

MIAMI-DADE COUNTY FINAL OFFICIAL MINUTES Miami-Dade Sea Level Rise Task Force

Lawson E. Thomas Courthouse Center
175 N.W. First Avenue
26th Floor Conference Room
Miami, Florida 33128

December 20, 2013
As Advertised

Harvey Ruvin, Clerk
Board of County Commissioners

Christopher Agrippa, Director
Clerk of the Board Division

Maryse Fontus, Commission Reporter
(305) 375-4906



**CLERK'S SUMMARY AND OFFICIAL MINUTES
MIAMI-DADE COUNTY SEA LEVEL RISE TASK FORCE
DECEMBER 20, 2013**

The Miami-Dade County Sea Level Rise Task Force (Task Force) convened a meeting on Friday, December 20, 2013, at the Lawson E. Thomas Courthouse Center, 175 N.W. 1st Avenue, Miami, Florida, at 10:00 a.m. Present were Honorable Clerk of Courts Harvey Ruvin, Task Force Chairman; and members Mr. David Enfield, Ms. Sara Fain, Mr. Arsenio Milian, and Mr. James Murley; (Mr. Willard T. Fair and Mr. Jorge Gonzales were absent).

In addition to the members of the Task Force, the following staff members were present: Ms. Nichole Hefty, Chief, Office of Sustainability, Planning Division, Miami-Dade Department of Regulatory and Economic Resources (RER); Ms. Debbie Griner, Sustainability Initiatives Coordinator, Office of Sustainability (RER); Assistant County Attorney Christopher Angell; Ms. Elizabeth Soto, Executive Assistant, Clerk of Courts; and Deputy Clerk Maryse Fontus.

I. Welcome and Introductions

Chairman Ruvin called the meeting to order at 10:05 a.m., and welcomed all of the participants, noting this was the Task Force's third meeting. He said that five members were present. He explained that Mr. Willard Fair had to attend a funeral, and Mr. Jorge Gonzales was engaged in a delicate transaction at City National Bank.

Chairman Ruvin asked all of those in attendance to introduce themselves. He welcomed the members of the Miami-Dade County Climate Change Advisory Task Force who were present at today's (12/20) meeting, and thanked them for their recommendations, which he noted he hoped the present Task Force would help move forward.

II. Approval of Meeting Minutes

Chairman Ruvin said that he would entertain motions to approve the minutes of the first two meetings of the Task Force.

It was moved by Mr. Milian that the minutes of the November 4th, 2013, Sea Level Rise Task Force meeting be approved, as presented. This motion was seconded by Mr. Enfield, and upon being put to a vote, passed by a unanimous vote of those members present.

It was moved by Ms. Fain that the minutes of the November 21st, 2013, Sea Level Rise Task Force be approved, as presented. This motion was seconded by Mr. Enfield, and upon being put to a vote, passed by a unanimous vote of those members present.

Chairman Ruvin stated that the purpose of the initial meetings of the Task Force was to invite experts to present to the members the status of implementation of the recommendations of the Miami-Dade County Climate Change Advisory Task Force.

III. Mr. Tommy Strowd, Assistant Executive Director, Operations, Maintenance and Construction, South Florida Water Management District – The Implications of Sea Level Rise on Water Management

Mr. Strowd noted the regional flood control system was authorized by Congress in 1948. He explained that it was constructed by the United States Army Corps of Engineers between 1950 and 1970, and covered a large part of southern Florida. It was designed for flood control; water supply; navigation; the prevention of saltwater intrusion, particularly along the east coast; and the protection of fish and wildlife, he noted. Mr. Strowd said that although it was operated today by the South Florida Water Management District (SFWMD), the regional flood control system was still a federal project, and the SFWMD could not make changes to this system unilaterally. He indicated that the federal project had implications for the eco-system, but it provided flood protection for the lower east coast.

Mr. Strowd noted the hurricanes of late September and early October 1947 flooded the entire peninsula, and the State of Florida requested the assistance of the federal government to develop a flood control plan. He

said that those capacities had been held constant over the past 50 years; however, those capacities may diminish as the sea level increases. Mr. Strowd indicated that sea level rise may have potential impacts on water management, as it would affect rainfall patterns (storm surge, droughts, flooding, and hurricanes), the drinking water supply (salt water intrusion and freshwater wells), and the natural environment (Everglades, ocean acidification and coral bleaching).

Mr. Strowd said that the SFWMD's initial focus was on sea level rise, as the data demonstrated that the sea level had increased in the last 100 years. Mr. Strowd noted the SFWMD was also evaluating the potential impacts of sea level rise to natural eco-systems, including the intrusion of salt water into the Everglades, the inland migration of salt water underground into the fresh water aquifer, and the threat to well fields. He said that as salt water moves more inland it may affect the fresh water supply. Mr. Strowd noted flooding is a major concern, and lately sunny day flooding has occurred in Fort Lauderdale and Miami Beach, which experience inundations without any rainfall. He explained that the SFWMD is concerned that there would be major flooding if this were to happen at the same time as a tropical system or a hurricane.

Mr. Strowd noted the National Academy of Science had performed some modeling on the West Coast, which indicated that storm surges responded to sea level rise in a non-linear manner. He stated that sea level rise could magnify the adverse impact of storm surges and high waves on the coast; there may be a general increase in sea level, with much more frequent storm surges and for longer durations. He said that storm surges would last longer, could trap people in buildings and their cars, and potentially be life-threatening.

Mr. Strowd stated that the SFWMD had a number of flood-control structures along the east coast. He said that because the SFWMD needed to maintain ground water levels sufficiently high to provide fresh water to recharge the aquifer for urban use, these structures were constructed as salinity dams. He indicated that they were designed with certain capacities to provide a specific level of service to the urban communities to the West. He noted as sea level increased, the differential between the upstream and the downstream sides would diminish, leading to a decrease in the level of service in the western areas. Therefore, Mr. Strowd pointed out, sea level rise was a threat to everyone, not just those along the coast. He noted the

salinity-control structures were approaching 40 or 50 years in age, and were near the end of their design life. He said that a decision would have to be made regarding whether to redesign them entirely, or just make simple modifications to accommodate sea level rise.

Mr. Strowd noted southern Florida was experiencing more frequent storm surges, especially near the coast. As a result, he stated, Miami-Dade County established the Storm Water Task Force, which recommended specific improvements, including the use of forward-pumping stations. He said that the SFWMD planned to install these forward-pumping stations in all of the flood-control structures to limit the impact of sea level rise.

In response to Mr. Enfield's question as to the foreseen lifetime of these structures, Mr. Strowd said that it was approximately 50 years, and for some of the more robust structures it was slightly longer. He said that the SFWMD did not want to build structures that would not be needed for another 15 to 20 years, as this would not be an efficient use of funds.

Chairman Ruvin pointed out that any contingency plan should involve triggering specific actions based on certain vital signs, to avoid the needless expenditure of funds.

Pursuant to Mr. Milian's question regarding back-pumping, Mr. Strowd indicated that the flood-control plan that was developed following Hurricane Irene included a back-pumping component.

Mr. Strowd reiterated that the SFWMD was unable to unilaterally make changes to the regional flood control system without the approval of the U.S. Army Corp of Engineers. He said that the SFWMD was able to make improvements to the flood-control structures because it was part of a Federal Emergency Management Agency (FEMA) flood mitigation effort. He noted following a major storm, it was fairly easy to obtain the federal government's approval to make improvements through a process called the federal post-authorization change. However, Mr. Strowd pointed out, it was more difficult to obtain federal funding to combat the potential impacts of sea level rise. He noted although it was possible to expect an important impact, a definite sea level rise impact could not yet be demonstrated. Mr. Strowd said that the risk of sea level rise was expected to increase over

time, but the infrastructure capacity was fixed; therefore, it was necessary to start planning. He noted the decision regarding how much to invest in anticipation of future risk should be based on the design life of the facility. He pointed out that this was a better way to plan, as it left room for unanticipated risk.

In response to Mr. Enfield's question as to whether it was possible to use the concept of a lift-slab building with these structures, Mr. Strowd said that this had been done in a limited fashion. He pointed out that one of the challenges on the inland side was that there would not be the opportunity to raise the canal level.

Mr. Strowd suggested that the first steps to tackle sea level rise should involve adopting the following "No-regret strategies": Continue looking at opportunities and technologies to reduce the amount of additional freshwater needed for water supply; implement water conservation measures; develop alternative water supply options; and maintain the existing flood protection system.

Mr. Strowd noted the following progress had been achieved to-date: Briefings to SFWMD's Governing Board and the Water Resources Advisory Commission (WRAC) since May 2008; monitoring of science; white paper and technical report, preliminary assessment of coastal water control structures; baseline mapping of saltwater intrusion front, technical assistance to local government committees and task forces, participation in workshops and conferences, and on-going coordination with the Florida Department of Environmental Protection (FDEP) and other water management districts.

Mr. Milian expressed concern that the planning stage would take many years, noting the community could not afford this. He recalled that the SFWMD carried out forward-pumping and back-pumping as a reaction to the loss of property during flooding in Sweetwater and West Miami some years ago. He stressed the importance of initiating the planning process to undertake the necessary improvements.

Mr. Strowd noted the SFWMD had launched a study to better understand the existing conditions in North Miami and to evaluate whether the pumps would be the appropriate solution.

Chairman Ruvlin stated that as it was not always possible to demonstrate the impact of sea level rise, it was necessary to anticipate impacts. He said that the Inter-governmental Panel on Climate Change (IPCC) would be releasing its projected sea level rise impacts in March 2014, noting more data was consistently being accumulated.

Mr. Murley said that it was important to identify solutions with the federal government as well as with other partners. He referred to the 17-County Ad Valorem Taxing District, in which Miami-Dade County (MDC) was the largest taxing district, and suggested that this body be contacted as a potential funding partner. He pointed out that MDC's water quality program was State-funded, noting in certain situations it was necessary to tap into State and regional funding sources.

Mr. Strowd noted the U.S. Army Corp of Engineers had been a real partner, and the SFWMD had adopted its sea level rise projections. He said that the federal post-authorization change process had been used effectively for the Everglades restoration, and this was most likely the process that would be used to modify the infrastructure in anticipation of sea level rise.

Pursuant to Ms. Fain's question regarding the timing for implementation, Mr. Strowd indicated that the SFWMD was still in the early stages of the planning process. He said that the current focus was to ensure that the older infrastructure complied with FEMA standards. He stated that much repair work was necessary, noting the projects that were being refurbished were inland, and were not affected by sea level rise.

Responding to Ms. Fain's question as to how the State and MDC could help the SFWMD with this project, Mr. Strowd noted the work with the Southeast Florida Regional Climate Compact (the Compact) had been very effective. However, at this point the SFWMD was still gathering the data to inform the planning process.

In response to Mr. Milian's question regarding whether the City of Miami Beach would be included in the SFWMD's planning, Mr. Strowd indicated

that a number of communities, including Miami Beach, were located downstream, and would not benefit from the planned improvements.

Chairman Ruvlin noted the City of Miami Beach was very important to this community, was represented at today's (12/20) meeting, and its managers were aware of this issue. He said that when the Task Force members finished their initial deliberations, they would try to identify the means to tap into all of the funding sources necessary to implement a plan addressing the worst-case scenario, with the help of various partners.

IV. Dr. Virginia Walsh, Senior Professional Geologist, Miami-Dade Water and Sewer Department – The WASD/USGS Surface Water/Storm Water Interface GIS Model

Dr. Walsh explained that the Miami-Dade Water and Sewer Department (WASD) entered into a joint Funding Agreement with the United States Geological Survey (USGS) in February 2008 to develop an integrated surface water-ground water model in response to the South Florida Water Management District's 20-year Water Use Permit. She said that one of the objectives of this exercise was to determine whether sea level rise would cause saltwater intrusion into coastal well fields. Dr. Walsh stated that one of the questions they were seeking to answer was whether current surface water structure control operational criteria would effectively control saltwater intrusion in view of the projected population increase and sea level rise. She explained that WASD's approach was to use an integrated surface water-ground water model to evaluate how increased well field pumping would affect the surface water structure's operation. She noted as there was a lack of data, WASD conducted a number of research projects simultaneously with the development of this model to gather more accurate data. Dr. Walsh stated that WASD created a brand new way to simulate surface water flow in MDC, noting they studied municipal pumping, recreational irrigation, land use, agricultural water use, etc. She said that WASD would be continuing to improve the model.

Chairman Ruvin noted in the event of a worst-case scenario, vital sign triggering would be necessary; and it appeared that the model being developed could be used to track these vital signs.

Dr. Walsh indicated that the calibration for this model was extremely complicated; the model was calibrated for an eight-year period to ensure that the results reflected the actual conditions, and was verified for a six-year period. She stated that the results would be included in the USGS publication, and a very conservative approach was adopted as the USGS has an extremely rigorous internal peer review process. She noted the current projected sea level rise, based on the available sea level rise data and existing meteorological conditions, was used for the base scenarios. Dr. Walsh said that the initial results demonstrate that Miami-Dade's well fields are in good shape for the next 20 years. She said that WASD intended to indicate in the USGS publication that over the next 30 years the existing surface-water system could be effectively used to control saltwater intrusion into the Biscayne aquifer. She noted WASD was continuing to update the models and was working with the Office of Sustainability to establish a Task Force within County departments to gather input on the type of data that would be most useful. She stated that the USGS would be training her and her staff to conduct internally-developed scenarios; and all of the results would be available to the public.

In response to Chairman Ruvin's question as to whether other counties were conducting similar tests, Dr. Walsh confirmed that Broward County was doing so, but was focusing on specific areas; on the other hand, Miami-Dade had developed models for the entire County because it had the necessary resources. She said that it would be useful for the counties to integrate their efforts in the future.

Pursuant to Ms. Fain's question regarding coordination efforts, Dr. Walsh said that the South Florida Water Management District (SFWMD) had been kept informed as the models had been developed.

Dr. Jayantha Obeysekera Obe, South Florida Water Management District, confirmed that SFWMD staff members attended technical meetings, provided input, and were hoping to use these tools.

Dr. Walsh pointed out that Miami-Dade had one of the best saltwater intrusion monitoring programs in the world. She said that the information was available on the web, and she hoped that as data became available it could be shared with the public.

Chairman Ruvin noted if it was anticipated that saltwater would intrude into the well fields, vital signs should be identified that would trigger the construction of desalinization plants.

Dr. Walsh indicated that models could help test different scenarios. For example, a scenario could be tested which would involve modifying the operation of the well fields in response to changing seasonal conditions; the well fields located close to the coast could be operated during the wet and dry seasons, and not in between. She noted such a scenario would allow Miami-Dade to maintain the current level of treatment without having to invest in desalinization plants.

Discussion ensued among Dr. Walsh, Ms. Olderman, Mr. Milian and Mr. Murley regarding the Floridan aquifer; reducing demand for water; the need to constantly educate the public on water conservation; and the County's Aquifer Storage and Recovery (ASR) system.

V. Ms. Marcia Steelman, Engineer 3, Miami-Dade Public Works and Waste Management – Miami-Dade's Storm Water Master Planning Program

Ms. Steelman said that she was asked to speak about Miami-Dade's Storm Water Master Planning program (SWMP), and how sea level rise was incorporated into the planning process. She noted the first two presentations today (12/20) explained what the SFWMD and the County were doing at the district and County levels to address sea level rise; and she would now present what was being done locally.

Ms. Steelman stated that the over-arching goal of the SWMP was to incorporate different climate scenario predictions, and risk assessment tools into practical design criteria for cost-effective and resilient civil works. However, she noted, the difficulty involved translating the National Resource Council (NRC) scenarios into flood levels of service. She said that in order to reach its goal the SWMP had to answer the following questions: Did the storm water planning procedures and current regulations compare to the NRC sea level rise scenarios? Did the procedures have to change? Were the current regulations sufficient? How could they be improved?

Ms. Steelman presented a slide depicting the scenarios for Global Mean Sea Level (GMSL) rise based on updates to the NRC 1987 equation. She compared the overview of elevation requirements before the Florida Building Code (FBC) 2010 to the elevation requirements after FBC 2010. She said that the Florida Building Code changed the regulations, and required that the structures located in the Coastal A Zone be raised.

Ms. Steelman explained that the Storm Water Master Plan used traditional planning procedures based on historical data and statistical trends. The SWMP used the mean sea level trends, the Mean Higher High Water (MHHW), the 100-year tide, and the 100-year rainfall; the National Oceanic and Atmospheric Administration (NOAA) provided information on the four components. Ms. Steelman said that the district had also developed a database on the tail water rise trends, and the rates were comparable to those on Miami Beach. The results show that inland rates of increase could be higher than the corresponding sea level rise on the shore. She also indicated that, according to NOAA, in 100 years the MHHW would be 6.36 up from 1. She noted these figures matched the modified NRC III scenario, which was the most conservative.

