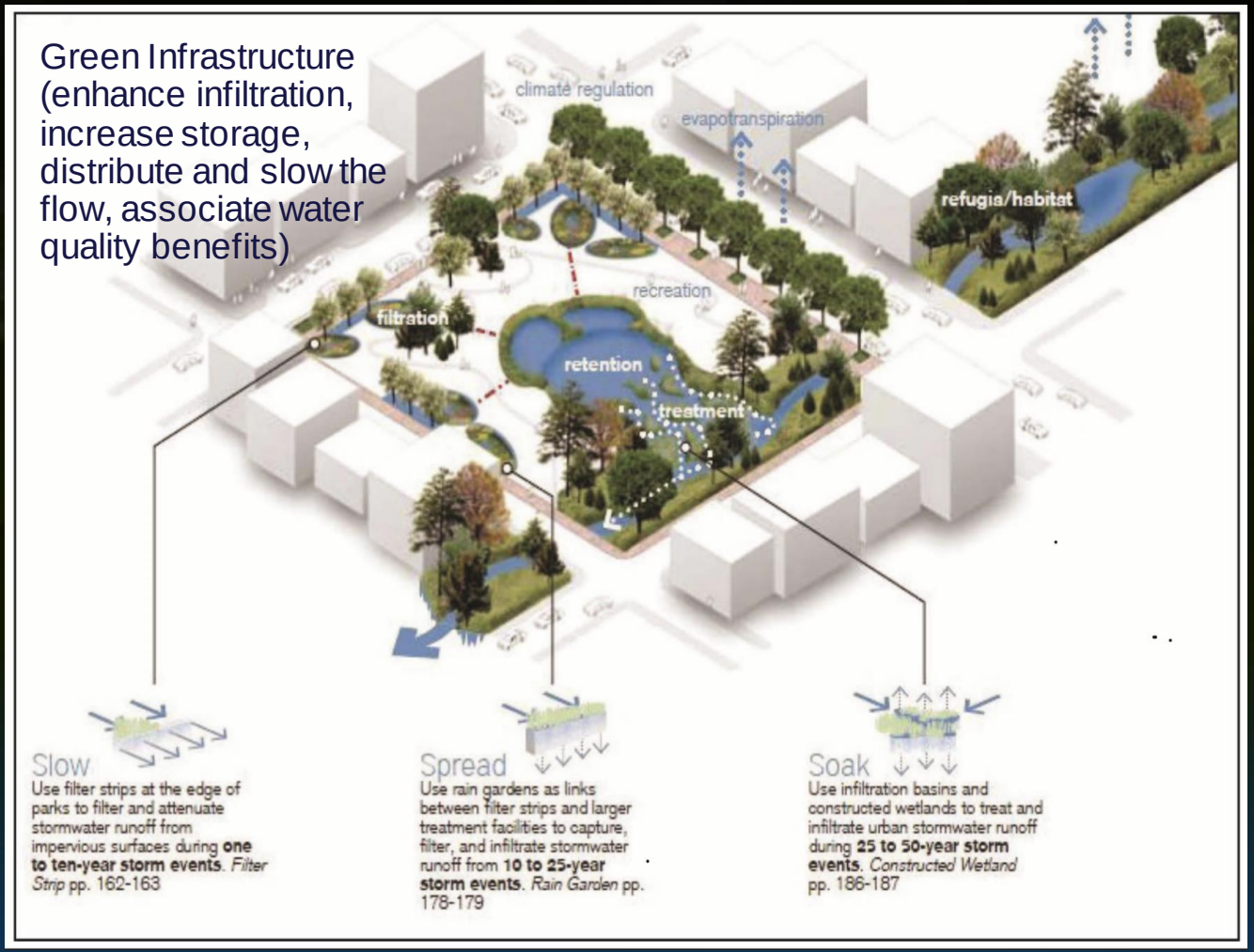
MILESTONE DESCRIPTION	MILESTONE DATE
Study Initiation - FCSA	SEP 2022 [A]
Alternatives Milestone	MAR 2023 [A]
Tentatively Selected Plan Milestone	DEC 2024
Agency Decision Milestone	OCT 2025
Final Report	DEC 2025
Chief's Report	MAY 2026

* Complete in time for WRDA 2026

Property Floodproofing

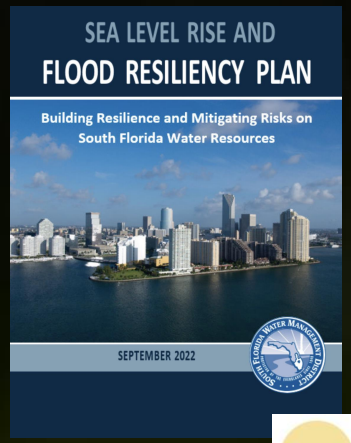
Flap Gate (enhance basin connectivity)

