

STORMWATER & FLOODPLAIN MANAGEMENT



https://www.bing.com/images/search?view=detailV2&ccid=Cc%2fXOFNm&id=4ECE25D6389E79D9CEF4EF4D6784FF1D0A1A50EC&thid=OIP.Cc_XOFNmGCI-MolUuvm3zwHaE8&mediarurl=https%3a%2f%2f0.wp.com%2fwww.beyoftravel.com%2fwp-content%2fuploads%2f2021%2f05%2fThe_Everglades_001.jpg%3fresize%3d1536%252C1024%26ssl%3d1&cdnurl=https%3a%2f%2fth.bing.com%2fth%2fid%2fr.09cfd7385366182d7e328954baf9b7cf%3frik%3d7FAaCh3%252fhGdN7w%26pid%3dlmgRaw%26r%3d0&exph=1024&expw=1536&q=photos+of+the+florida+everglades&FORM=IRPRST&ck=7E6EDCB2B1659A6FF16A3F3EAC9443C5&selectedIndex=0&itb=0&idpp=overlayview&ajaxhist=0&ajaxserp=0

<https://worldlandscapearchitect.com/beyond-management-stormwater-as-asset-on-the-urban-campus/?v=7516fd43adaa>

Presentation By: Marina Blanco-Pape, P.E.

Department of Regulatory and Economic Resources

Robust Commitment

Floodplain:

Critically linked to all development activities, including land grading and filling

Quality of fill, ground elevations, and other construction standards protect the structures and how well properties will drain

Drainage impacts require comprehensive development evaluations integrated through the plan review and building permitting process

Surface Water Control

This comprehensive effort ensures that our community is safeguarded from flooding, contamination and pollution, but also ensures that development activity does not introduce unnecessary risks to the aquifer by protecting water supply and controlling salt intrusion

Risk is assessed and mitigated site by site as each permit for development and construction is issued

Stormwater:

Critical for the life safety of our structures, to avoid additional burden and losses as storm waters dissipate after rain events, to protect the quality of surface water

All private and public sites handle their own drainage and are required to retain their own stormwater by code, a process that is assured through the review of construction and development plans

Standards are required by code to ensure that buildings can withstand rain and that flooding is minimized

Current Situation

We built what was planned:

- ▶ 34 years history
- ▶ Dedicated funding
- ▶ Regional operations
- ▶ Local drainage operations

County regulates and manages the floodplain & stormwater

U.S. Department of Homeland Security
Washington, DC 20472



September 29, 2023

The Honorable Daniella Levine Cava
Mayor of Miami-Dade County
111 NW 1st Street
Miami, Florida 33128

Dear Mayor Levine Cava:

The purpose of this letter is to provide you with the results of the National Flood Insurance Program (NFIP) Community Rating System (CRS) field verification findings based on your 3-year cycle verification. The field verification report is enclosed for your records.

Congratulations! The Department of Homeland Security, Federal Emergency Management Agency (FEMA), has determined that the Miami-Dade County will be upgraded to a Class 3 in the NFIP CRS. The floodplain management activities implemented by your community qualify it for a 35 percent discount on flood insurance premiums for most NFIP policies issued or renewed on or after April 1, 2024. This savings is a tangible result of the flood mitigation activities your community implements to protect lives and reduce property damage.

The CRS rating for your community will automatically be renewed annually as long as there are no NFIP noncompliance actions, so a notification letter will not be sent every year. This annual renewal will take place as long as your community continues to implement the CRS activities you certify in your annual recertification documentation. If no additional modifications or new CRS activities are added, the next verification visit for your community will be in accordance with its established 3-year cycle. In the interim, FEMA will periodically send the *NFIP/CRS Update* newsletter and other notices to your CRS Coordinator to keep your community informed.

I commend you on your community actions and your determination to lead your community to be more disaster resistant. This commitment enhances public safety, property protection, and protects the natural functions of floodplains, and reduces flood insurance premiums. If you have any questions or need additional information, please contact the FEMA Region IV Office, CRS Coordinator Roy McClure, by telephone at (770) 220-8835.

