

Planning Commission Work Session

Stormwater Design Manual Amendments

September 17, 2026



**Presented by:
Thomas Gerstenberger, P.E.**

Regulatory Standards

Present Regulatory Standards (County and SWFWMD)

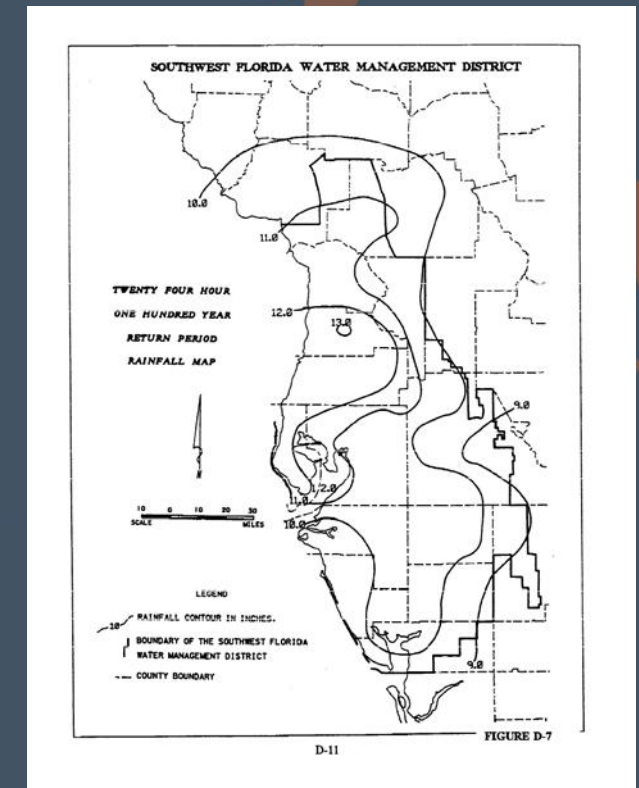
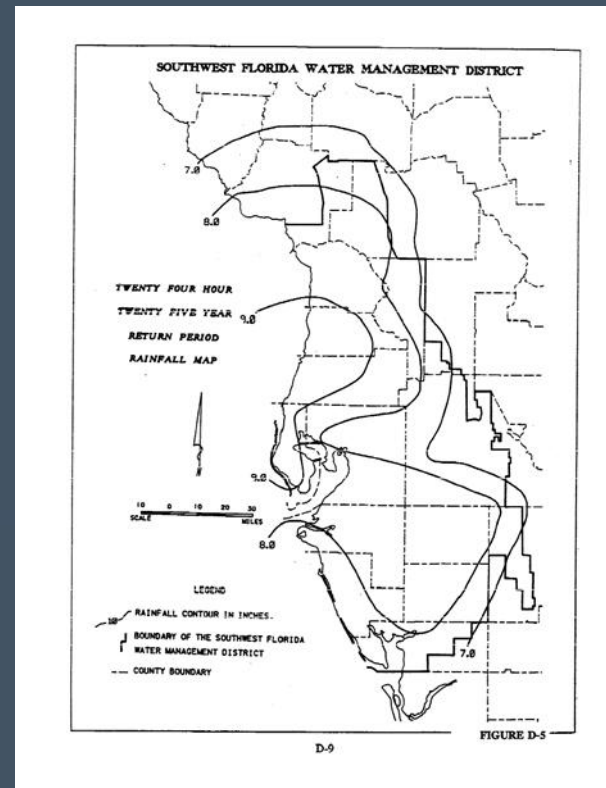
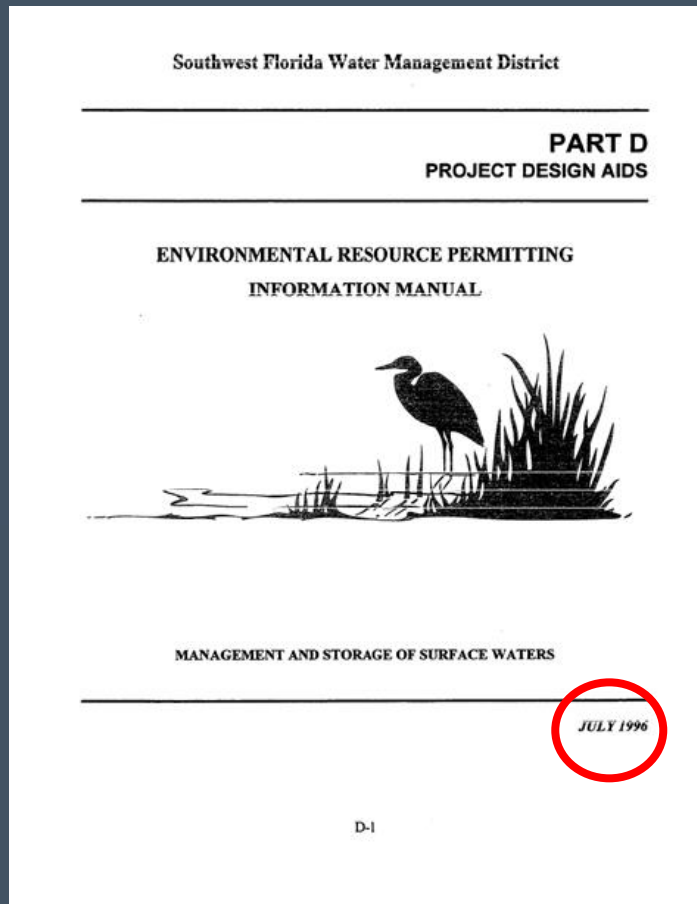
- **Attenuation/Discharge: 25-year/24-hour = regulatory 8 inches rainfall**
- **Floodplain analysis (Cut/Fill; floodplain encroachment/compensation) = 100-year/24-hour = regulatory 10 inches rainfall**