Ms. Steelman said that she looked to the past to see how the structures built 50 years ago had been affected by sea level rise. She noted they had been severely affected, as small rainfalls caused floods, whereas in Miami Beach, which was developed more recently, the water did not get into the buildings.

Chairman Ruvin noted the perception was that sea level rise was only a threat for wealthy people; however, this was incorrect as poor neighborhoods were also affected.

Ms. Steelman pointed out that residents of the more affluent areas had the means to construct the buildings in anticipation of sea level rise. However, in the poorer areas, for example in the Arch Creek Basin, the County had applied for a grant from FEMA to demolish the houses and rebuild them at higher elevations.

Ms. Steelman suggested the following solutions to build in anticipation of sea level rise: Recognize the uncertainty to determine the level of detail and accuracy required with respect to potential risks and consequences; remain flexible in planning and engineering and incorporate in the design of all civil works a range of likely changes and safety factors for unknown possibilities; understand that periodic adjustments must be made over a longer planning horizon. She recommended that the same standards should be used for all areas; there should be a minimum freeboard of 12"; and the County's flood criteria should be updated.

Chairman Ruvin said that the Task Force may recommend hiring a global engineering firm to pull all of the information presented today (12/20) into a coherent plan that could be submitted for funding.

VI. Dr. Douglas Yoder, Deputy Director, Miami-Dade Water and Sewer Department – Miami-Dade's Water and Sewer Department's Planning for Sea Level Rise

Chairman Ruvin presented Dr. Yoder, noting he had been working on the sea level rise issue for a very long time. He recounted that in 1990 the International Council for Local Environmental Initiatives (ICLEI) was founded, and in 1991, ICLEI started its first program entitled "Cities for Climate Protection;" this was a milestone program, which helped 14 different cities formulate climate action plans. Chairman Ruvin said that Dr. Yoder was in charge of this program for Miami.

Dr. Yoder noted the climate action plan for the County would not have happened without Chairman Ruvin's leadership. He said that he would present the Water and Sewer Department's (WASD) efforts to tackle sea level rise. He stated that WASD was currently dealing with four issues related to sea level rise: storm surge, salt water intrusion, ground water rise, and depopulation. He noted WASD had regional waste water treatment plants located on the coast, which continue to be vulnerable to storm surge – the Hialeah reverse osmosis plant and a new South Miami Heights plant, which were both Floridan aquifer-supplied plants; and other smaller plants in South Dade. He said that Dr. Walsh had already covered salt water intrusion. Referring to the impact of ground water rise, Dr. Yoder noted this could translate into additional flooding. He said that the fourth issue, depopulation, was dependent on how the first three issues were handled, and could potentially be catastrophic for Miami-Dade because it pertained to the County's customer base.

Dr. Yoder observed that Mr. Strowd in his presentation aptly described an adaptive management approach to managing risk in the short and long terms. He said that as decisions were being made on whether to build new infrastructure or to refurbish old infrastructure, those decisions should take into account the risks that exist today, and those that may occur in the future. He noted WASD staff members had to be mindful of these risks as they made decisions regarding the repair or construction of waste water treatment plants; they also had to take into consideration the State legislative requirement that the central and north plants stop using ocean outfalls.

Dr. Yoder said that in the recent past, in part as a result of the experience with Hurricane Andrew, WASD completed its largest construction project, which involved adding tertiary treatment to its facilities. He explained that when those facilities were designed, they were built one and a half feet above the required base flood elevation. He noted this was done because during Hurricane Andrew the generators were washed out by the storm surge, and as a result the plants were not operational for two weeks. He observed that people expect to lose power during storms, but not water.

Dr. Yoder said that in the past WASD had elevated the new structures to address storm surge. He noted staff members experimented with a storm surge scenario, using as a guideline 3 feet of sea level rise and a 22-foot storm surge, which is what is expected by 2075. He said that considering the elevation of the existing facilities, which range from 12 to 20 feet, the risk of flooding would exist with a Category 2 hurricane. As a result, the general approach that WASD was recommending was that it would be most cost-effective to harden the base of the facilities to protect them from flooding. Dr. Yoder said that another option would be to construct a wall to surround each facility, but there would have to be drainage, and this would be more expensive. Yet another option would involve moving the plants, and he noted WASD was planning to construct a new waste water treatment plant in the western part of the County. He stated that in their design guidelines, WASD staff members were using the assumption that there would be a 3-foot rise. He said that they would build new facilities based on this assumption; and the approach for old facilities would be to harden the base. He pointed out that it did not make sense to invest huge amounts of money to address the uncertain risk.

Mr. Enfield urged caution with using Hurricane Andrew as a model for a Category 5 storm, because it was such a compact storm; the inland reach and the duration of the flooding were much less than the median storm surge for a Category 5 storm. He pointed out that if Hurricane Sandy had landed in southern Florida, it would have caused more damage, because it was much wider.

Discussion ensued between Mr. Enfield and Dr. Yoder regarding whether it was preferable to use the high or low end on the projection curves.

Chairman Ruvin noted much was based on historic data. He referred to the report from the Geneva Society entitled: "Sea Level Rise: Implications for the Insurance Industry," which found that the insurance industry could no longer rely on historic data to set rates or assess risk; and now had to rely on predictive data. He noted the insurance industry was formulating new policies in light of the report's findings. He said that he reached out to Swiss Re, to ask them if they would be willing to address the Task Force.

He explained that insurance industry representatives were concerned with keeping the area insurable and may expect a plan from government addressing sea level rise. He said that he would like to secure their cooperation in order for them to take ownership in the Task Force's recommendations.

VII. Discussion/Public Comment

Mr. Tom David, a member of the public, asked where on the curve of sea level rise economic failure would happen, noting it could happen earlier than 3 feet.

Chairman Ruvin said this was a very important point to raise, because people thought that catastrophe would only occur if there was flooding. He stressed the importance of having a plan in place and of implementing it before the catastrophe occurs. He referred to the report by the Inter-governmental Panel on Climate Change (IPCC), a scientific body based in The Hague, whose mission was to produce periodic assessments of the science and its impact. Chairman Ruvin noted in their latest assessment a month ago, they escalated their predictions regarding sea level rise, and in 2014, they would issue an addendum to the report that would accelerate the predictions made previously. He stated that it would be necessary to educate the public; however, the message should be as positive as possible to avoid creating panic.

Further to a comment by a member of the public that the County Commission would have to seriously consider whether to authorize the construction of a soccer stadium in the vicinity of the Port of Miami, Ms. Fain pointed out that building infrastructure in the far western part of the County was as much of a concern as constructing infrastructure on the coast.

Mr. Terry Murphy, a member of the public, said that he was encouraged to find out from the South Florida Water Management District that an option existed to upgrade the flood-control structures. He suggested that the

County work in conjunction with the District Board to ensure that these improvements were accelerated. He noted the information shared by Dr. Walsh indicating that Miami-Dade's well fields were not at risk of saltwater intrusion for the next 20 years would alleviate concerns relating to MDC's water supply.

Chairman Ruvin said he agreed, and that it would be useful to explain to potential donors that Miami-Dade had one of the best saltwater intrusion monitoring programs in the world.

Mr. David Adams, a journalist from Reuters, observed how useful the presentations were for the media, and asked Ms. Steelman how many homes were at risk in the Arch Creek Basin.

Ms. Steelman said that a number of areas were at risk. She noted these low-income areas were developed over 50 years ago, and had not been redeveloped. She pointed out that the more affluent areas were at a lower risk because they had either been newly-developed or had been redeveloped. She stated that it was necessary to identify a comprehensive solution to sea level rise; for example, elevating the structures two feet above the base water elevation level, and upgrading the infrastructure.

Discussion ensued between Ms. Steelman and members of the public regarding the number of basins that were at risk; the repetitive loss areas along the Miami River; FEMA's program to assist these areas; and whether it made more sense to pay the residents to move.

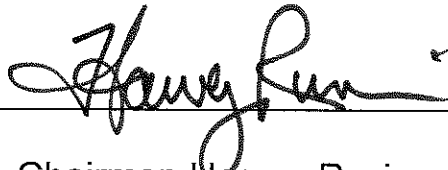
VIII. Proposed Date for Next Meeting

Chairman Ruvin said that he would contact the members regarding the date of the next meeting. He asked the members for their thoughts regarding other presenters who could be invited to address the Task Force.

Ms. Nichole Hefty, Chief, Office of Sustainability, Planning Division, Miami-Dade Department of Regulatory and Economic Resources (RER), noted she went through the minutes, and extracted the proposed presentations.

IX. Adjournment

There being no other business to come before the Sea Level Rise Task Force, the meeting adjourned at 12:30 p.m.

A handwritten signature in black ink, appearing to read "Harvey Ruvin", is positioned above a horizontal line.

Chairman Harvey Ruvin
Sea Level Rise Task Force



**Miami-Dade County
Sea Level Rise Task Force
December 20, 2013**

Prepared by: Maryse Fontus

EXHIBITS LIST

NO.	DATE	ITEM #	DESCRIPTION
1	12/20/2013		Attendance Sheet
2	12/20/2013		Agenda
3	12/20/2013		Stormwater Masterplan Planning Procedures
4	12/20/2013		The Federal Flood Control Project
5	12/20/2013		WASD's Water and Wastewater Major Facilities
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MIAMI-DADE SEA LEVEL RISE TASK FORCE
MEETING DATE OF Dec. 20, 2013

	TASK FORCE MEMBERS	PRESENT	LATE	ABSENT
1	Enfield, David	✓		
2	Fain, Sara E.	✓		
3	Fair, T. Willard	—		✓
4	Gonzalez, Jorge	—		✓
5	Milian, Arsenio	✓		
6	Murley, James F.	✓		
7	Ruin, Harvey	✓		

Four (4) members constitutes a quorum



Miami-Dade Sea Level Rise Task Force Meeting

December 20, 2013

10:00AM – 12:00 PM

Lawson E. Thomas Courthouse Center

175 NW 1st Avenue, 26th Floor Conference Room

Miami, Florida 33128.

- **Welcome and Introductions**
Honorable Clerk & Sea Level Rise Task Force Chair, Harvey Ruvin
- **Approval of Meeting Minutes**
 - November 4th, 2013
 - November 21, 2013
- **Mr. Tommy Stroud, P.E., Assistant Executive Director, Operations, Maintenance & Construction, S. Florida Water Mgmt. District**
Implications of Sea Level Rise on Water Management
- **Ms. Marcia Steelman, CFM, Engineer 3, Miami-Dade Public Works and Waste Mgmt.**
Miami-Dade's Stormwater Master Planning program
- **Ms. Virginia Walsh, Sr. Professional Geologist, Miami-Dade Water and Sewer Dept.**
The WASD/USGS Surface Water/Stormwater Interface GIS model
- **Dr. Douglas Yoder, Deputy Director, Miami-Dade Water and Sewer Dept.**
Miami-Dade Water and Sewer Dept. Planning for Sea Level Rise
- **Q/A and Discussion**
- **Public Comment**
- **Proposed Date for Next Meeting**



Miami-Dade Sea Rise Task Force

SEAWATER MASTERPLAN PLANNING PROCEDURES

12/20/2013

PROBLEM STATEMENT

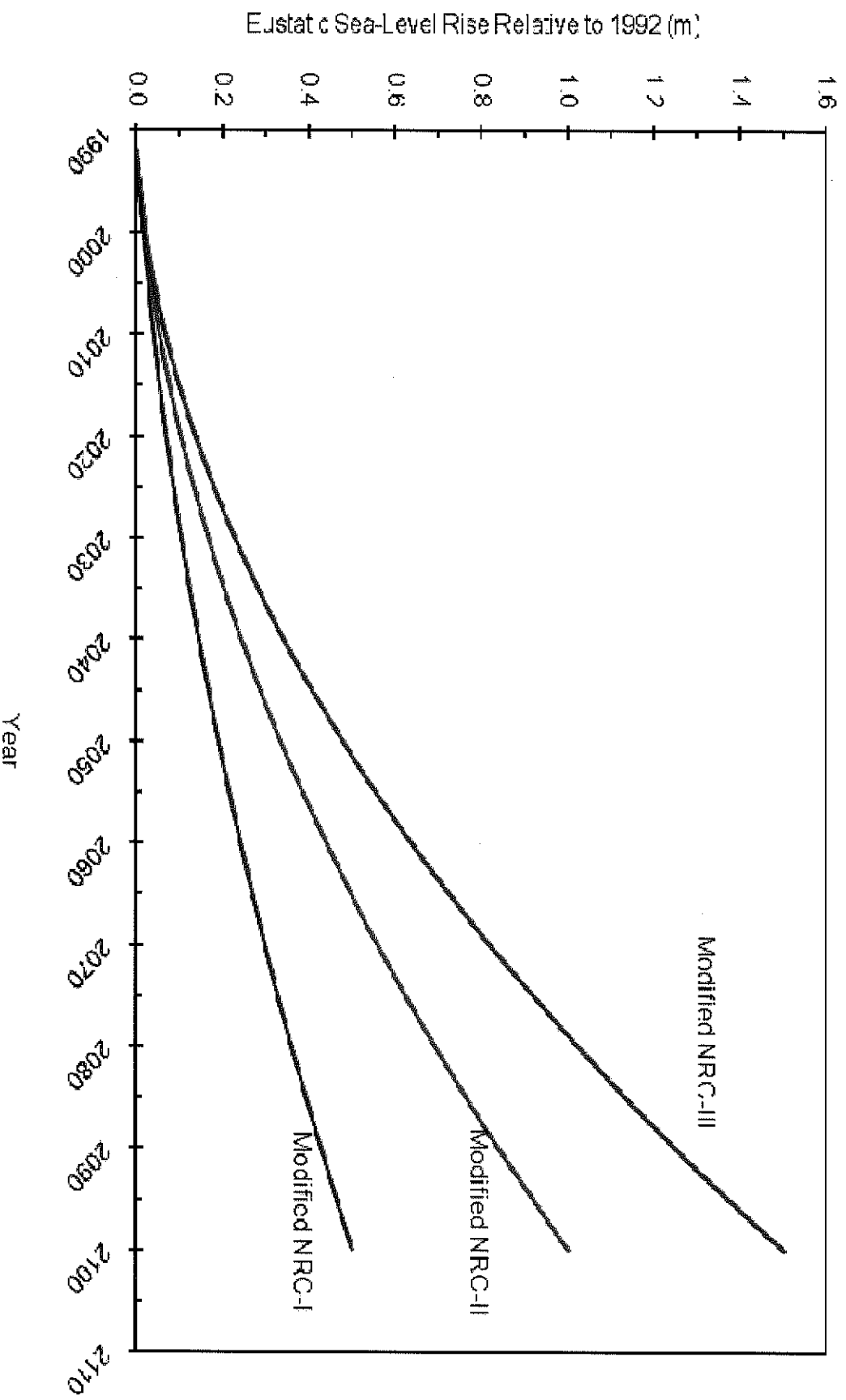
How do we incorporate different climate scenarios predictions, scientific/political disputes, and risk assessment tools into a practical design criteria for cost effective and resilient civil works?