Sincerely,

Deanne Criswell
Administrator

Enclosure
cc: Marina Blanco-Pape, PE, CRS Coordinator

Desired State

We are planning for the future:

- ▶ Be the leader in resilience
- ▶ Contribute to the health of the bay
- ▶ Protect drinking water supply
- ▶ Mitigate flooding and salt intrusion

Success depends as much on the activities of the private sector as those of the public sector. To that end, the County's rating and recognition in the CRS program helps us better prepare our community for the future, one property at a time.



Managing Stormwater
Means
Managing Storm Events

Miami-Dade

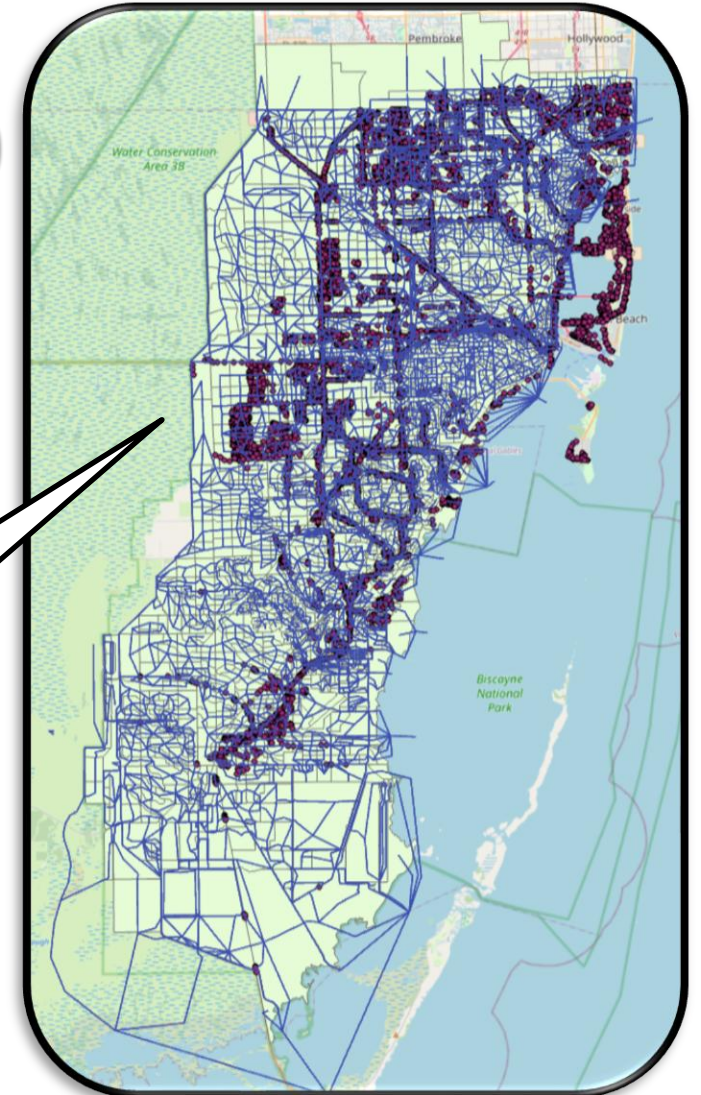
- ▶ There are ~129 rainy days per year
- ▶ Average Precipitation 61 to 68 inches per year
- ▶ Evapotranspiration 58 to 65 inches per year

SW Master Plan includes current and future scenarios through 2100 5, 10, 25, 50, 100, 500, 1000 Year events

- ▶ Countywide hydrologic and hydraulic (H&H) regional model mapped all scenarios and rainfall intensities
- ▶ County has assessed sub-watersheds systemwide
- ▶ Focus on flooding in the urban areas east of the L-31N, C-111, L-30
- ▶ Scenarios: Current (2020), 2040, 2060, 2080, and 2100

- XPSWMM Models
- 806 Square Miles
 - 11 Watersheds
 - 3693 Sub-watersheds

Latest, 2021 Model Update



Model History

Origins (1993). Miami-Dade established its first countywide Stormwater Master Plan (SWMP) and set criteria for watershed stormwater models. First generation watershed models were then built **1996–1998**, with substantial segment-by-segment updates across major watersheds in **2003–2008**

Methodology improvements (mid-2000s). County memos record modeling upgrades with significant methodology refinements **in 2005 and 2009. Partial model updates implemented through 2017**