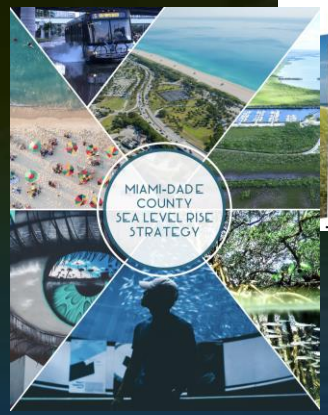
Green Infrastructure (enhance infiltration, increase storage, distribute and slow the flow, associate water quality benefits)

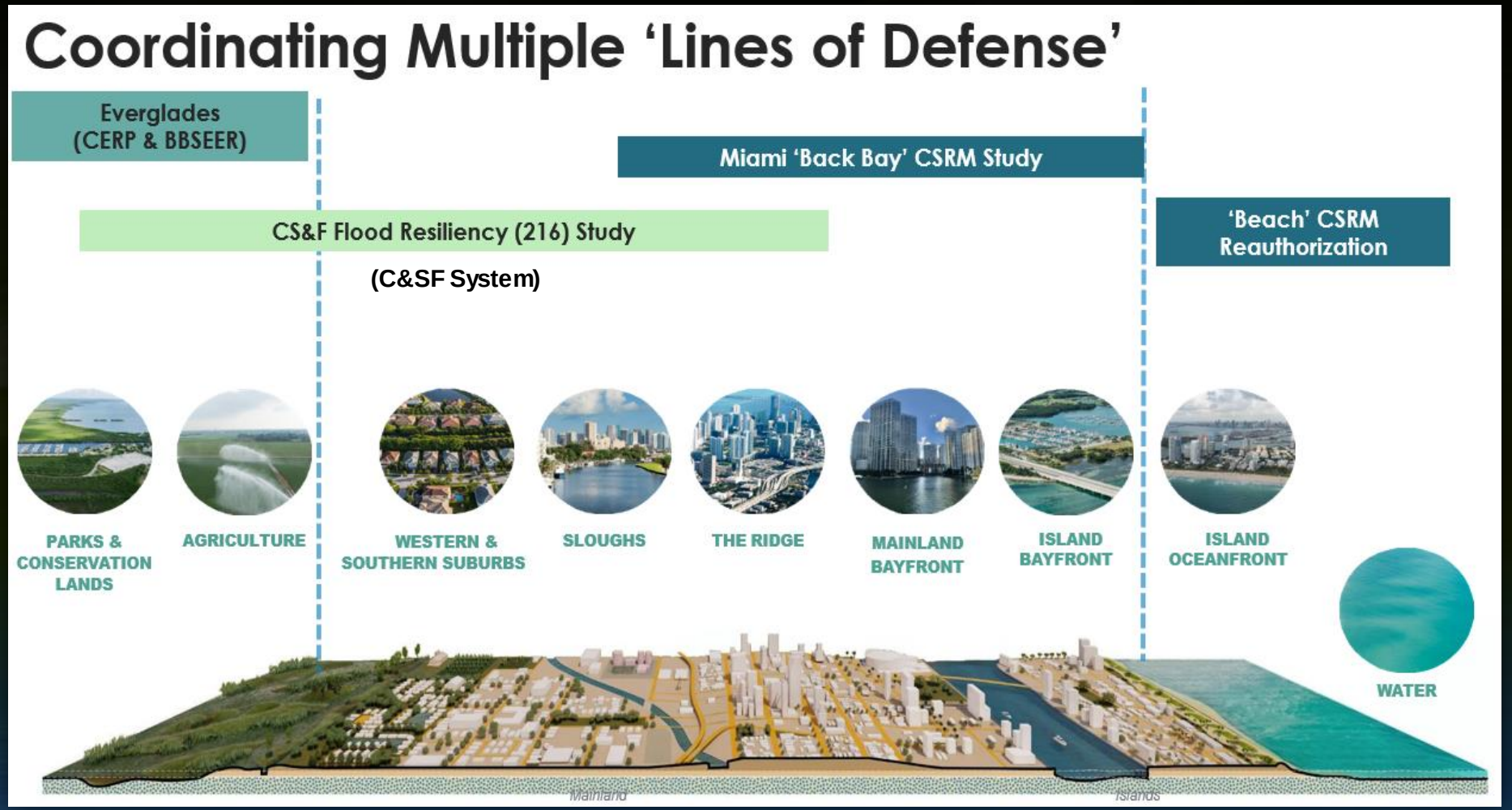


Presenter: Carolina Maran

South Florida's Studies Integration

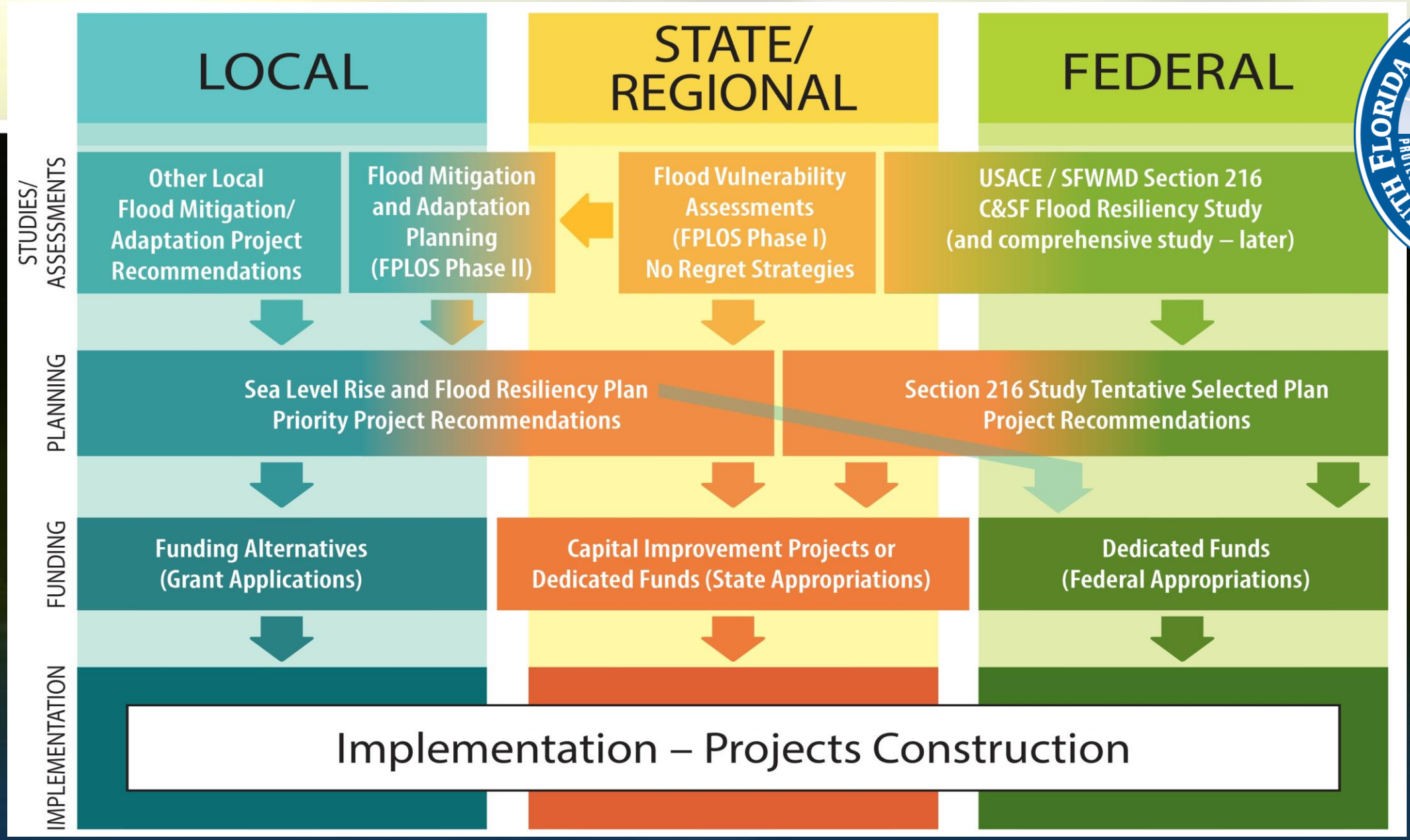






Source: Image presented by Miami-Dade County on January 11, 2023, C&SF Flood Resiliency Study Planning Charrette

Presenter: Carolina Maran


LOCAL
STATE/ REGIONAL
FEDERAL
STUDIES/ ASSESSMENTS
PLANNING
FUNDING
IMPLEMENTATION
Other Local Flood Mitigation/ Adaptation Project Recommendations
Flood Mitigation and Adaptation Planning (FPLOS Phase II)
Flood Vulnerability Assessments (FPLOS Phase I) No Regret Strategies
USACE / SFWMD Section 216 C&SF Flood Resiliency Study (and comprehensive study – later)
Sea Level Rise and Flood Resiliency Plan Priority Project Recommendations
Section 216 Study Tentative Selected Plan Project Recommendations
Funding Alternatives (Grant Applications)
Capital Improvement Projects or Dedicated Funds (State Appropriations)
Dedicated Funds (Federal Appropriations)
Implementation – Projects Construction

Thanks!

Questions?

Carolina Maran, Ph.D., P.E.,
cmaran@sfwmd.gov
District Resiliency Officer

South Florida Water Management District
www.sfwmd.gov/resiliency