MIAMI-DADE COUNTY'S PLANNING PROCEDURES

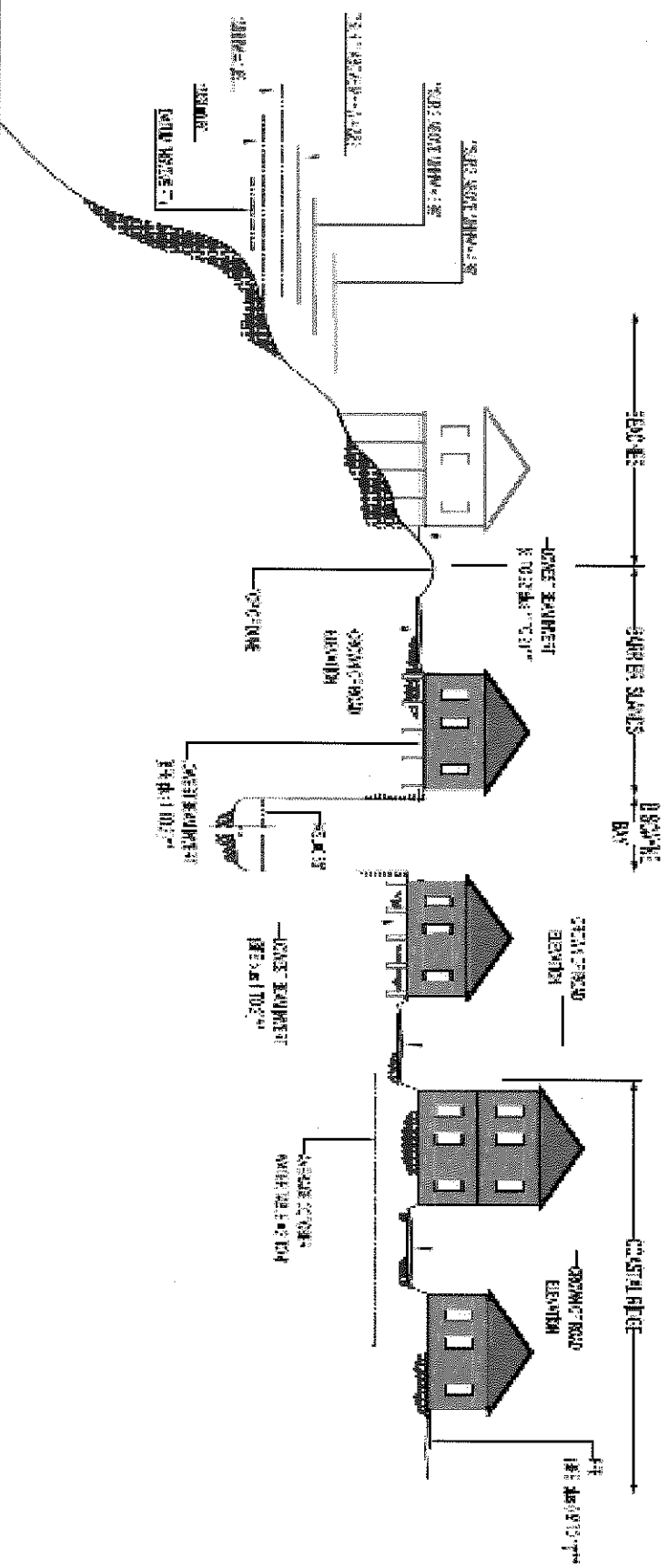
- HOW DO WE TRANSLATE THE NRC SCENARIOS INTO FLOOD LEVELS OF SERVICE?
- HOW DO THE STORMWATER MASTERPLAN PLANNING PROCEDURES AND CURRENT REGULATIONS COMPARE TO THE NRC SEA LEVEL SCENARIOS FOR YEAR 2113?
- ARE THE CURRENT REGULATION SUFFICIENT?
- HOW CAN THEY BE IMPROVED?

Scenarios for GMSL Rise (based on updates to NRC 1987 equation)

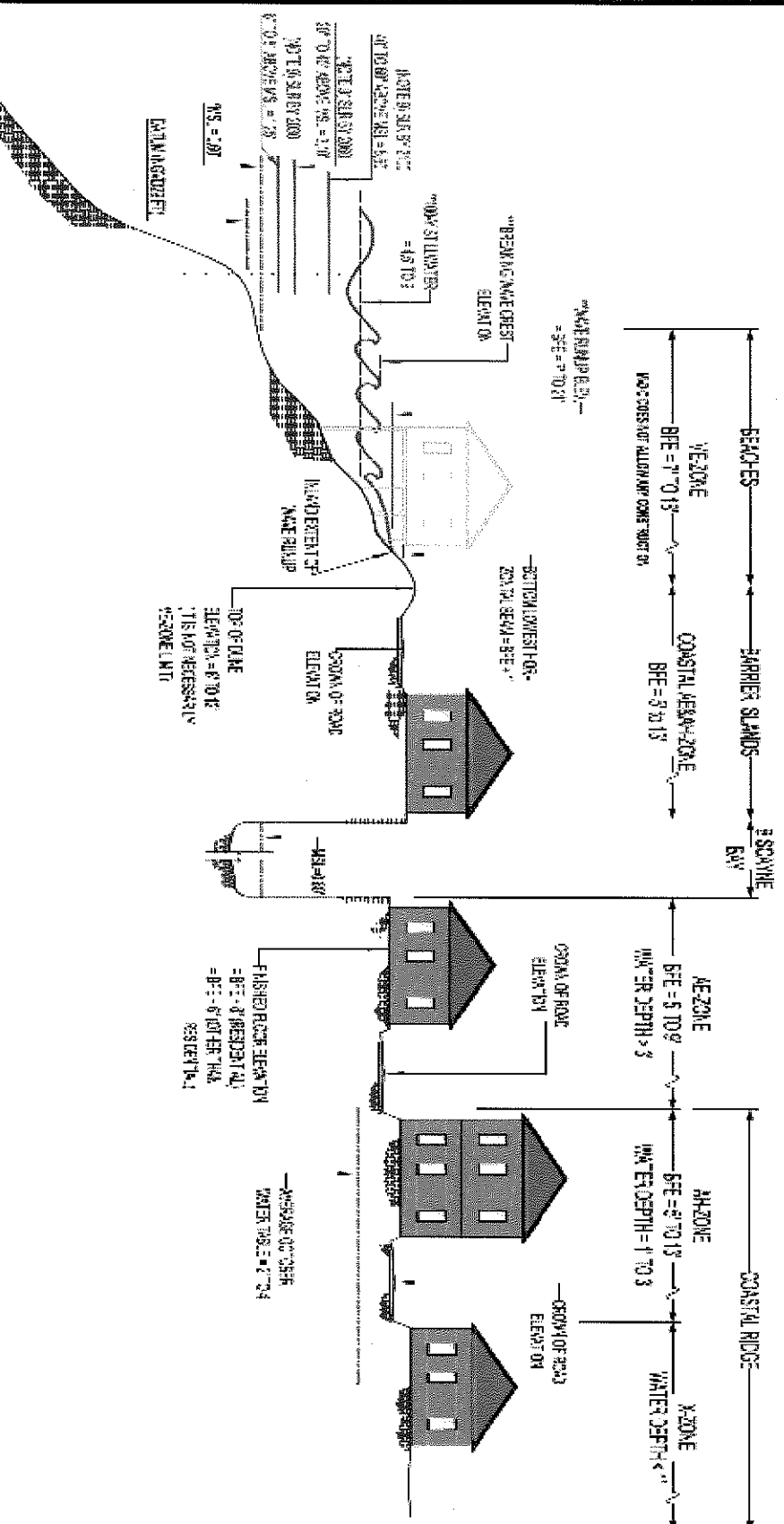
Source: Engineer Circular 1165-2-212: Sea-Level Change Considerations for Civil Works Programs (2011) \USACE



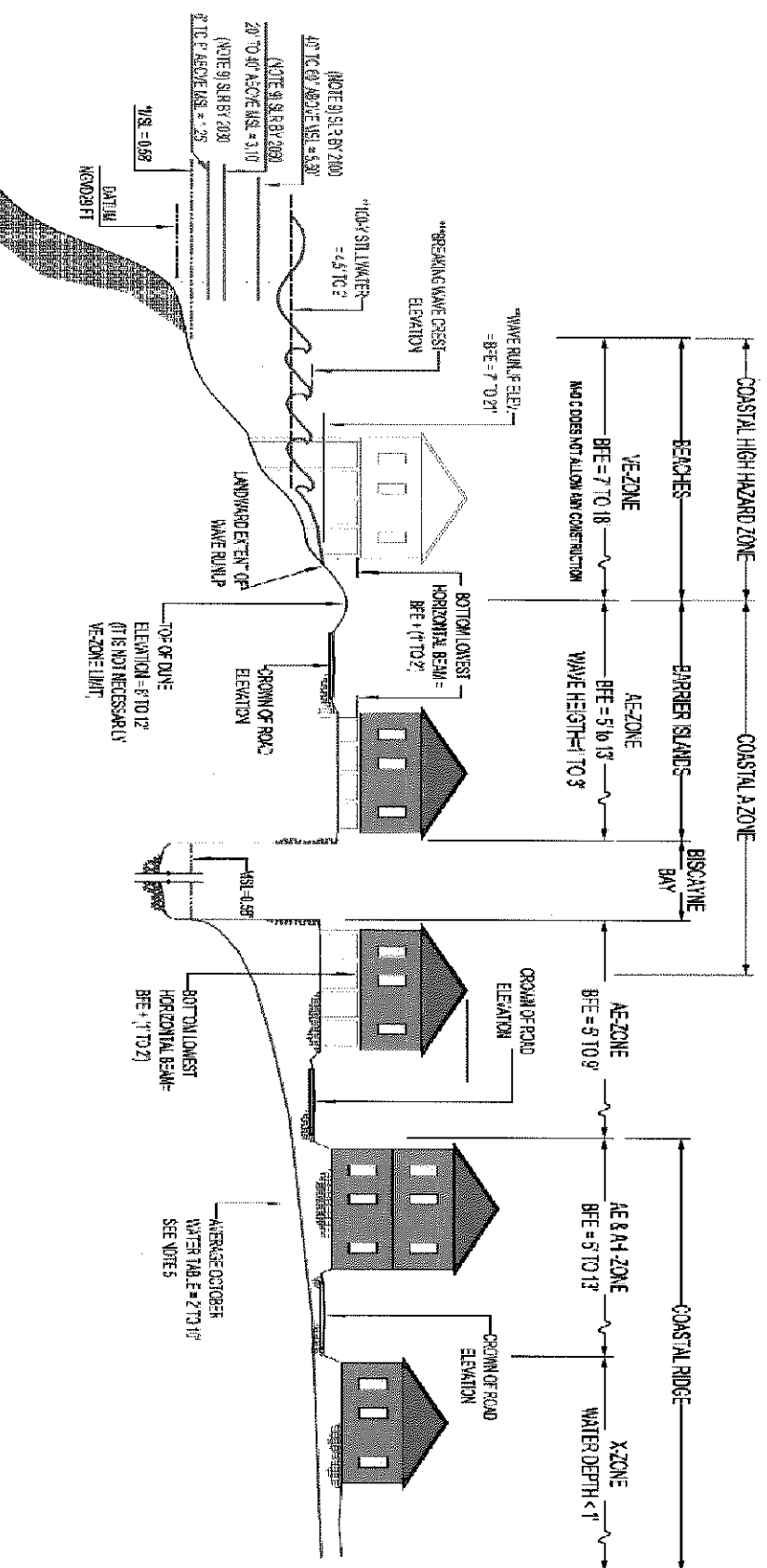
PROJECTIONS (BATH TUB)



OVERVIEW OF ELEVATION REQUIREMENTS BEFORE FBC 2010



AFTER FBC 2010 - CURRENT



12/20/2013

STORMWATER MASTERPLAN

TRADITIONAL PLANNING PROCEDURES
BASED ON HISTORICAL DATA AND
STATISTICAL TRENDS

STORMWATER MASTERPLAN

MEAN SEA LEVEL TRENDS

+

MHHW

+

100-YEAR TIDE

+

100-YEAR RAINFALL

NOAA provides information on the 4
components

SEA LEVEL RISE = TIDAL TRENDS

In Feet/100 years

Source: NOAA – Tides & Currents website

Linear mean sea level (MSL) trends and 95% confidence intervals in feet/century

Station Name	First Year	P.O.R., years	For all data to 2006		Previously Published Trends	
			MSL Trend, FT	+/- 95% Confidence Interval	MSL Trend, FT	+/- 95% Confidence Interval
Fernandina Beach	1897	110	0.66	0.07	0.67	0.08
Mayport	1928	79	0.79	0.10	0.80	0.12
Miami Beach	1931	51	0.78	0.14	0.78	0.14
Vaca Key	1971	36	0.91	0.20	0.85	0.28
Key West	1913	94	0.73	0.05	0.74	0.06
Naples	1965	42	0.66	0.20	0.68	0.28
Fort Myers	1965	42	0.79	0.21	0.75	0.29
St. Petersburg	1947	60	0.77	0.10	0.79	0.12
Clearwater Beach	1973	34	0.80	0.26	0.91	0.42
Cedar Key	1914	93	0.59	0.06	0.61	0.07
Apalachicola	1967	40	0.45	0.29	0.50	0.38
Panama City	1973	34	0.25	0.27	0.10	0.41
Pensacola	1923	84	0.69	0.09	0.70	0.10

MHHW – MIAMI BEACH No. 8723170

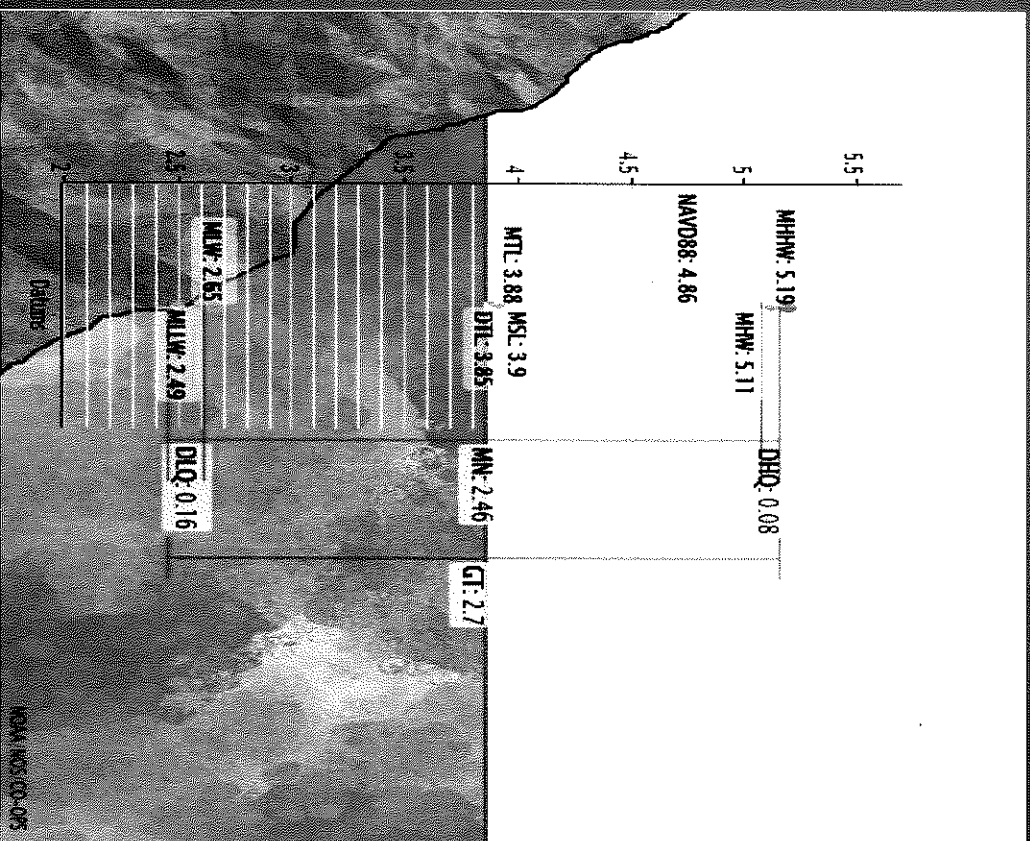
T.M.: 75 W

1983-2001

Datum: STND

Elevations on Station Datum

Value	Description
5.19	Mean Higher-High Water
5.11	Mean High Water
3.88	Mean Tide Level
3.90	Mean Sea Level
3.85	Mean Diurnal Tide Level
2.65	Mean Low Water
2.49	Mean Lower-Low Water
4.86	North American Vertical Datum of 1988
0.00	Station Datum
2.70	Great Diurnal Range
2.46	Mean Range of Tide
0.08	Mean Diurnal High Water Inequality
0.16	Mean Diurnal Low Water Inequality
0.78	Greenwich High Water Interval (in hours)
6.93	Greenwich Low Water Interval (in hours)
8.70	Highest Observed Water Level
03/08/1965 05:12	Highest Observed Water Level Date and Time
0.70	Lowest Observed Water Level
03/24/1936 14:42	Lowest Observed Water Level Date and Time
6.39	HAT Date and Time
10/16/1993 13:24	HAT Date and Time
1.58	Lowest Astronomical Tide
02/08/1997 07:18	Lowest Astronomical Tide LAT Date and Time