Countywide model modernizations (2020–2021). The County updated **11 XPSWMM** watershed models through 2020 and issued the signed and sealed **2021 SWMP** (September 24, 2021). That update standardized NAVD88, applied 2015/2018 LiDAR, and evaluated multiple SLR scenarios for **2040, 2060, 2080, 2100**. Updated model provided to FEMA for upcoming FIRMs

Regulatory mapping updates. The 2021 SWMP served as the basis for the updates to the County Flood Criteria (CFC) and Water Control Map (WCM) adopted in **October 2022**, explicitly tied to SWMP results and 2060 SLR scenario selection

Regional modeling convergence (2023–2025). SFWMD's C&SF Flood Resiliency work formalized **MIKE SHE/MIKE Hydro** as the integrated surface-groundwater platform for sub-regional simulation and event analysis, aligning County efforts with regional practice

Current transition to MIKE. The County's active migration from XPSWMM to **DHI MIKE+ with MIKE SHE** builds an integrated surface-groundwater framework across **11 watersheds, roughly 2,226 square miles**, using unified datum and projections and multi-event calibration



1993

2009

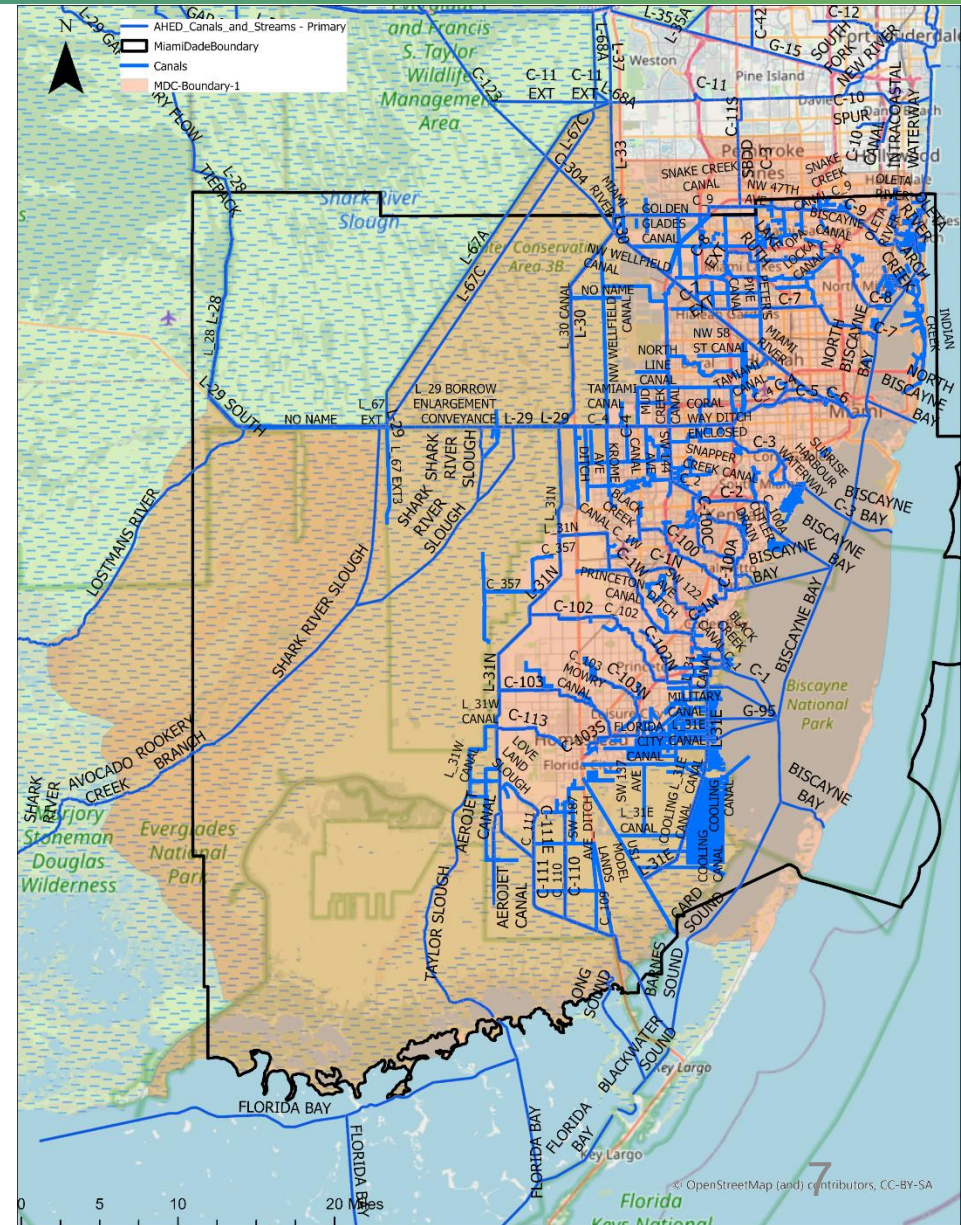
2021

2022

2026

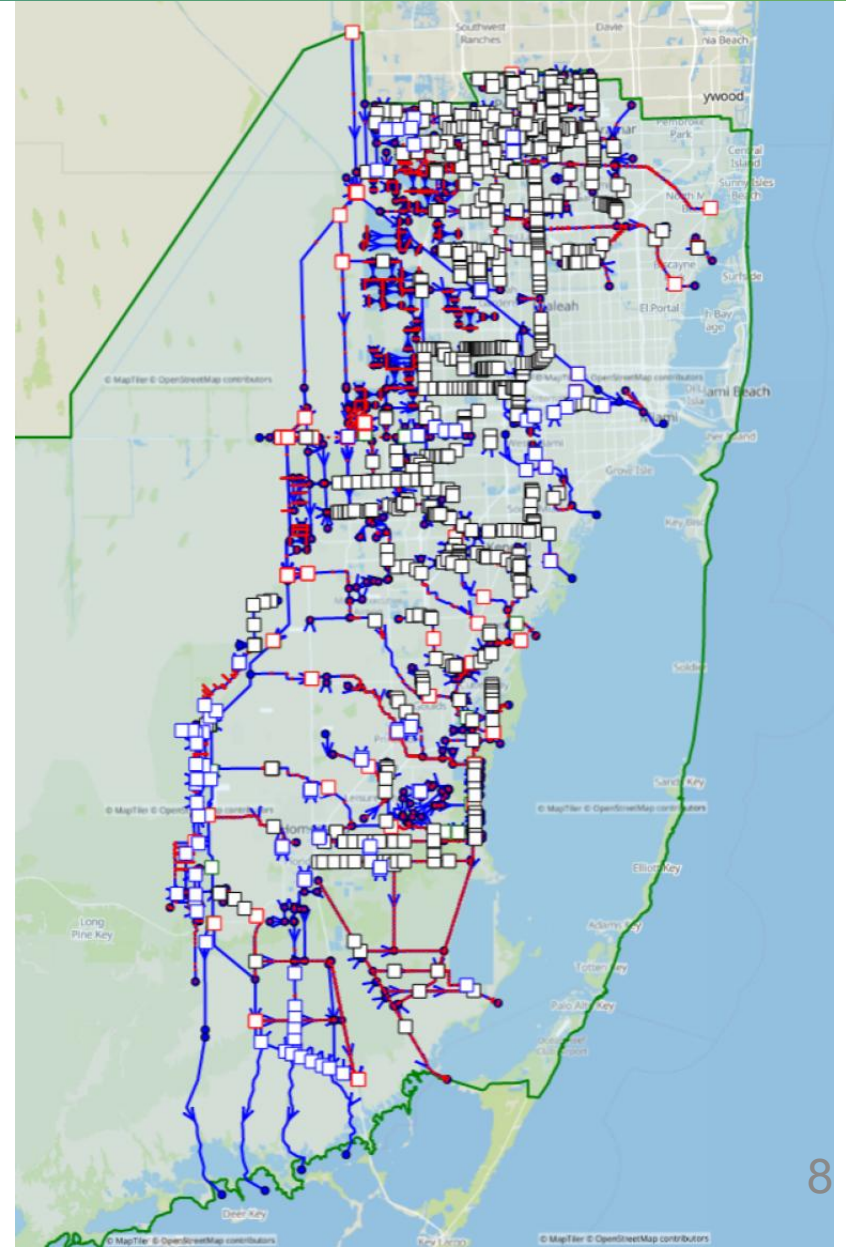
What's New

- ▶ Upcoming (2026) H&H model update (~2,226 square miles)
- ▶ Boundary extension implemented to enable evaluation of potential operational changes to the Primary Conveyance System managed by SFWMD and USACE
- ▶ To incorporate environmental considerations associated with higher stages west of the former boundary including ENP and WCA-3B
- ▶ To explicitly include Biscayne Bay and the adjacent barrier islands. The model can run simulations with the original domain (800 sq.mi) if the focus is only on flooding in the urban areas
- ▶ A total of 49 SFWMD-defined watersheds are represented, however, results continue to be summarized using the previously established 11 watershed groupings