Most recent storm events (Hurricane Debby, No Name Storm 2017) provide identify three challenges:

- **High Accumulation Totals (greater than 8 inches)**
- **Long Duration (longer than 24-hour period)**
- **High Intensity (2 or more inches in one hour)**



Present Regulatory Standards



Problem: Outdated Design Rainfall Data

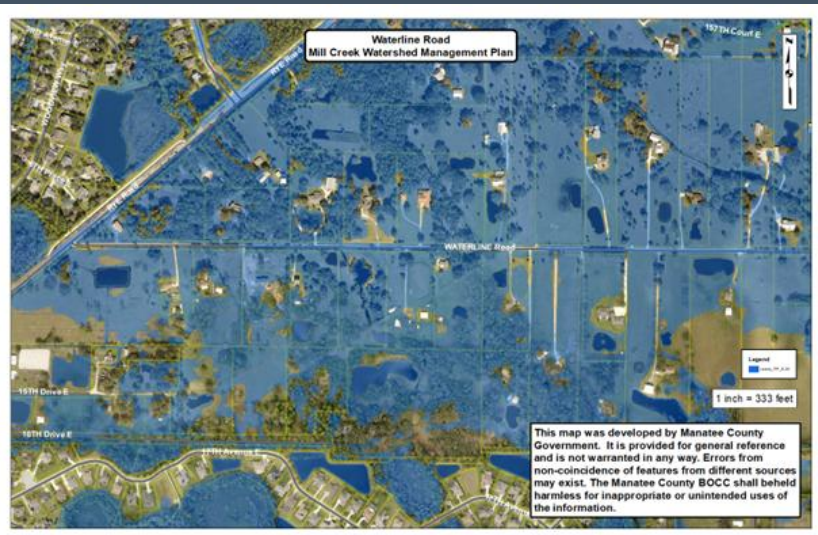
Rainfall accumulation maps have been utilized for decades without updates based upon weather trends or recorded rainfall data.



Outdated Flood Maps



Comparison of FEMA 2014 effective FIRM 100-year Floodplain Delineation versus Mill Creek Watershed Management Plan (WMP)



The FEMA 2014 effective FIRM illustrates minimal 100-year floodplain delineation on Waterline Road and the adjacent properties, whereas inundation is prevalent.