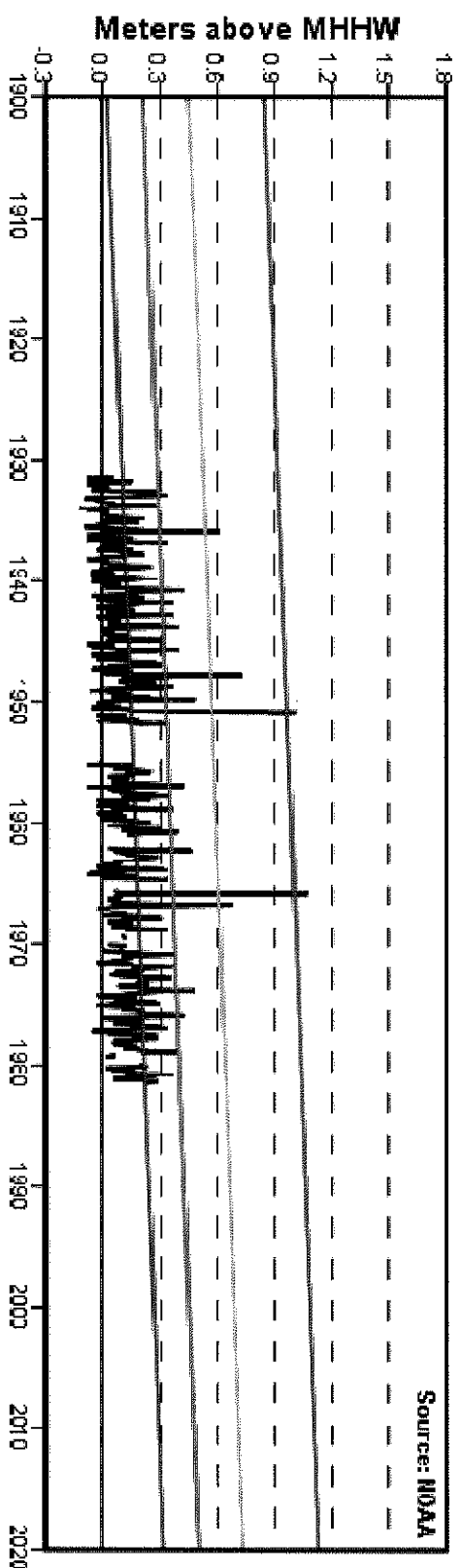
12/20/2013

SEA LEVEL RISE = TIDAL TRENDS

MONTHLY HIGHEST WATER LEVELS

- RED: 1% level, estimated to be exceeded ONCE in 100 YEARS
- ORANGE: 10% level estimated to be exceeded TEN TIMES in 100 YEARS,
- GREEN: 50% level, estimated to be exceeded TWICE in 100 YEARS
- BLUE: 99% level, estimated to be exceeded 99 TIMES in 100 YEARS

Miami Beach, FL



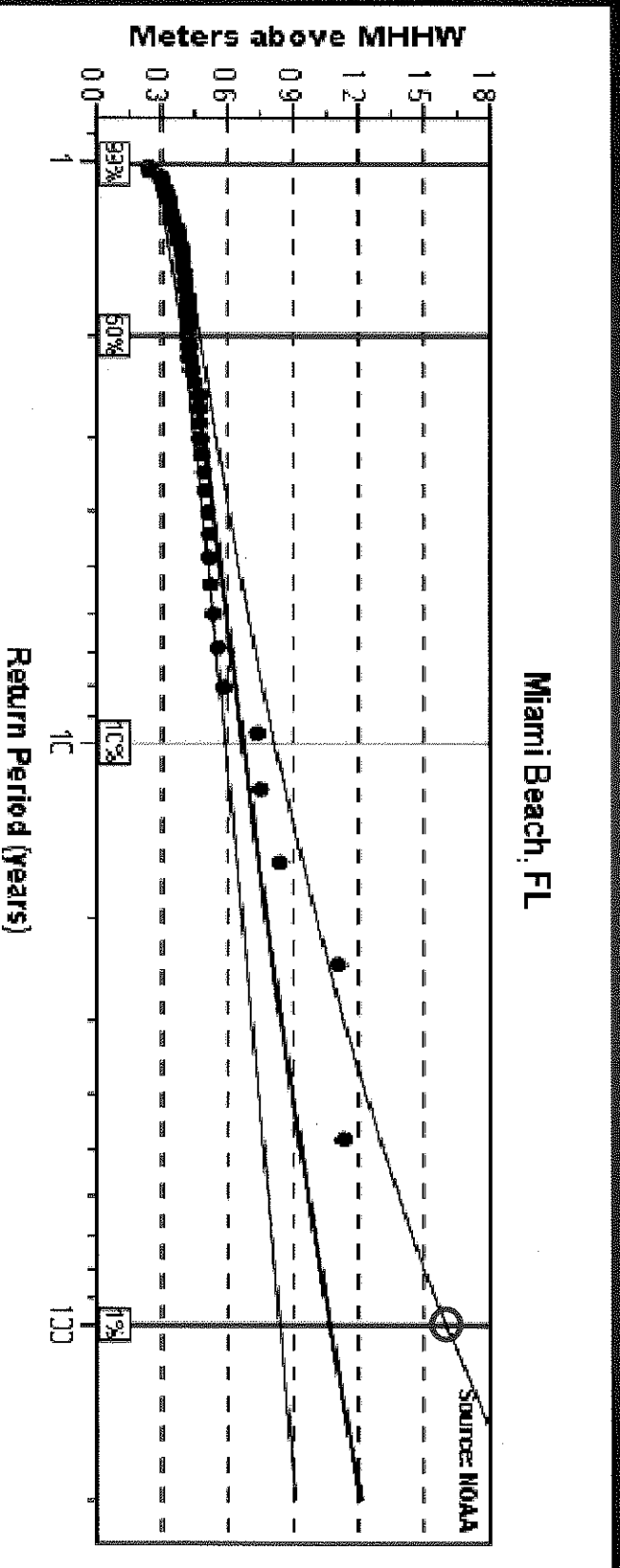
The plotted values are in meters relative to the National Tidal Datum Epoch (1983-2001) Mean Higher High Water (MHHW) datum established by CO-OPS (1 foot = 0.3 meters). The monthly extreme water levels include a Mean Sea Level (MSL) trend of 2.39 millimeters/year with a 95% confidence interval of +/- 0.43 millimeters/year based on monthly MSL data from 1931 to 1981 which is equivalent to a change of 0.78 feet in 100 years

Source:

12/20/2013

100-YEAR TIDE ABOVE MHHW

- The plot shows the annual exceedance probability curves with 95% confidence intervals, representing highest levels as a function of return period in years.
- The dots indicate the annual highest water levels after the Mean Sea Level trend was removed.



The levels are in meters relative to the Mean Higher High Water (MHHW) datum established by CO-OPS (1 foot = 0.3 meters). The position of the rightmost dot indicates the number of years of data used in the calculation.

Source:

12/20/2013

SFWMD CONTRL STRUCTURES

- Source: DBHYDRO, Masterplan trend line analysis of mean daily data

TAILWATER RISE TRENDS, BASED ON DBHYDRO MEAN DAILY WATER LEVELS			
Station, at tailwater	TAILWATER RISE TREND, inches/100 years	TAILWATER RISE TREND, feet/100 years	LOCATION
S-29	10	0.87	S-29 STRUCTURE ON SNAKE CREEK CANAL (C-9) AT NORTH MIAMI BEACH, FL (TAILWATER)
S-28	8	0.69	S-28 STRUCTURE ON BISCAYNE CANAL (C-8) AT TIDEWATER (TAILWATER)
S-27	11	0.93	S-27 STRUCTURE ON LITTLE RIVER CANAL (C-7) AT TIDEWATER (TAILWATER)
S-26	12	0.99	S-26 STRUCTURE ON MIAMI CANAL (C-6) AT TIDEWATER (TAILWATER)
S-25	14	1.13	S-25 CULVERT ON COMFORT CANAL (C-5) AT TIDEWATER (TAILWATER)
S-22	11	0.91	S-22 STRUCTURE ON SNAPPER CREEK CANAL (C-2) NEAR SOUTH MIAMI, FL (TAILWATER)
S-21	10	0.81	S-21 STRUCTURE ON BLACK CREEK (C-1) CANAL NEAR GOULDS, FL (TAILWATER)
S-123	8	0.70	S-123 STRUCTURE ON CUTLER DRAIN CANAL (C-100) AT TIDEWATER (TAILWATER)
S-20F	10	0.81	S-20F STRUCTURE ON MOWRY CANAL (C-103) NEAR TIDEWATER (TAILWATER)
S-21A	8	0.70	S-21A STRUCTURE ON PRINCETON CANAL (C-102) AT TIDEWATER (TAILWATER)

C-8 MODEL TIDAL BOUNDARY

Miami Beach Station

TIDE BOUNDARY – 100Y

MB	100Y + MHHW	3.61 NAVD88	
	100Y	3.28 Above MHHW	
	MSL	3.9 STDN	
	NAVD88	4.86 STDN	
MRT	2.46 MEAN RANGE OF TIDE		
T	PERIOD		
GT	2.7		
MHHW	5.19 STDN		
MHHW	0.33 NAVD88		
MHW	5.11 STDN		
MHW	0.25 NAVD88		
MLLW	2.49 STDN		
MLLW	-2.37 NAVD88		
MLW	2.65 STDN		
MLW	-2.21 NAVD88		
	REGULAR	100Y	
MHHW	0.33 NAVD88		3.61
MHW	0.25 NAVD88		3.53
MLLW	-2.37 NAVD88		0.91
MLW	-2.21 NAVD88		1.07

TIDE BOUNDARY 100Y+SLR

MB	MHHW + SLR+100Y	6.36 NAVD88	
	100Y	5.25 Above MHHW	
	MSL+SLR	4.68 STDN	
	NAVD88	4.86 STDN	
	SLR (NOAA)	0.78 ABOVE CURRENT MSL	
MRT	2.46 MEAN RANGE OF TIDE		
T	PERIOD		
GT	2.7		
MSL	3.9		
MHHW	5.19 STDN		
MHHW	0.33 NAVD88		
MHW	5.11 STDN		
MHW	0.25 NAVD88		
MLLW	2.49 STDN		
MLLW	-2.37 NAVD88		
MLW	2.65 STDN		
MLW	-2.21 NAVD88		
	REGULAR	SLR-100	
MHHW	0.33 NAVD88		6.36
MHW	0.25 NAVD88		6.28
MLLW	-2.37 NAVD88		3.66
MLW	-2.21 NAVD88		3.82

USACE PLANNING COMMUNITY TOOLBOX

Engineer Circular 1165-2-212: Sea-Level Change Considerations for Civil Works Programs (2011) Expiration: September 30, 2013

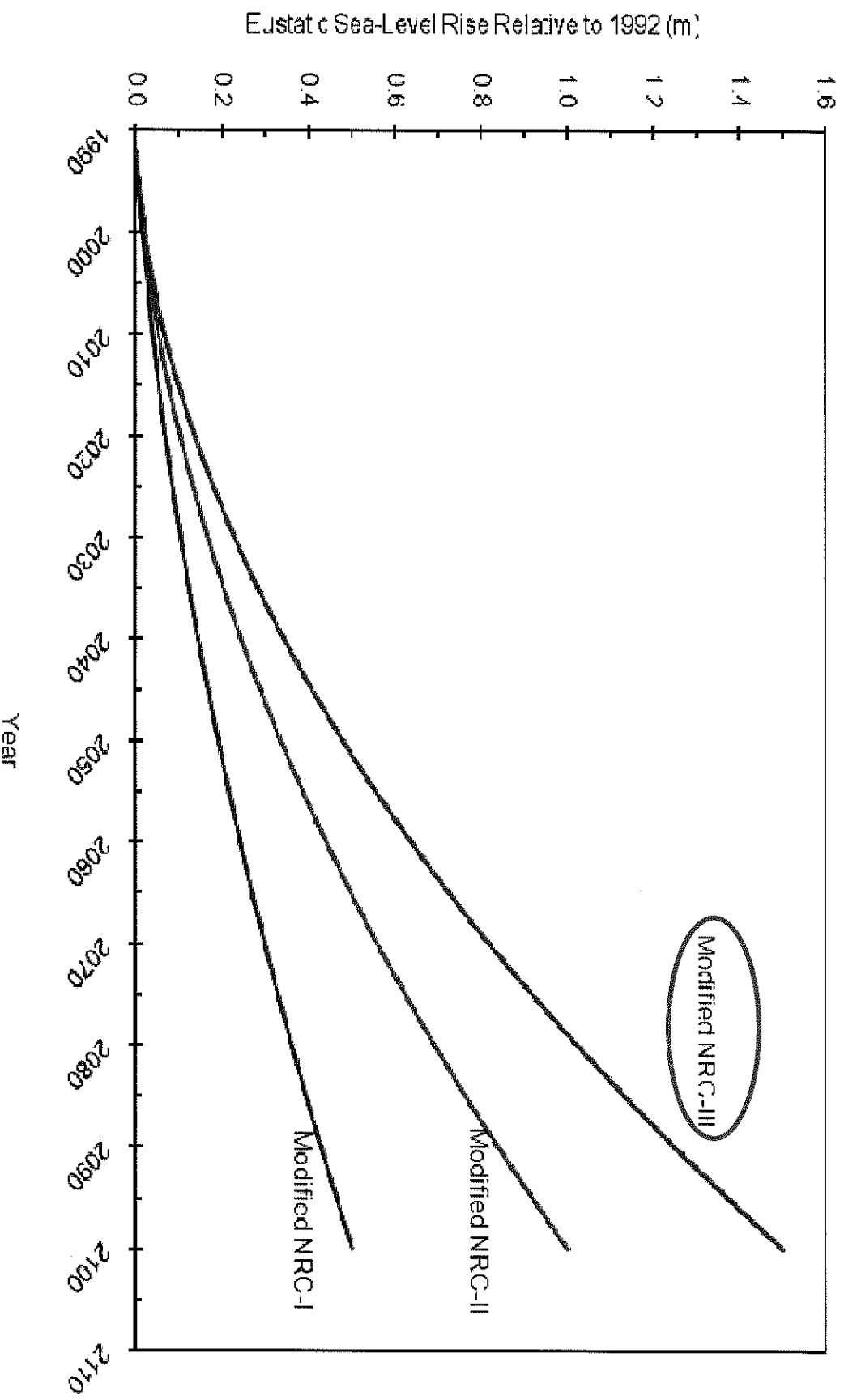
Engineer Circular 1165-2-211: Water Resource Policies and Authorities; Incorporating Sea-Level Change Considerations in Civil Works Programs (2009 Expiration: July 1, 2011)

HOW DO THESE FIGURES COMPARE TO THE SEA LEVEL SCENARIOS?

- THEY MATCH THE MODIFIED NRC III
SCENARIO, WHICH IS THE MOST
CONSERVATIVE

Scenarios for GMSL Rise (based on updates to NRC 1987 equation).

Source: Engineer Circular 1165-2-212: Sea-Level Change Considerations for Civil Works Programs (2011) \USACE



PROJECTIONS

USACE Circular No. 1165-2-212

for year 2113 – Miami Beach

SCENARIO	Meters	Rise above current MSL, feet	Rise above current MSL, inches	2013 MSL, IN NAVD88	2113 MSL, IN NAVD88	2113 MHHW, in NAVD88
NRC-I	0.60	1.96	23	-0.96	1.00	2.29
NRC-II	1.22	3.99	48	-0.96	3.03	4.32
NRC-III	1.84	6.03	72	-0.96	5.07	6.36

MASTERPLAN/ MITIGATION EXAMPLE

A neighborhood developed in the
1940's

Legend

- Repetitive Losses
- MDC Structures
- # MDC Pumps
- " SF/MD STRUCTURES
- Drainage Projects
- FDEM LIDAR
- NGVD 29
- LESS THAN 3
- 3 - 5
- 5 - 7
- 7 - 9
- MORE THAN 9

Legend

2009_DFIRM

FLD_ZONE

☐ VE

☐ AE

☐ AH

☐ X (Shaded)