- ▶ All watersheds are interconnected and provide analysis of flows between watersheds
- ▶ Model Datum: NAVD88
- ▶ The subsurface model is represented at a 100-meter resolution, which is finer than the 500-meter resolution used in the WASD regional model, while the surface overland flow resolution remains at 5 feet



What's New

- ▶ **Calibration Period:** Hurricane Irma and multiple recent high intensity rainfall events
- ▶ **Model relies on recorded gate opening from SFWMD (breakpoint values).** Observed downstream water level time series are applied directly at each tidal control structure
- ▶ **Coastal boundary conditions are based on NOAA data and storm surge water level timeseries for the 5-, 10-, 25-, and 100-year events, developed by SFWMD using statistical analysis methods, are incorporated into the modeling framework**
- ▶ **Overland and groundwater two-dimensional boundary conditions are defined through spatial interpolation of data from more than 300 groundwater wells and surface water monitoring locations**
- ▶ **The western portion of the domain relies on the USGS EDEN network within Everglades National Park, while SFWMD monitoring data are used within the urbanized areas**
- ▶ **Model includes more than 500 canals, 150 gated structures, 50 pumps, 800 culverts and weirs, 10,000 cross sections, major outfalls**
- ▶ **SLR Scenarios developed in concurrence with FDEP requirements for Vulnerability Assessments (VA) and include +0.5, +2, +4, +6 ft to represent SLR and Storm Surge (current (2025), 2040, 2060, 2080, and 2100) and we are including events that FDEP's VA studies currently required, i.e. 2050 and 2080 NOAA Int Low and NOAA Int.**



Tactics & Initiatives

➤ Analyze Challenges & Identify Solutions

- SW Capital Plan Implementation
- New Technology Applications

➤ Collaborate with Other Agencies & the Public

- Collaboration with USACE & SFWMD in Regional Planning
- Partnering with Cities
- Educational Outreach

➤ Establish Consistent Processes & Procedures