☐ X

Flood Event 6/7/2013, NE Miami-Dade County



Source: MDC PWW

NE 144th ST and 145th ST, between NE 12th AVE and NE 13th AVE

12/20/2013

Flood Event 6/7/2013, NE Miami-Dade County

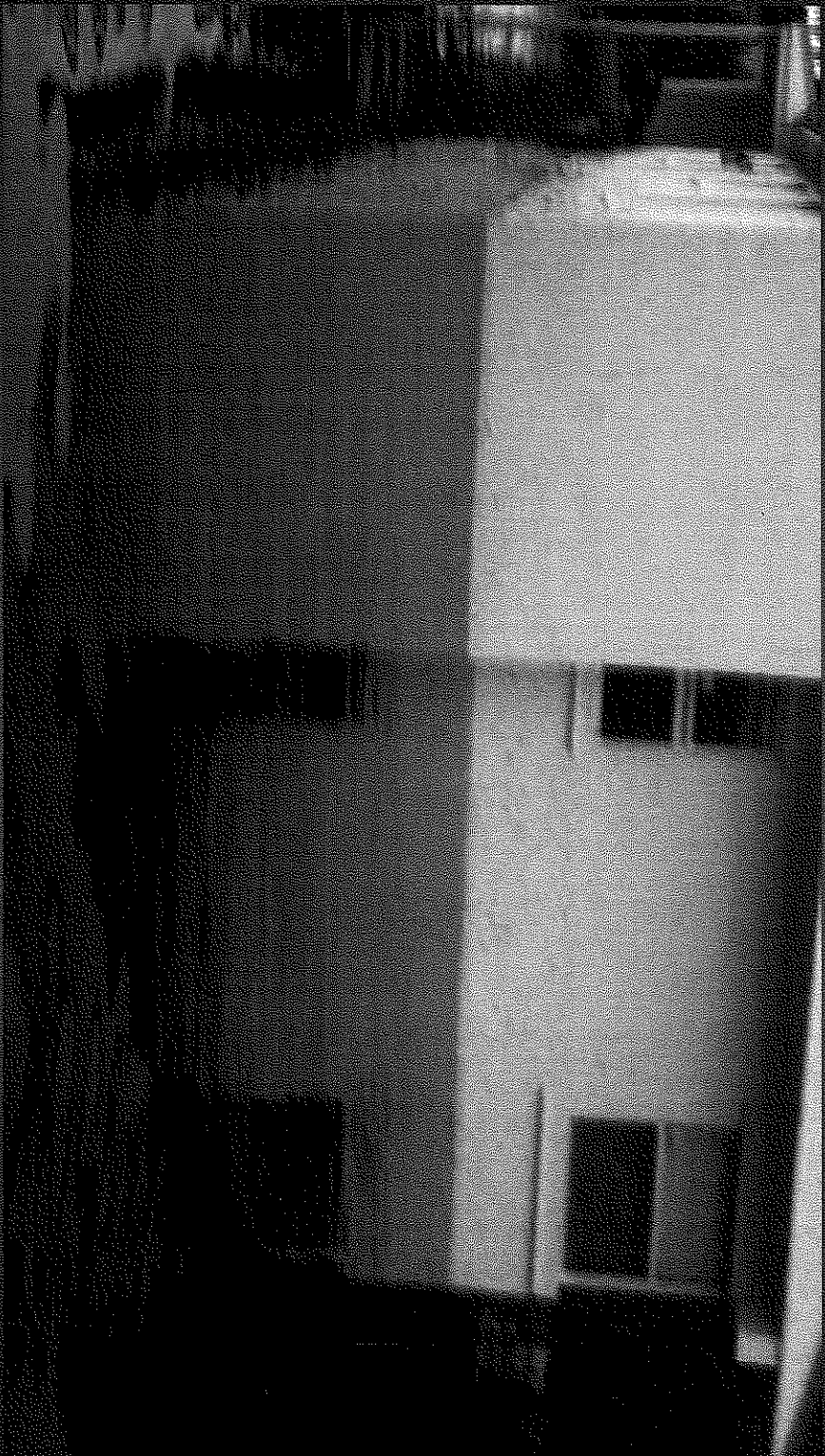


NE 2ND CT, LOOKING NORTH, BETWEEN NE 135TH AND NE 141ST ST

Source: City of North Miami

12/20/2013

Flood Event 6/7/2013, NE Miami-Dade County



Source: MDC PWW

NE 144th ST and 145th ST, between NE 12th AVE and NE 100th AVE

12/20/2013

PROPERTY AGE -- SEA LEVEL CHANGE

FOLIO	ADDRESS	YEAR BUILT	AGE OF BUILDING, years	ESTIMATE FOR THE MEAN SEA LEVEL RISE, ft (NOAA CO-OPS 2.39 mm/Yr)	* ESTIMATE FOR THE LOCAL RISE IN THE WATER TABLE, ft
3022200022341	1511 - 1513 NE 146TH ST	1970	43	0.31	1.5
3022200022840	1285 NE 144TH ST	1970	43	0.31	1.5
3022200023340	1246 NE 144TH ST	1952	61	0.44	1.5
3022200022590	1370 NE 146TH ST	1952	61	0.44	1.5
3022200023330	1254 NE 144TH ST	1952	61	0.44	1.5
3022200022320	1471 - 1473 NE 146TH ST	1969	44	0.32	1.5
3022200023302	1290 NE 144TH ST	1969	44	0.32	1.5
3022200022342	1510 - 1512 NE 147TH ST	1973	40	0.29	1.5
3022200024270	1660 NE 146TH ST	1959	54	0.39	1.5
3022200023320	1276 NE 144TH ST	1952	61	0.44	1.5
3022200021530	1563 NE 148TH ST	1952	61	0.44	1.5
3022200021870	1331 NE 147TH ST	1940	73	0.53	1.5
3022200022310	1470 NE 147TH ST	1949	64	0.46	1.5
3022200022333	1491 - 1493 NE 146TH ST	1973	40	0.29	1.5
3022200022541	1391 NE 145TH ST	1969	44	0.32	1.5
3022200021520	1573 NE 148TH ST	1954	59	0.43	1.5
3022200021490	1543 NE 148TH ST	1952	61	0.44	1.5
3022200024170	1751 NE 145TH ST	1949	64	0.46	1.5
3022200022850	1310 NE 145TH ST	1967	46	0.33	1.5
3022200023303	1280 NE 144TH ST	1969	44	0.32	1.5
3022200021601	1540 - 1542 NE 148TH ST	1972	41	0.30	1.5
3022200380030	1697 - 1699 NE 146TH ST	1970	43	0.31	1.5
3022200022570	1383 - 1385 NE 145TH ST	1950	63	0.46	1.5

MODELING OF STORM EVENTS

- 10-FOOT CEL DEM, PUBLISHED BY THE SFWMMD
- ELEVATIONS IN NAVD 88
- CURRENT LAND USE
- CURRENT INFRASTRUCTURE
- NOAA RAINFALL RETURN PERIOD ANALYSIS:

http://www.sfwmd.state.tx.us/pdfs/pfds/pfds_prep_conf.pdf

MODELING SCENARIO

- XP-SWMM MODELS CONSIDERS THE 1% CHANCE PROBABILITY OF EXCEEDENCE PLUS TIDAL TRENDS AND MHHW;
- TIDE FORECASTS ARE AVAILABLE (NOAA);
- FORECASTS FOR STORM SURGE ELEVATIONS WITH SEA LEVEL RISE SCENARIOS IS NOT YET AVAILABLE FROM NOAA.

ARCH CREEK BASIN MITIGATION PLAN

MIAMI-DADE COUNTY STORMWATER MASTERPLAN - ARCH CREEK BASIN
 INUNDATION LIMITS FOR THE 100-YEAR EVENT MAXIMUM STAGE OF 6.58 FEET NGVD
 FEMA MAP BASE FLOOD ELEVATION IS 7 FEET NGVD



ARCH CREEK BASIN MITIGATION PLAN

MIAMI-DADE COUNTY STORMWATER MASTERPLAN - ARCH CREEK BASIN

INNUNDATION LIMITS FOR THE 100-YEAR EVENT WITH SEA LEVEL RISE FORECAST FOR 2113 (+0.78')

MAXIMUM STAGE OF 7.63 FEET NGVD

FEMA STILLWATER ELEVATION IS 7 FEET NGVD



SOLUTION

- ❑ Recognize uncertainty to determine level of detail and accuracy required with respect to potential risks and consequences;
- ❑ Flexible planning and engineering, incorporating in the design of all civil works, a range of likely changes and safety factors for unknown possibilities.
- ❑ Understanding that periodic adjustments must be made over a longer planning horizon

RECOMMENDATIONS

- ☐ SAME STANDARDS FOR ALL AREAS (SFHA OR NOT)
- ☐ MINIMUM FREEBOARD OF 12"
- ☐ UPDATE OF THE COUNTY FLOOD CRITERIA
- ☐ CRITICAL FACILITIES MINIMUM STANDARD - ABOVE 500-YEAR FLOOD PLAIN

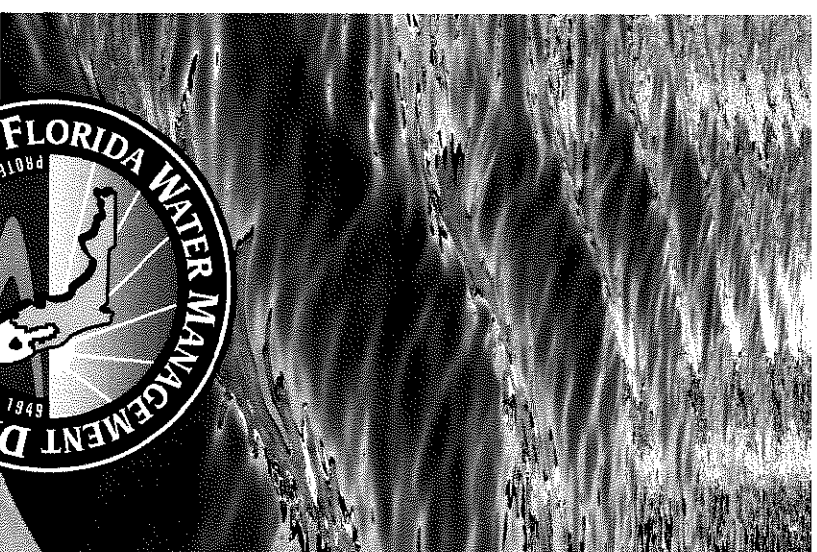
The Federal Flood Control Project

The Implications of Sea Level Rise on Water Management

*Tommy B. Stowd, P.E.
Assistant Executive Director
Operations, Maintenance & Construction
South Florida Water Management District*

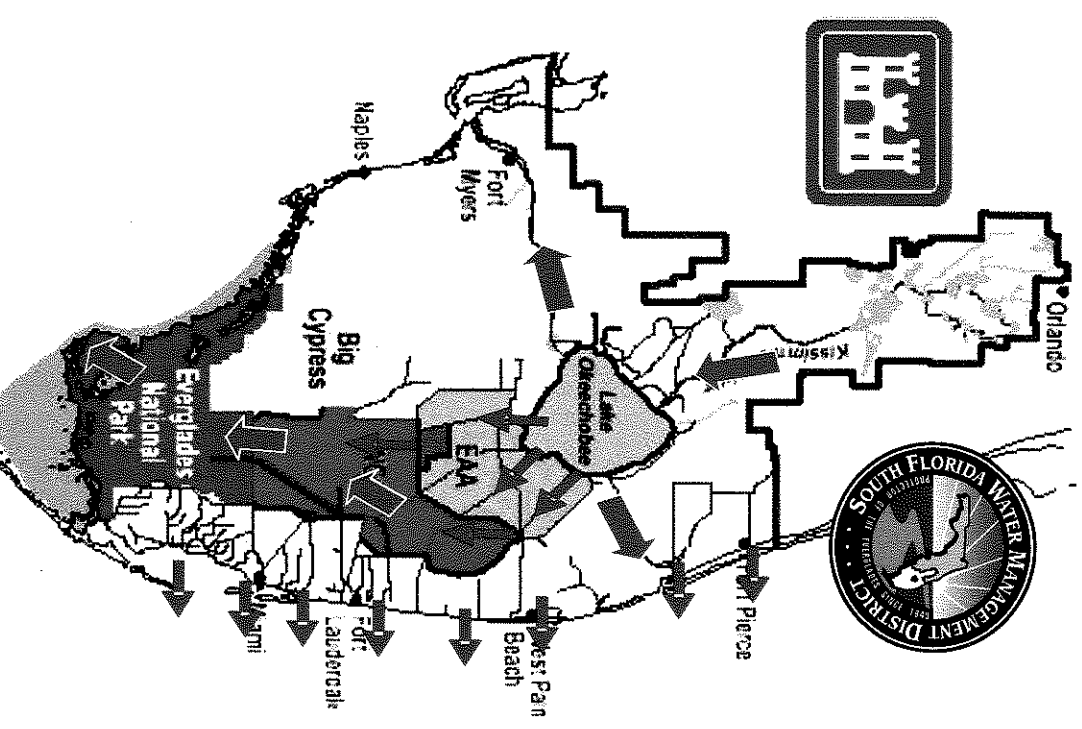
Miami-Dade Sea Level Rise Task Force

December 20, 2013

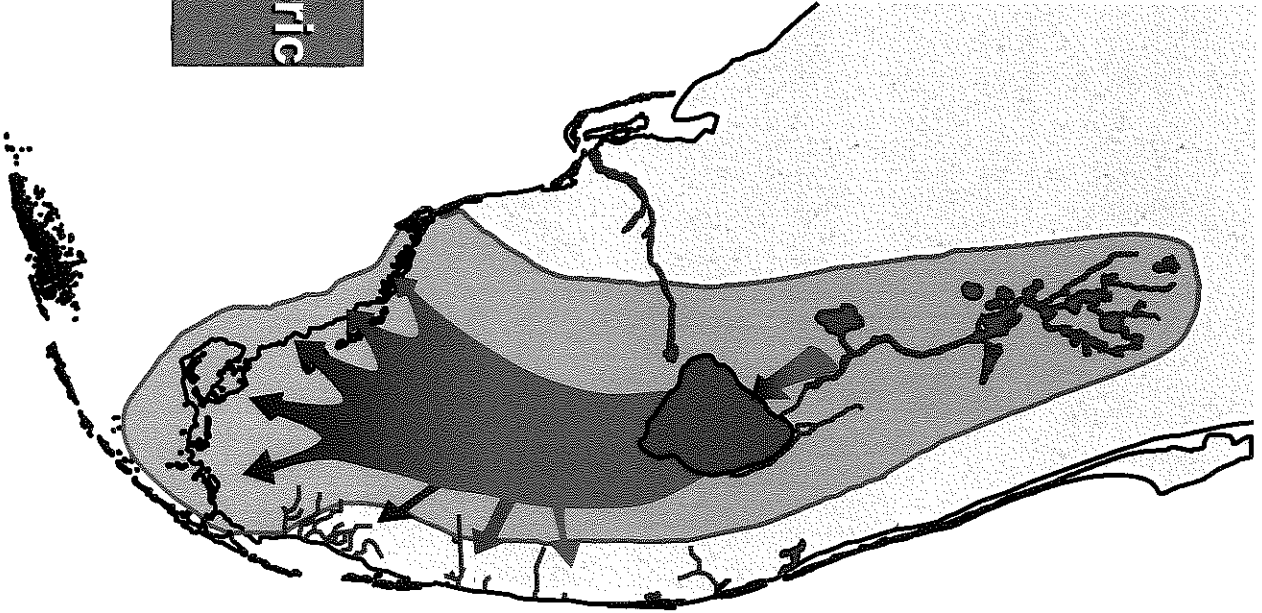


Central and Southern Florida Project for Flood Control and Other Purposes

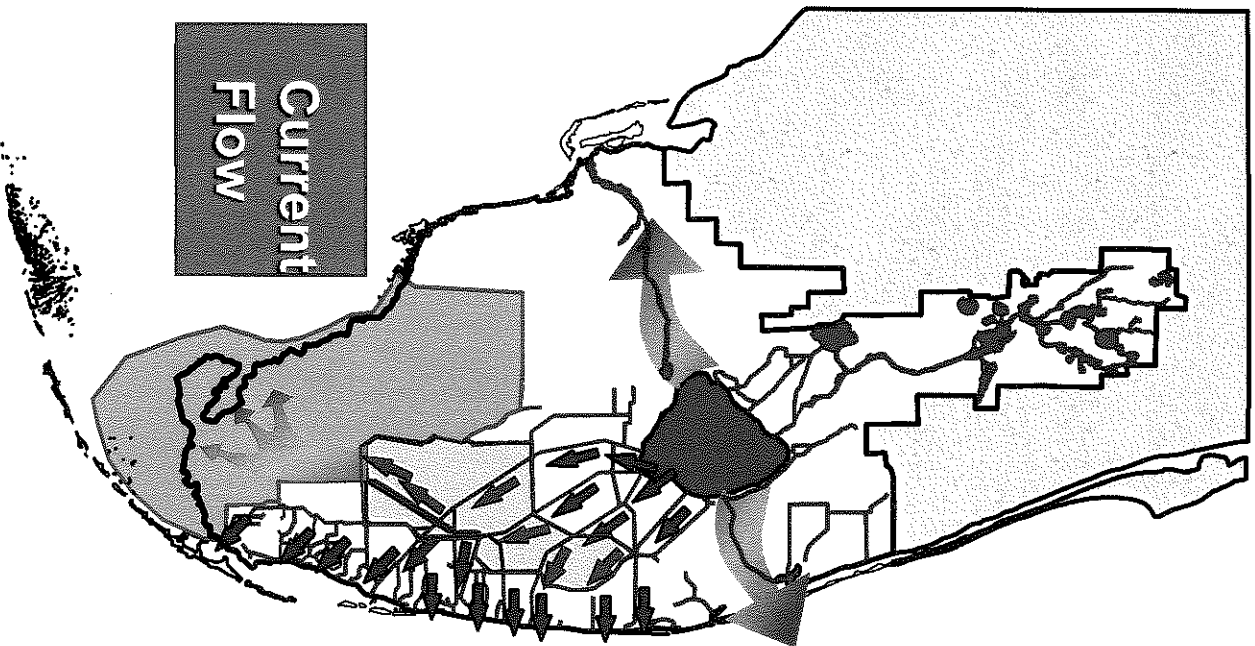
- Authorized in 1948
- Designed for multiple purposes
 - Flood Control
 - Water Supply
 - Navigation
 - Prevention of Saltwater Intrusion
 - Protection of Fish & Wildlife
- Constructed by the U.S. Army Corps of Engineers between 1950 and 1970
- Operated by the South Florida Water Management District

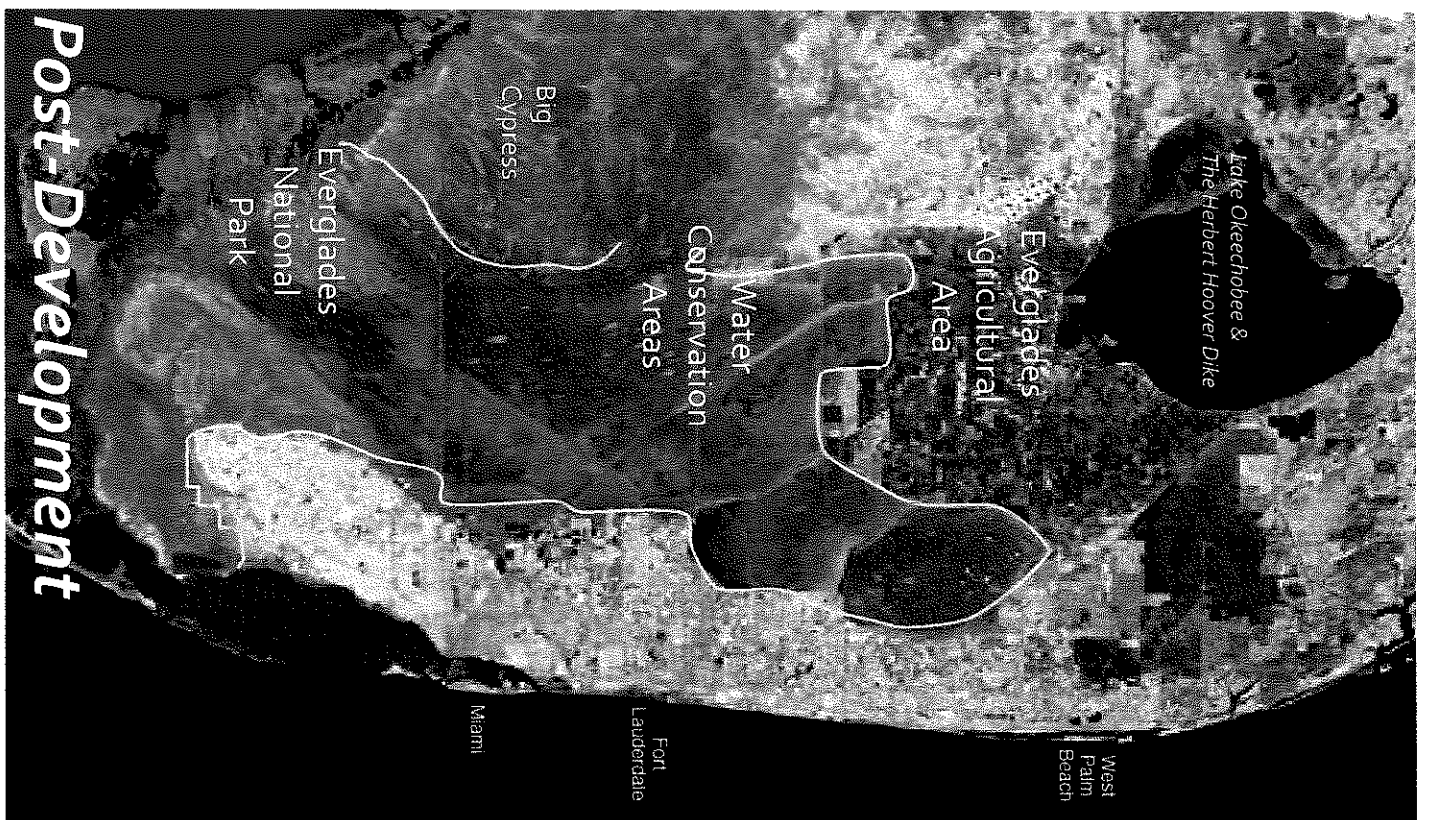
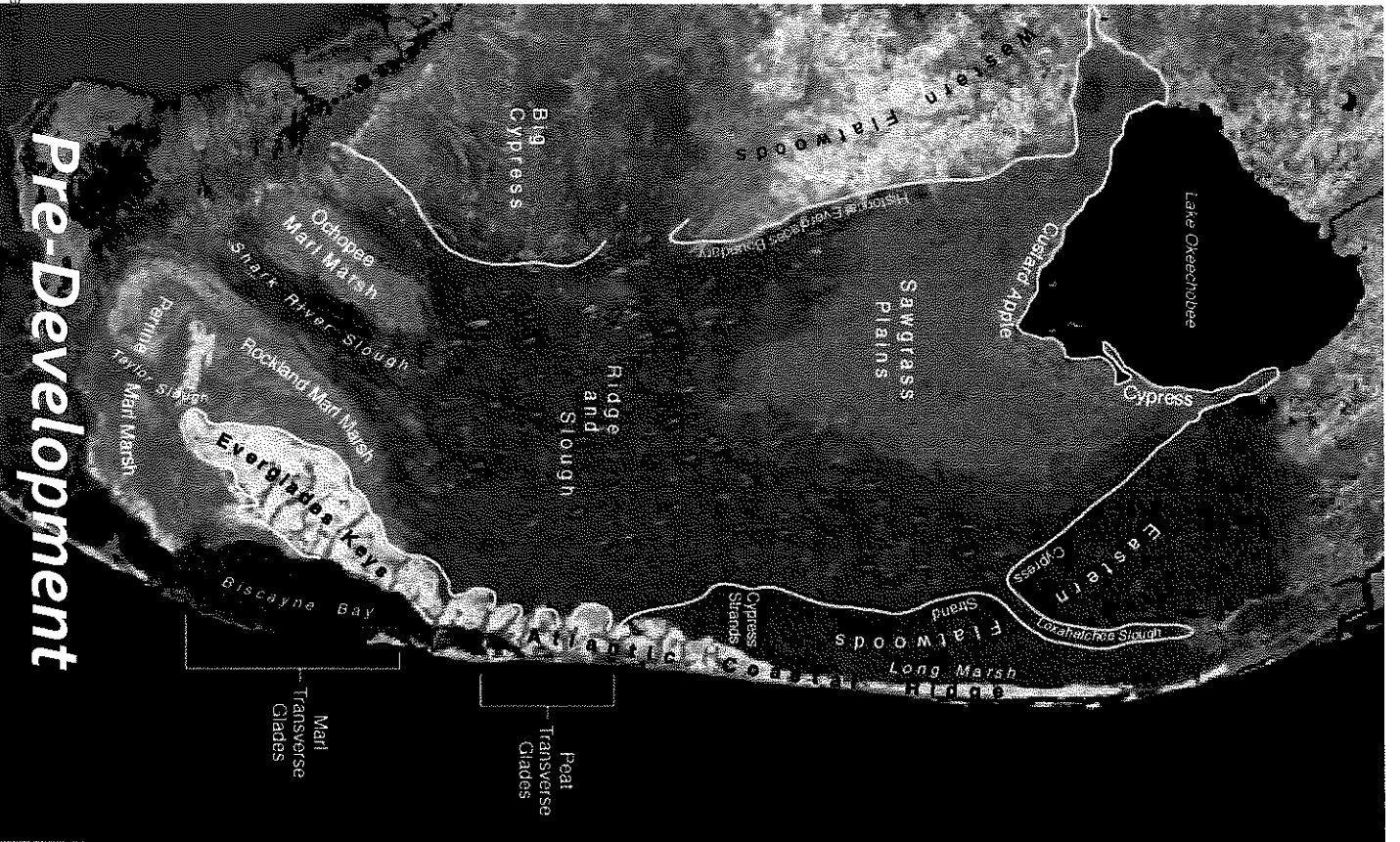


Historic
Flow



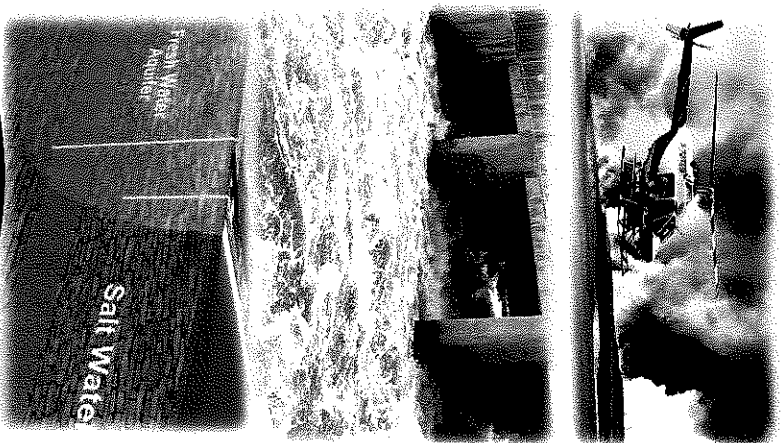
Current
Flow





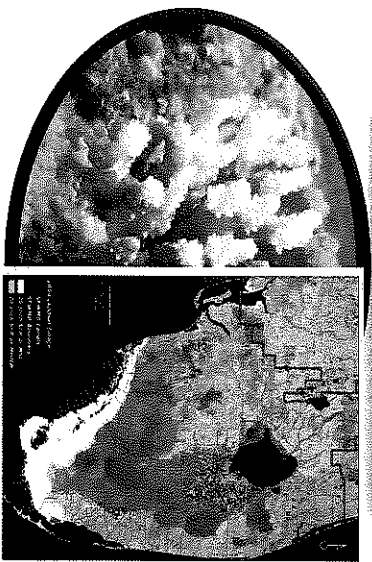
Potential Impacts on Water

Management



- Rainfall patterns including extremes (water budget, droughts, flooding, storm surge, hurricanes, coastal structures)
- Drinking Water Supply (saltwater intrusion, freshwater wells)
- Natural Environment (Everglades, Ocean acidification, Coral Bleaching)