- Operating Records for Public ROW Systems (*)
- Certification for Public ROW Systems (*)
- MDC Public Works Manual Update (groundwater maps)
- Maintenance Optimization of Secondary & Tertiary Systems

➤ Deliver Higher Protection Standards

- County Flood Criteria (Adopted 10/2022)
- Water Control Map (Adopted 10/2022)
- Chapter 11C Updates (Adopted 10/2022)
- (*) Impervious Ordinance (Adopted 9/2024)
- Local technical amendment to the Florida Building Code incorporating Sea Level Rise for design of below grade structures and underground garages

Completed

On-Going

Coming Soon

Comprehensive Flooding Risk Protection is Best Achieved Combining:

- **Proactive Floodplain Management with Higher Elevation & Cost Effective Level of Service:**

- In UMSA, ~60% of the surface area is not flood prone/outside of Special Flood Hazard Areas (SFHAs) , ~40% of the surface area is in SFHAs or flood prone locations
- Most critical flood risk is generally around ~11% the buildings/parcels and adjacent roads in UMSA, located in flood prone areas (SFHAs) developed before the early 1970's
- Solutions require private/public \$ investment for individual parcels
- Solutions require roadway impact fees and grant funding for public road construction/reconstruction

- **Proactive Operations & Maintenance of Stormwater Infrastructure (Including Pre- and Post-Storm Response):**

- Achieved for all UMSA areas (local drainage systems), and countywide (secondary canals)
- Requires Stormwater Utility Fee revenue (*)

- **Proactive Capital Improvements:**

- Achieved countywide for the regional conveyance system of canals (*)
- Achieved in all UMSA areas for local drainage systems (*)
- Requires Stormwater Utility Fee revenue (*)

Funding sources:

- SWU fees (*)
- Federal & State grants (FEMA, EPA, NRCS, FDEP, FDOT, SFWMD)
- Bonds (GOB, PTP, and Stormwater Utility Bonds) (*)
- Roadway and Neighborhood Improvements (Road Impact fees)