...Initial focus on sea level rise



Inundation & Collapse of Freshwater Wetlands in the Southern Coasts



Remnant living sawgrass

peat collapse

Dead sawgrass, substrate decay



Credit:
Prof. Hal
Wanless

Coastal well-fields

Fresh Water
Aquifer

Salt Water

Limestone
rock sample

Coastal well fields

Fresh Water Aquifer

Salt Water

Limestone rock sample

Coastal well-fields

Fresh Water
Aquifer

Salt Water

Limestone
rock sample

Coastal well-fields

Fresh Water Aquifer

Salt Water

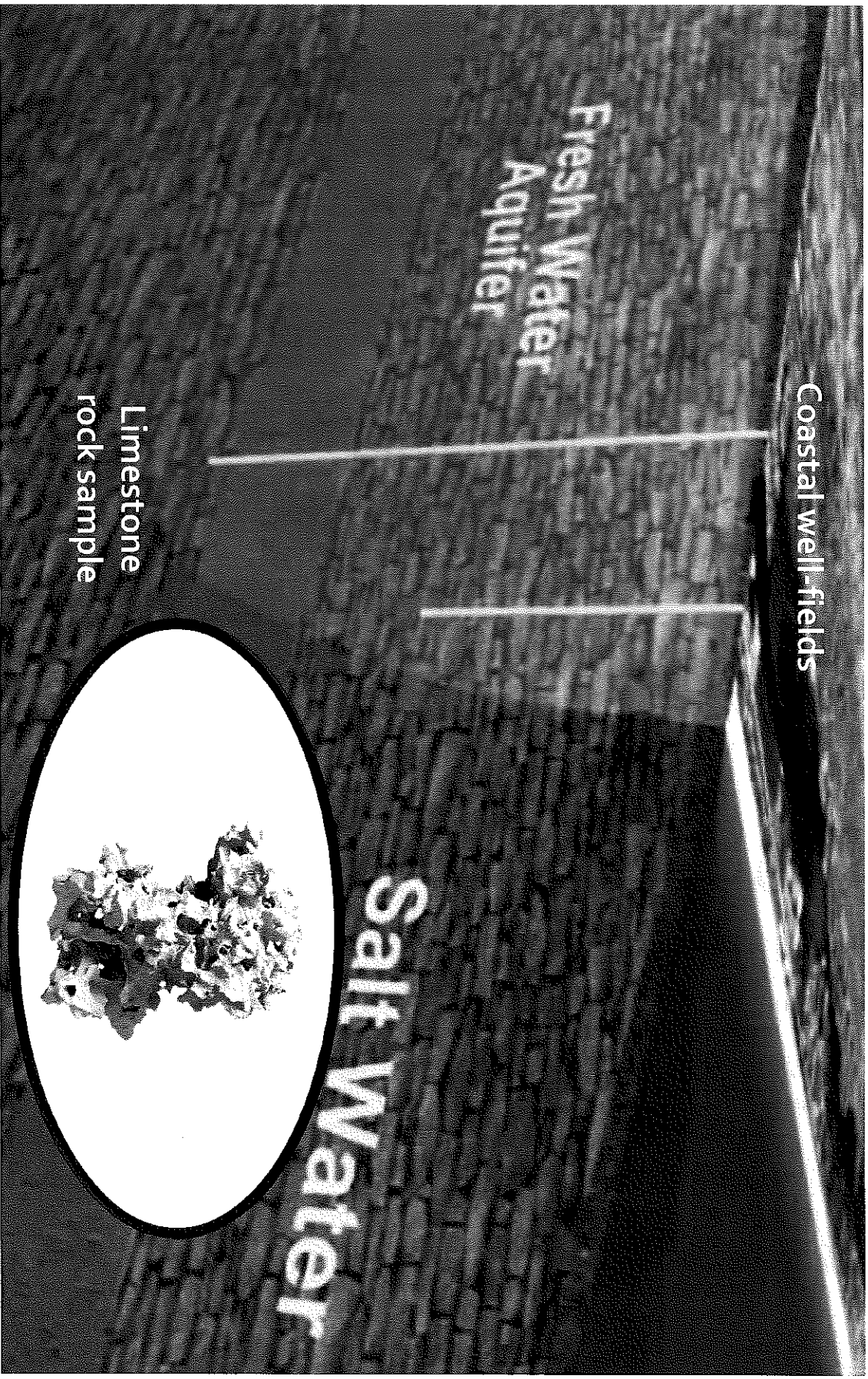
Limestone rock sample

Coastal well-fields

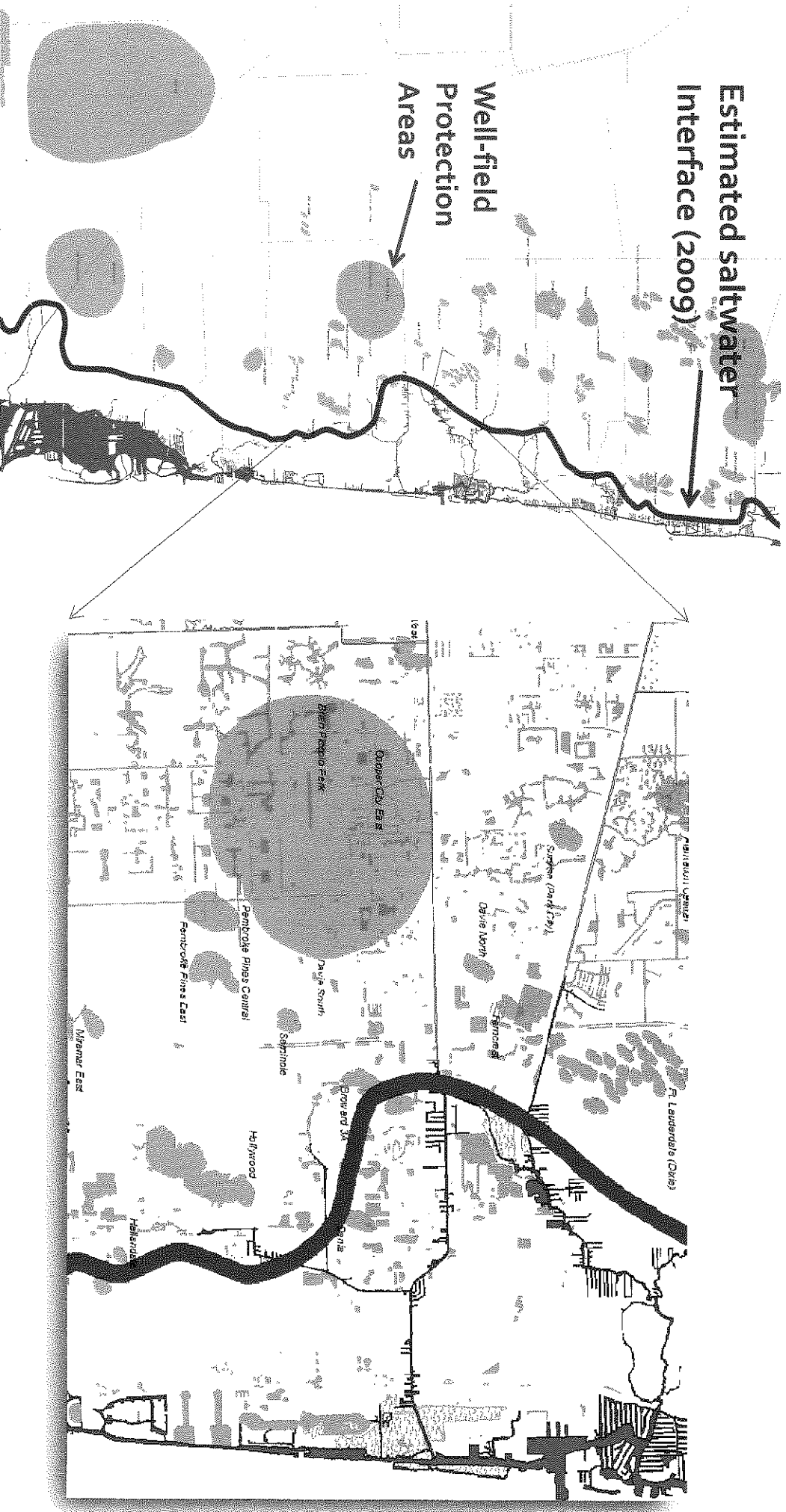
Fresh Water Aquifer

Salt Water

Limestone rock sample



Threat to Wellfields





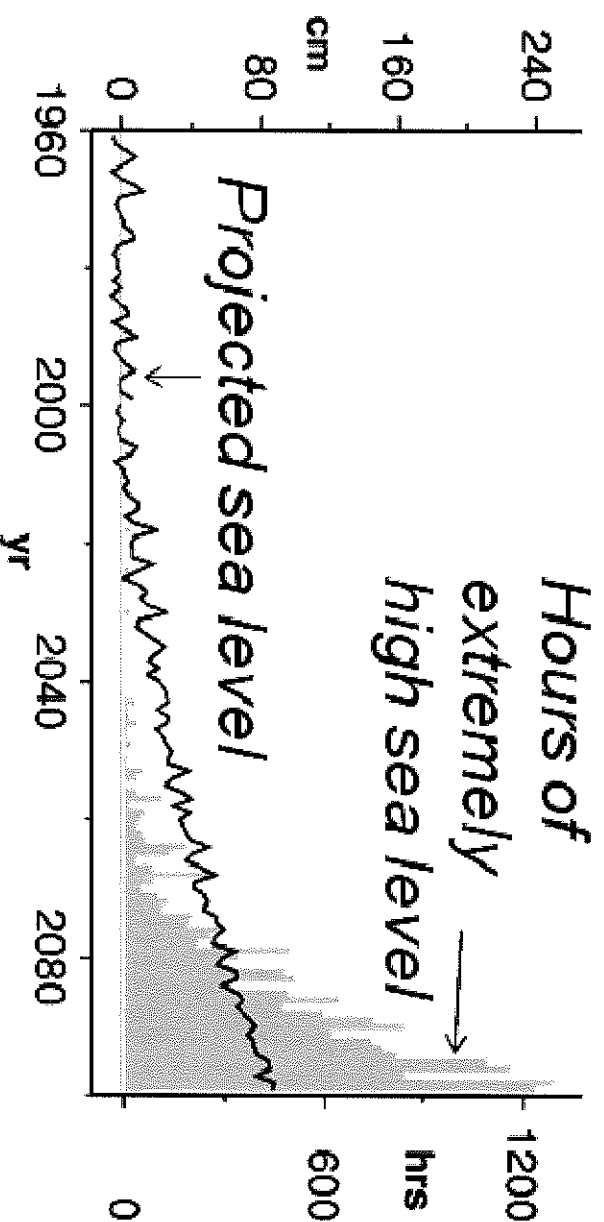
Photos from the Miami New Times website

Recent Observations along SE Coast ("Sunny Day Flooding")



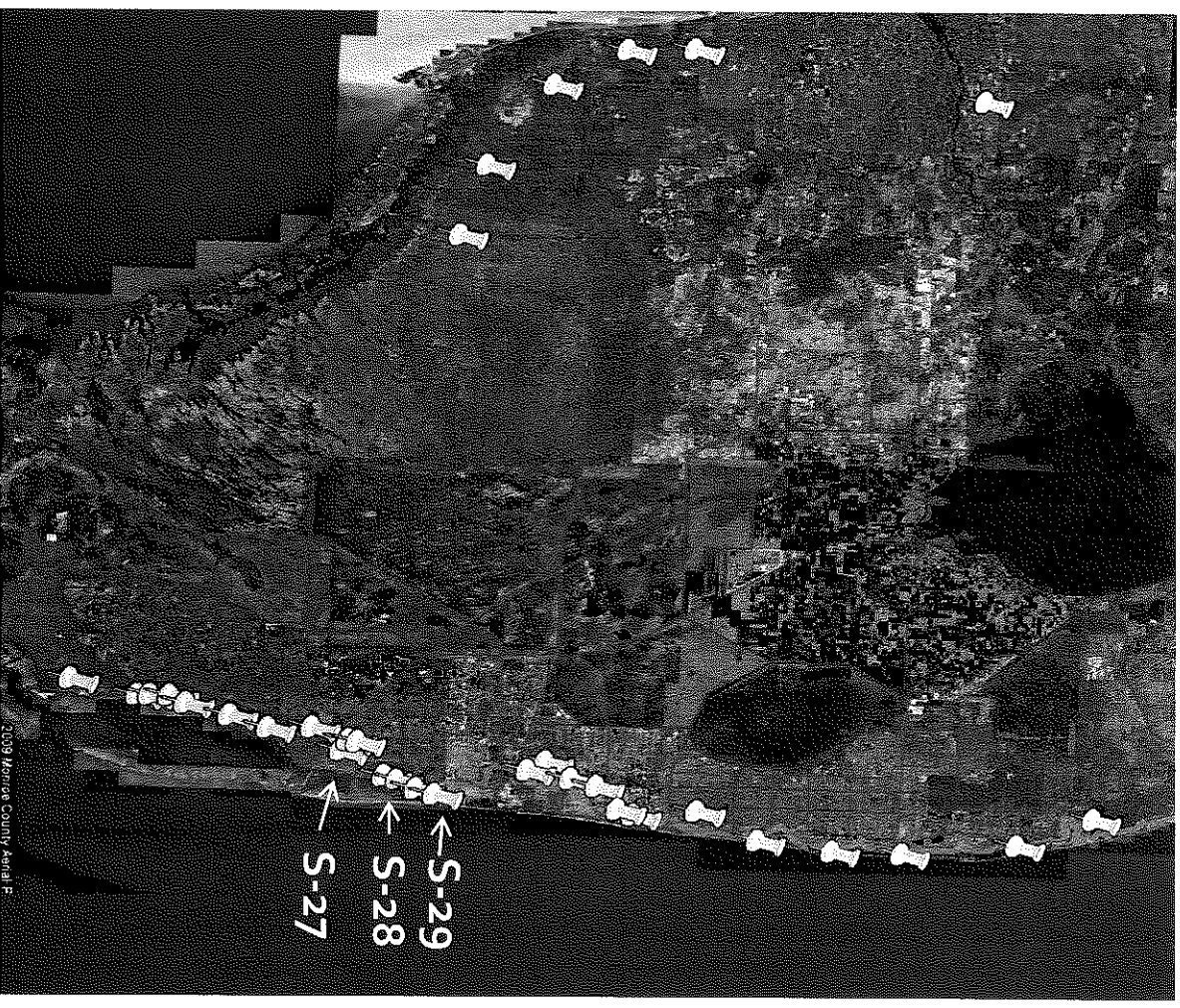
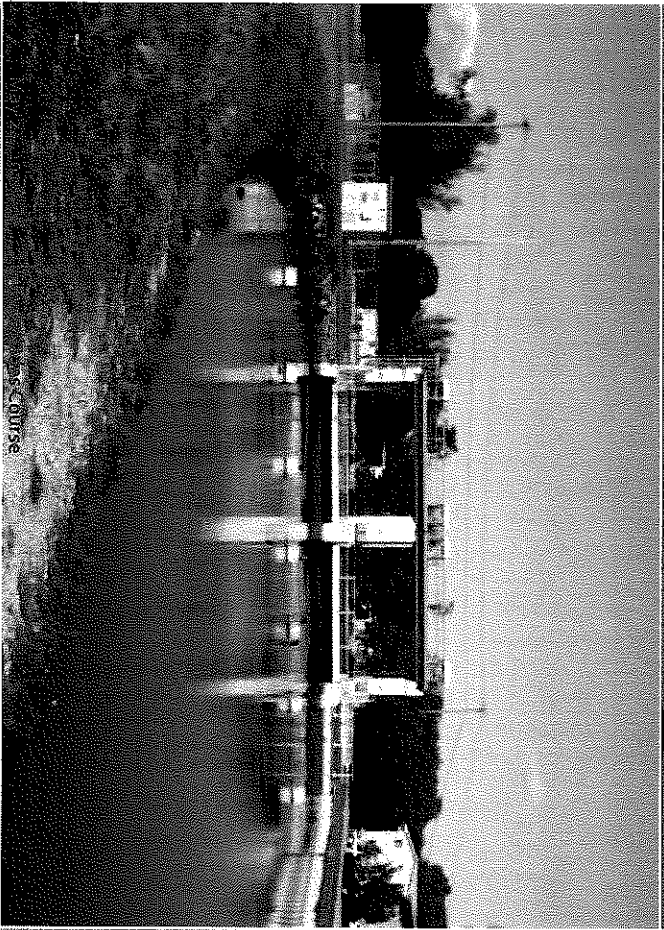
Miami-Dade County
Credit: Miami-Dade DERM

Sea-level rise will magnify the adverse impact of storm surges and high waves on the coast



Extreme high sea level events (>1.4 m above historical mean sea level) in San Francisco Bay is projected to increase substantially with sea-level rise based on model results

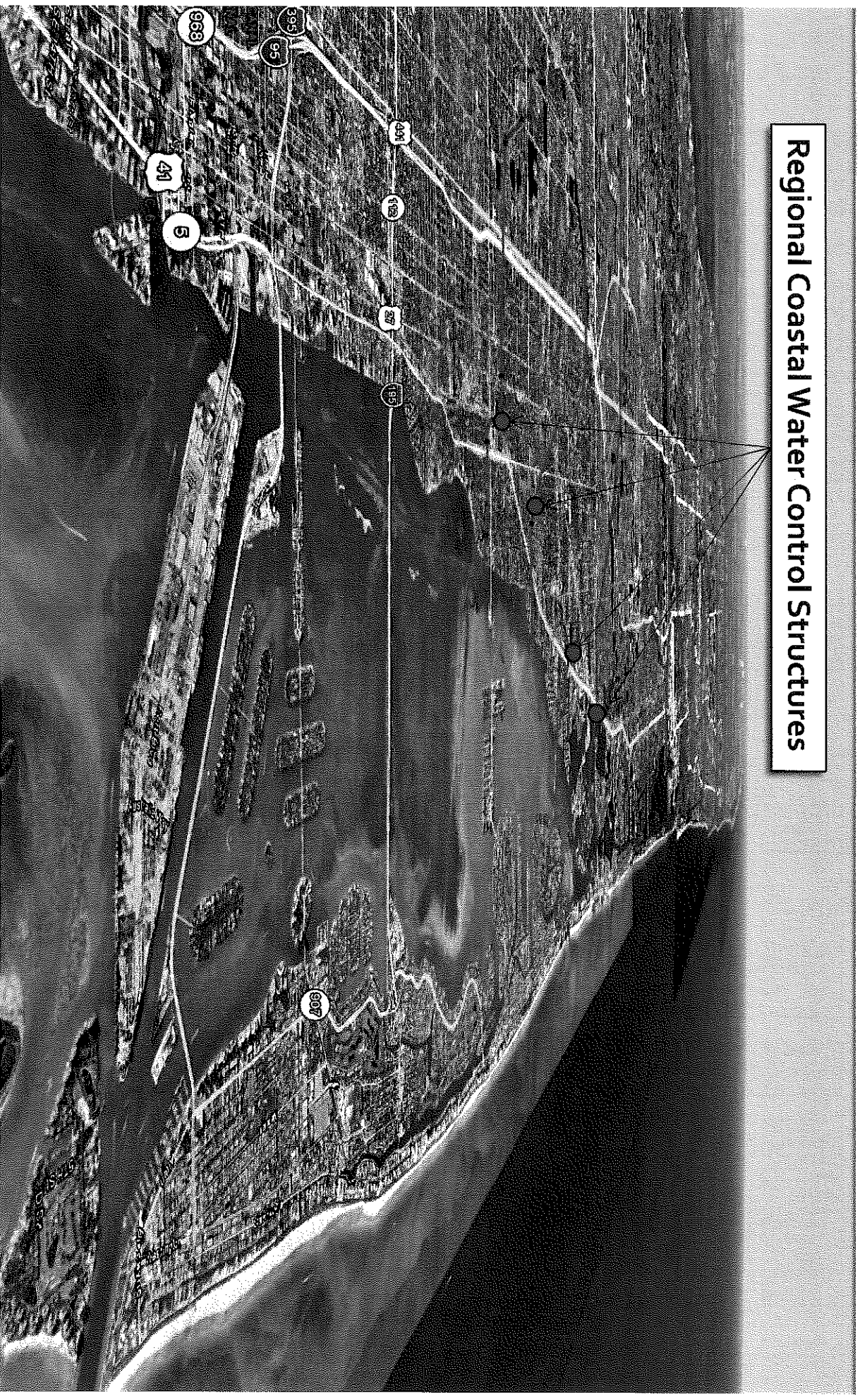
Coastal Infrastructure Risks



← S-29
← S-28
← S-27

Regional Water Control System

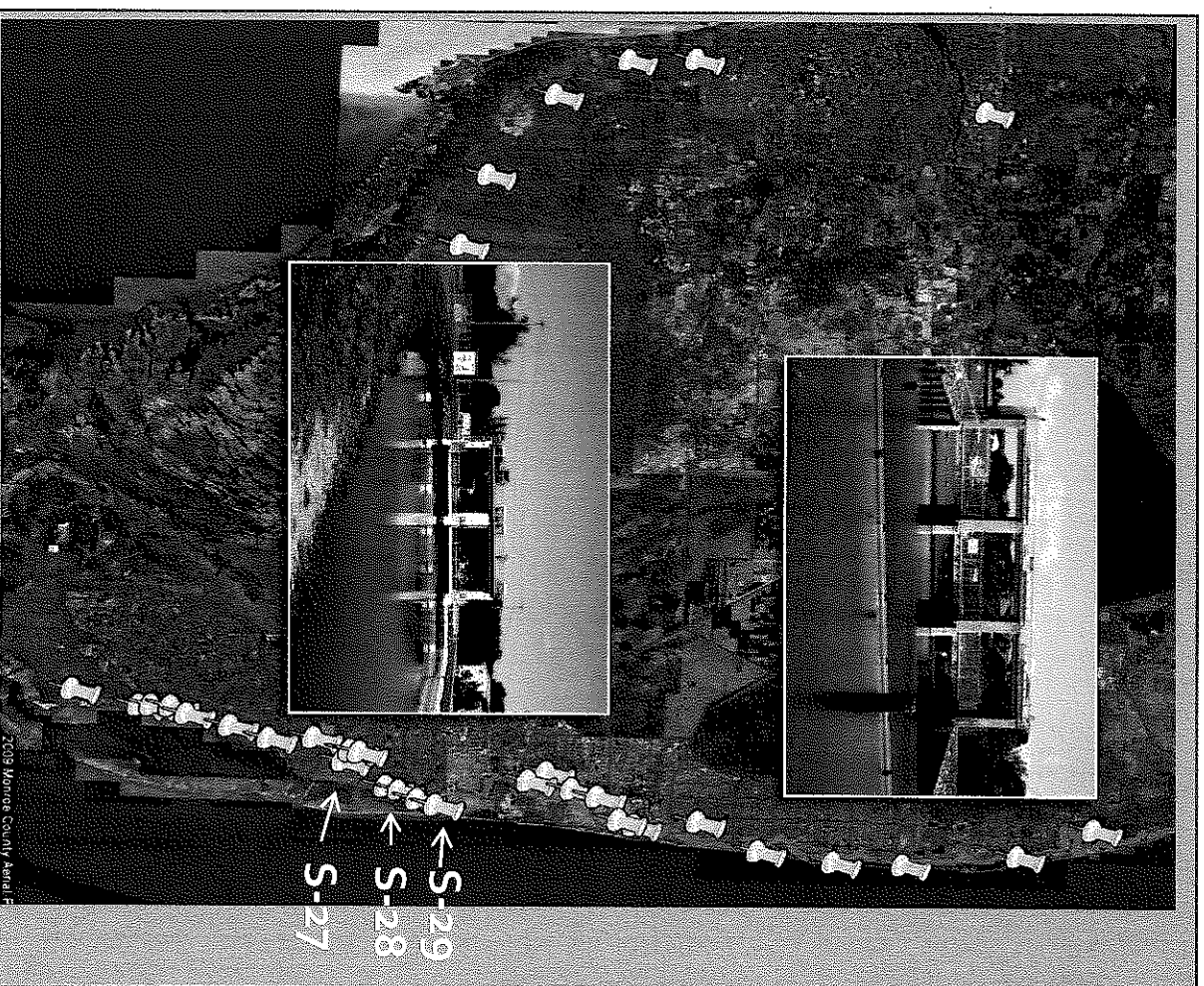
Regional Coastal Water Control Structures

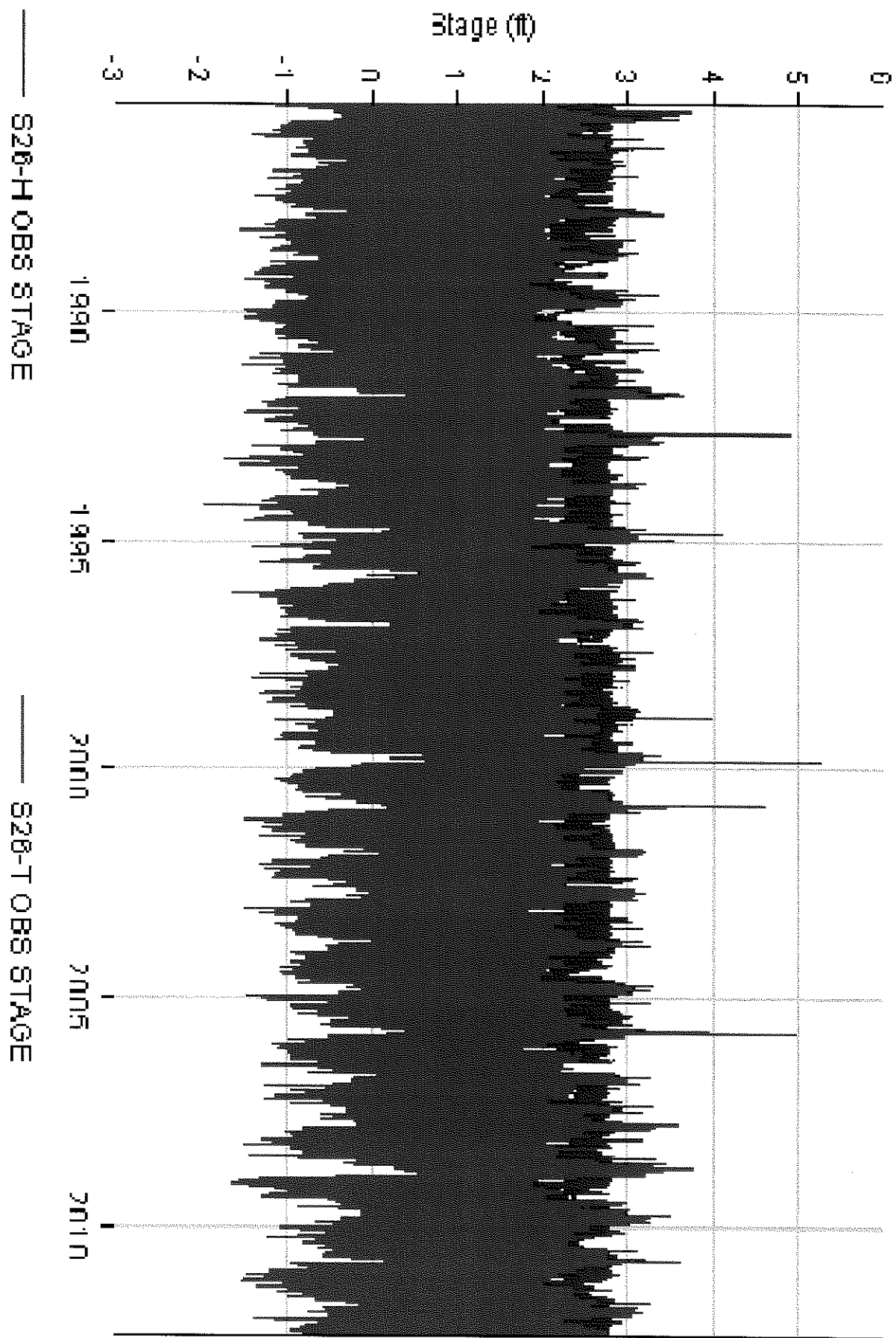


Review of Coastal

Infrastructure

- Salinity Control Structures provide two primary functions: Barrier for saltwater intrusion and Flood Control
- C&SF system is approaching or exceeding design life expectancy. SFWMD routinely evaluates infrastructure on a 5 year cycle.
- 5 year and 10-year capital improvement budgets (~\$50 million annually)
- Complexity requires a thorough analysis: frequency and duration of flooding, impacts on downstream areas
- Coordination with local governments in dealing with local flooding
- Federal interest?....





Adaptation to Rising Seas

Example: Forward Pumping at S-26 Structure



Adaptation to Rising Seas

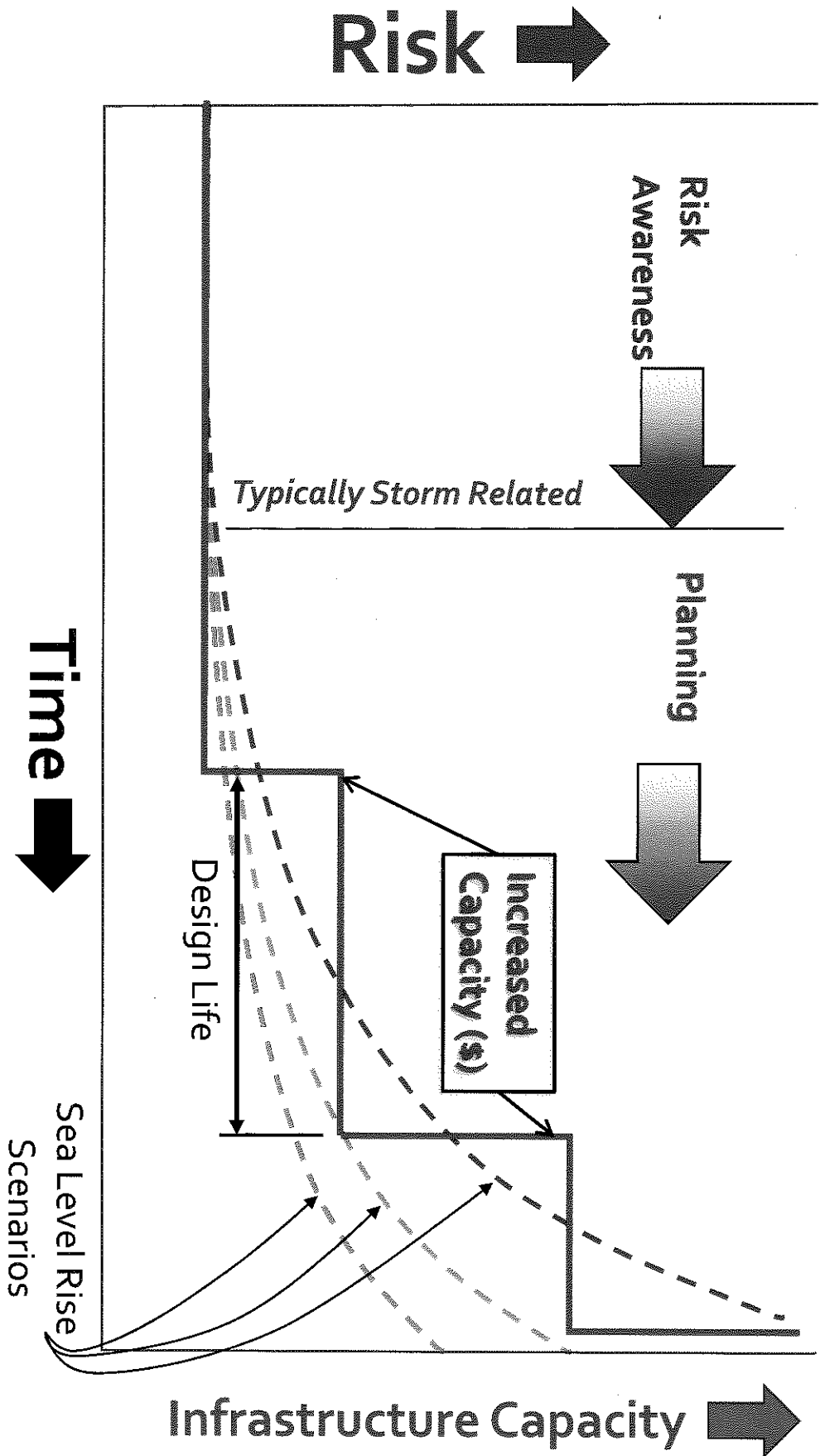
Example: Forward Pumping at S-26 Structure



Federal Post Authorization Changes

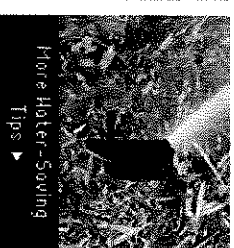
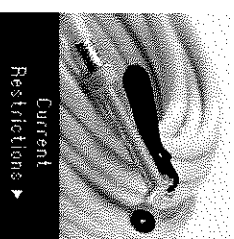
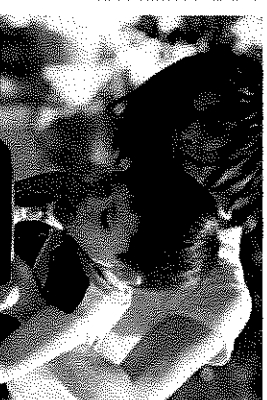
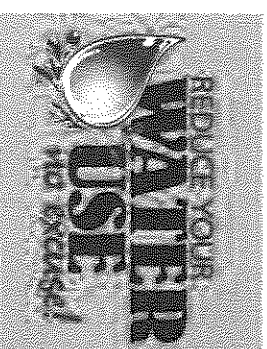
- Feasibility Reports – new projects, like CERP
- ER 1165-2-119, MODIFICATIONS TO COMPLETED PROJECTS
 - "...a general policy of the Chief of Engineers that completed Corps projects be observed and monitored by the Corps to ascertain whether they continue to function in a satisfactory manner and whether potential exists for better serving the public interest."
- Section 216-the Flood Control Act of 1970 (Public Law 91-611)
 - "The Secretary of the Army, acting through the Chief of Engineers, is authorized to review the operation of projects the construction of which has been completed and which were constructed by the Corps of Engineers in the interest of navigation, flood control, water supply, and related purposes, when found advisable due to significantly changed physical or economic conditions, and to report thereon to Congress with recommendations on the advisability of modifying the structures or their operation, and for improving the quality of the environment in the overall public interest."
- Federal Floodplain Mapping / Flood Mitigation (FEMA)

Conceptual Adaptive Resilience Model



"No-regret" strategies

- Continue looking at opportunities and technologies to reduce amount of additional freshwater needed for water supply
- Implement water conservation measures
- Develop alternative water supply options
- Maintain the existing flood protection system (regional, right-of-way etc.)



Current Restrictions ▶

Florida-Friendly Landscaping ▶

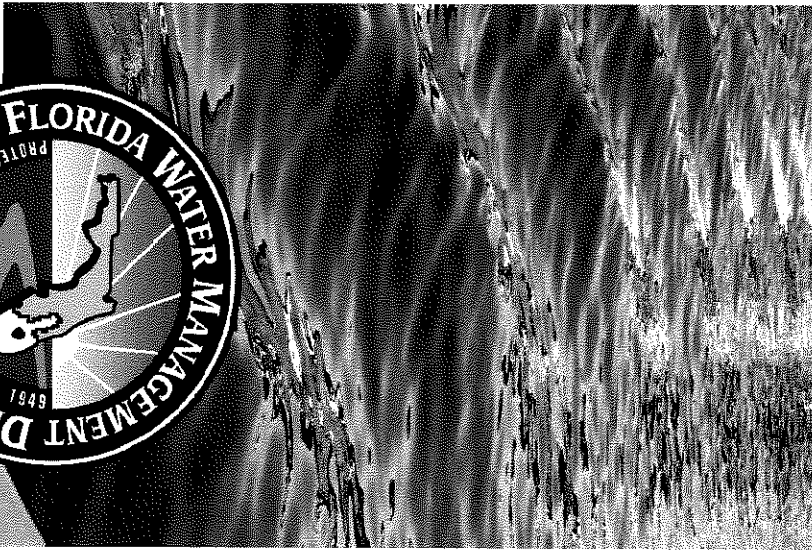
More Water-Saving Tips ▶

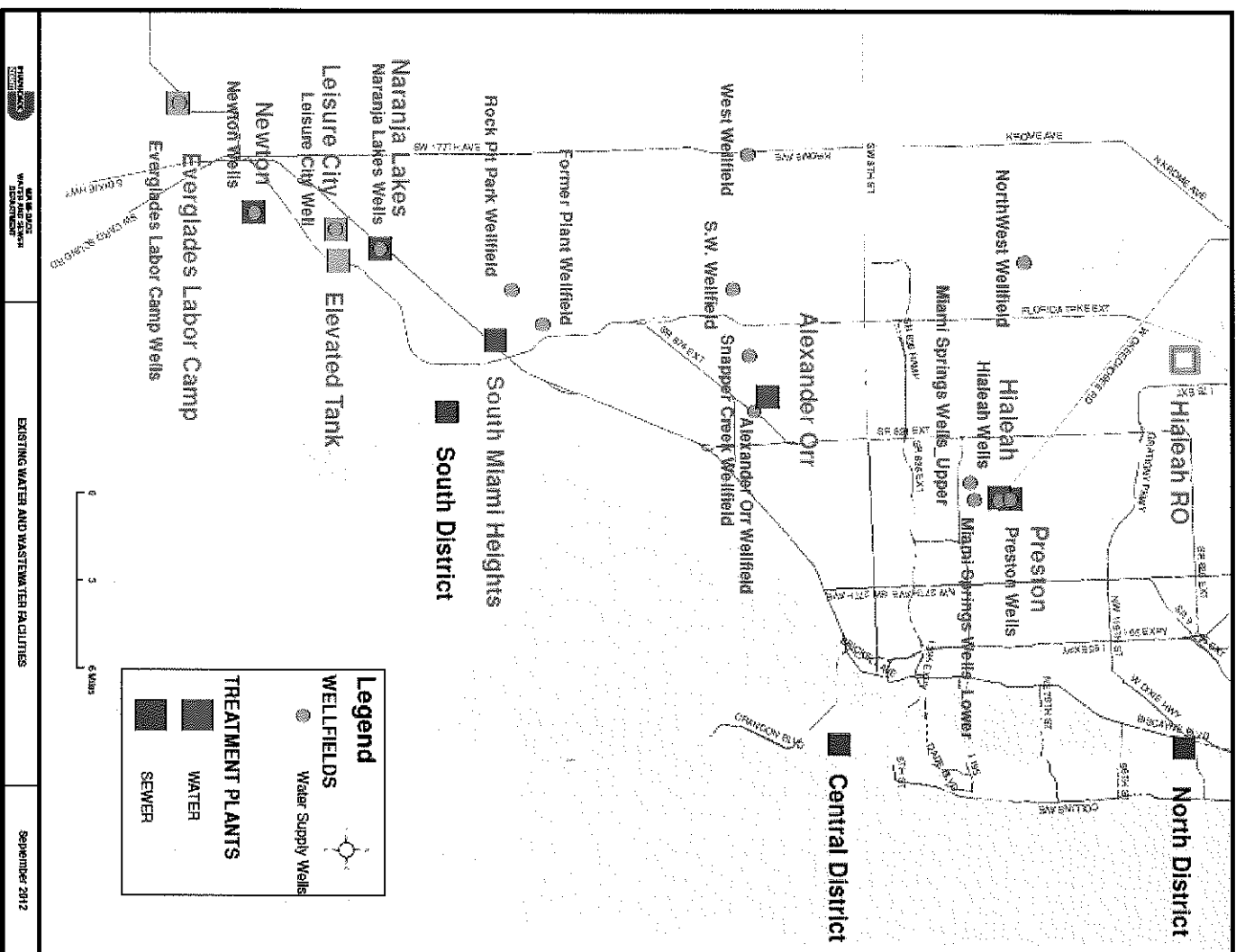
Progress to Date

- Briefings to GB & WRAC since May 2008
- Monitoring of science (climate variability & sea level rise)
 - Interdepartmental working group
- White paper & Technical report
- Preliminary assessment of coastal water control structures – identified 3 priority structures
- Baseline mapping of saltwater intrusion front
- Technical assistance to local government committees and task forces
- Participation in workshops and conferences
- Ongoing coordination with FDEP and other WMDs



Thank You... Questions





WASD's Water & Wastewater Major Facilities