- **Other Strategies for Older Development:**

- ~11% older buildings and parcels in flood prone areas/SFHAs in UMSA , require private/public \$ investment to redevelop
- Require roadway impact fees and grant funding for public road reconstruction and careful timing to avoid negative impacts on adjacent parcels (private/public)
- Higher drainage Level of Service improvements are being implemented in impacted flood prone areas to alleviate street flooding and control additional private parcel runoff (e.g. Biscayne Shores areas, east and west of Biscayne Boulevard; Biscayne Gardens area) as identified/modelled in the Master Plan (*)



Best Management Practices

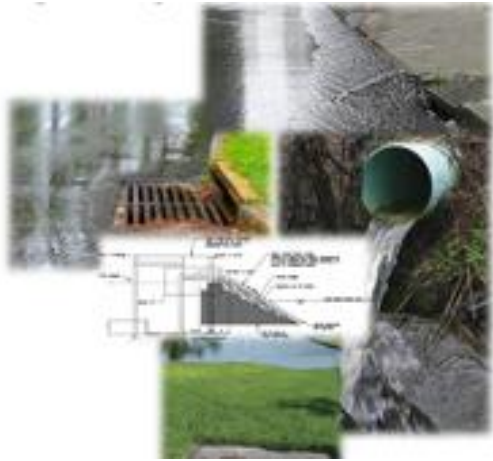
- **Require approvals for non-structural impervious surface improvements (paving) for single family and duplex properties, implemented in unincorporated and incorporated areas**
- Review and approval of multifamily, commercial, swimming pools, paving and drainage is currently done by RER through review of municipal permits (M-permits)

- **Allow municipalities to adopt and enforce their own ordinance addressing non-structural impervious surface improvements for single family and duplex properties, provided that such municipal ordinance is at least as stringent as the County Code**
- County may still review and enforce the code requirements for properties causing flooding on adjacent property or on the public right-of-way
- Require approvals prior to any development, improvement, construction, or other alteration of a parcel or property that contains stormwater infrastructure
- Require that applications for approval to construct, extend, or alter a facility, equipment, or process, including **stormwater infrastructure show compliance with the requirements and standards promulgated hereunder**
- Require maintenance of records for completed work, approval for any alterations or changes to the already approved work, project closure report, as-built plans, operation, or approvals to changes in system functionality. This requirement applies to wastewater systems, industrial waste disposal, air emissions and air pollution abatement facilities, and **stormwater infrastructure**



Requirements to Address Maintenance and Operations of Municipal Stormwater Management Infrastructure

- Require that each municipality or other public entity that owns or operates a stormwater management system that drains runoff from the public right-of-way or that otherwise serves a public right-of-way, and from a special taxing district, community development district, or private property owners' association that owns or operates stormwater infrastructure that connects to or drains into public right-of-way drainage infrastructure, shall submit their asset inventory, maintenance reports and their system maintenance Standard Operating Procedures
- This requirement does not apply to public entities, such as the Florida Department of Transportation, that also own and operate stormwater infrastructure outside of the County.



Requirements to Address Stormwater Management System Performance

- Certify that stormwater management infrastructure that drains runoff from the public right-of-way or otherwise serves a public right-of-way that is owned or operated by a municipality or other public entity, and each stormwater infrastructure that connects to or drains into public right-of-way drainage infrastructure that is owned or operated by a special taxing district, community development district, or private property owners' association continues to operate in accordance with, **and otherwise complies with the requirements of Chapter 24**, and the conditions and terms of any prior approval of said stormwater infrastructure. Furthermore, certify if such stormwater infrastructure has caused, or that no record has been found that it has caused, any pollution, contamination of air, water, soil, or property, flooding, or runoff in violation of any prior approval of said stormwater infrastructure.

- Include with the initial certification and subsequent recertifications of such stormwater management systems, copies of the following documents: - stormwater master plan, stormwater capital improvement plan, annual maintenance records and SOPs since the last submittal, new asset records showing changes that have occurred since the last submittal, annual fiscal analysis to certify their investment to improve and maintain system performance
- Require ongoing recertification for existing stormwater infrastructure for which no prior approval exists and no approval was required at the time of installation. Certify whether such stormwater infrastructure has caused, or if no record has been found that it has caused, any pollution, contamination of air, water, soil, or property, flooding, or runoff **in violation of Chapter 24 or the rules or regulations promulgated hereunder.**
- Identify deficiencies **and recommend corrective actions and a timeline by which such corrective actions will be implemented for stormwater infrastructure.**



Standards to Address Flood Control and Water Quality

- Provide updated references and data to be used, including but not limited to, design seasonal water table (October and May), future groundwater elevations, and tail-water design seasonal elevation including future surface water elevations for Sea Level Rise
- **Require minimum standards and information to be provided for construction drawings, specifications, and operational procedures**
- Set minimum standards for stormwater quantity and quality for development and other activities impacting the **retention**, runoff volume, flow, course, **treatment, discharge**, disposal, ponding, flooding, or **quality of stormwater discharges**
- Provide updated references and data to be used, including but not limited to, design seasonal water table (October and May), future groundwater elevations, and tail-water design seasonal elevation including **future surface water elevations for Sea Level Rise**
- Limit post-development stormwater impacts and runoff to pre-development levels at the site boundary, and set minimum onsite retention **for all parcels, of any size, including lots for single-family and duplex residences not part of a larger subdivision**, as well as minimum requirements for **water quality** to be achieved with onsite retention
- **Require a minimum retention for new outfalls or additional direct discharge volumes**; and require onsite retention and detention systems to provide a **minimum water quality treatment volume, and a minimum post-development pollutant reduction, for outfalls to Biscayne Bay, surface waters designated as Outstanding Florida Waters or their tributaries**
- Require **minimum standards for water quantity and water quality for public right-of-way projects that are not part of a subdivision application**
- Require erosion and sedimentation controls for construction activities
- Clarify the permit requirements for dewatering activities for swimming pools, for discharges into stormwater infrastructure, and for construction or alteration of stormwater infrastructure
- **Set new minimum permeability requirements and allow permeable materials that meet those minimum requirements including installation standards**
- Recognize that Green Stormwater Infrastructure (GSI), Low Impact Development (LID), along with green areas, swales, **pervious pavers, pervious pavement**, dry shallow exfiltration trenches, retention systems, or similar infrastructure or other development may satisfy the minimum requirements for stormwater onsite retention and for stormwater detention capacity
- Prohibit dewatering and discharges when they may cause or allow sediment to discharge into waterways or off-site private or public properties or into stormwater infrastructure in a manner that causes sedimentation, impedes water flows, or degrades water quality
- Prohibit discharges of floating solids, settleable solids, or sludge deposits attributable to stormwater in fresh and tidal waters
- Require best management practices (BMPs) for improving water quality by reducing excess nutrients and other pollutant loads in water

Impervious Ordinance

Key Dates

	Requirement	Code Reference
December 31, 2024	Municipalities shall communicate with Miami-Dade County if they will review or continue to review non-structural impervious surface improvements for single-family and duplex properties. Representatives of municipalities shall inform the County if a Municipality intends to adopt the Impervious Ordinance or if existing regulations meet the minimum standards of the Ordinance.	24-15(7)(b)(vi)
March 31, 2025	All non-structural impervious surface improvements and construction or modification of stormwater infrastructure are reviewed pursuant to new requirements.	24-15 and 24-42.8
December 31, 2025	Municipalities that intend to review non-structural impervious surface improvements for single-family and duplex properties must have regulations that meet the minimum standards of the Ordinance.	24-15(7)(b)(vi)
December 31, 2026	Municipalities and other public entities must submit records of relevant stormwater infrastructure and maintenance.	24-21.1(1)
March 31, 2028	Municipality and other public entities must provide initial recertification of stormwater infrastructure and every ten years thereafter.	24-21.1(2)

Requirements to Address Maintenance and Operations of Municipal Stormwater Management Infrastructure

Requirements to Address Stormwater Management System Performance

Retention Requirements



Development Type	Storm Event	Additional Information	Code Reference
Single-Family and Duplex Properties	25-year, 10-minute	Retention equivalent can be demonstrated with minimum setbacks, perimeter swale, and percent pervious area based on the lot size	24-42.8(4)(b)(i)
Single-Family and Duplex Properties with a Building 5 Stories or More	25-year, 6-hour	Requirement is regardless of lot size	24-42.8(4)(c)(i)(8)
Developments (other than single-family and duplexes) less than 2 ac of Impervious Area or 10 ac of Total Area	25-year, 6-hour	Unless more stringent retention is required by other aspects of the code	24-42.8(4)(c)(i)(3)
Developments (other than single-family and duplexes) more than 2 ac of Impervious Area or 10 ac of Total Area	25-year, 3-day	Surface Water Management General Permit (SWMGP) is required if a project meets the threshold provided in Section 1.2 of ERP Applicant's Handbook Vol. II	24-42.8(4)(i)

Standards to Address Flood Control and Water Quality

Retention Requirements

Development Type	Storm Event	Additional Information	Code Reference
Outfall into Primary or Secondary Canal	25-year, 3-day	Subject to canal capacity; Class II permit required	24-42.8(4)(c)(i)(5)
Cut and Fill Basin (Basin B, the Bird Drive Basin, and the North Trail Basin)	100-year, 3-day	Retention equivalent can be demonstrated with percentages of total lot area set aside for stormwater management established for each basin or approved off-site stormwater management areas.	24-42.8(4)(c)(i)(5)(a)
Outside of the Urban Development Boundary	100-year, 3-day	Required on-site	24-42.8(4)(c)(i)(6)
Construction Sites more than 1 ac	25-year, 6-hour	Provide temporary structural stormwater features until the completion of all construction activities	24-42.8(4)(f)(ii)

Standards to Address Flood Control and Water Quality



*Standards to
Address Water
Quality*

1. *Projects Requiring a Surface Water Management General Permit (SWMGP)*

The Surface Water Management General Permit (SWMGP) is required for projects that are more than 2 acres of impervious or 10 acres total for which the County has delegated jurisdiction to issue a SWMGP under its Operating Agreement with the South Florida Water Management District (SFWMD):

- a. **Governing Criteria:** These projects are reviewed for compliance with the Florida Department of Environmental Protection (FDEP) Applicant's Handbook Vol. I and SFWMD Applicant's Handbook Vol. II. (last updated on June 28, 2024), introducing nutrient loading performance criteria in Vol. I. An 18-month delayed implementation period applied, during which applicants were required to provide pre-versus post-development nutrient loading calculations for total phosphorus (TP) and total nitrogen (TN).
- b. **Current Requirements (Effective December 28, 2025):** All performance requirements (nutrient loading) in Section 8.2, Vol. I are fully in effect. For new applications and applications not deemed complete as of December 28, 2025, compliance with Section 8.2 is required
- c. **Grandfathered Projects:** Projects qualifying as grandfathered under Section 3.1.2, Vol. I are reviewed under the prior SFWMD Applicant's Handbook, Vol. II (pre-June 28, 2024). These projects must meet the volumetric water quality treatment criteria, defined as 1 inch of runoff over the basin, or 2.5 inches multiplied by the percent impervious area.

2. Projects Requiring a Class II Permit (County Code)

*Standards to
Address Flood
Control and
Water Quality*

Miami-Dade County Code requires water quality review when a project proposes or modifies an outfall or overflow system. Water quality is reviewed as part of the Class II permit process per Section 24-48.1(1)(b) of the Code:

- a. Governing Criteria: Provide signed and sealed water quality calculations demonstrating pretreatment of the first inch of runoff prior to discharge to the outfall, in accordance with Section 24-48.3(8)(a)
- b. Definition of First Inch of Runoff: The volume of stormwater runoff generated during the initial stages of a rainfall event, calculated as the volume generated during the time required to supply and transport one (1) inch of runoff from the farthest point in the basin to the emergency overflow outfall, as defined in “Design of Drainage Structures, An Updated Policy for the Design of Storm Runoff Drainage Structures, December 1980.”
- c. Projects Discharging to Outstanding Florida Waters (OFW): Including Biscayne Bay, are subject to enhanced water quality requirements.
 - i. Provide signed and sealed water quality calculations demonstrating a minimum water quality treatment volume equivalent to 150 percent of the first inch of runoff. First inch of runoff is defined as above in County Code.
 - ii. Projects must demonstrate no degradation of water quality, pursuant to Rule 62-302.700, F.A.C., by providing pollutant loading calculations demonstrating that post-development pollutant loads do not exceed pre-development loads.

Questions & Answers