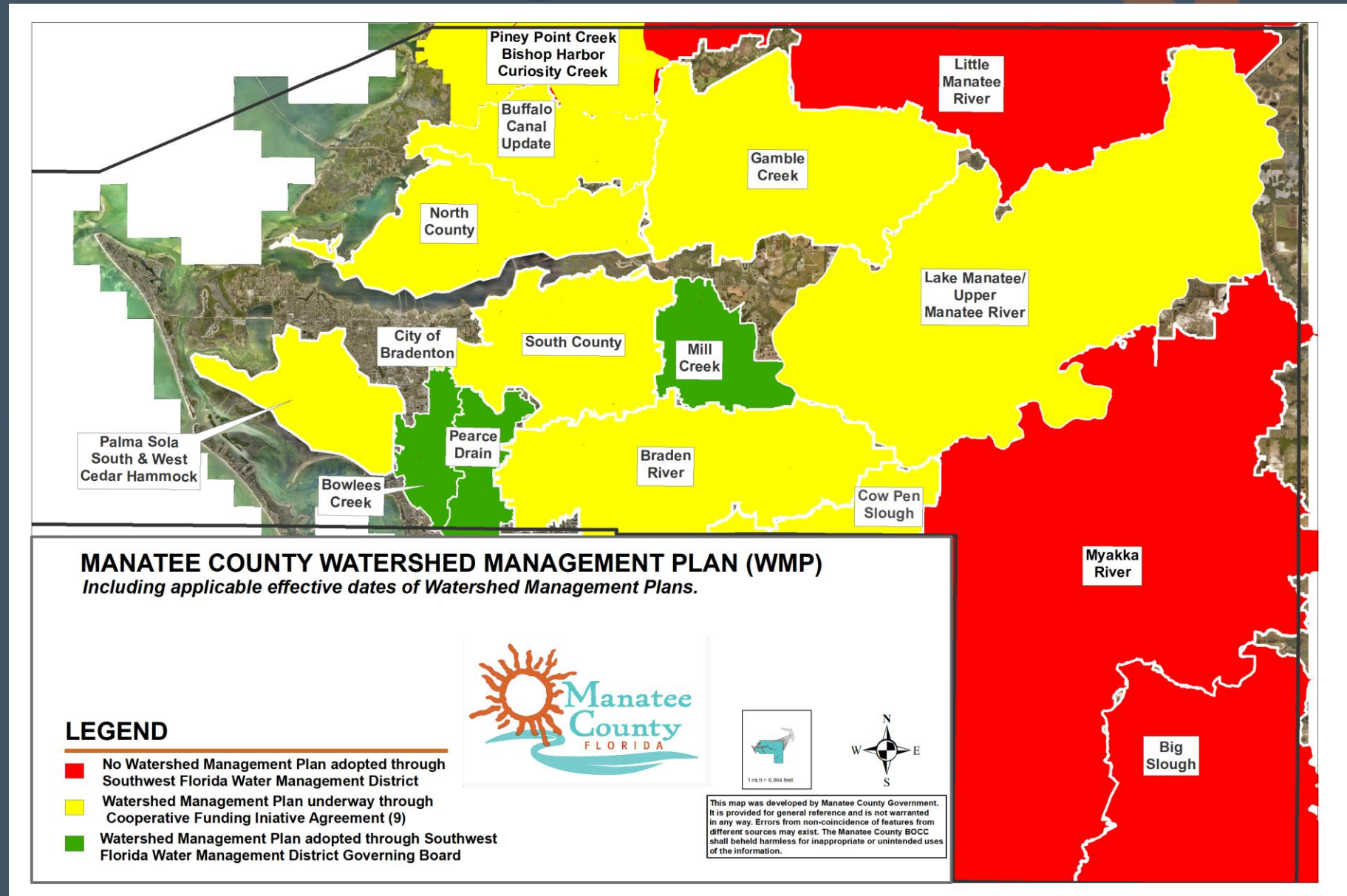
Watershed Management Plans (WMP)

Total County Watersheds: 33

- Recently Adopted (3): Mill Creek (April 27, 2021); Pearce Drain (November 16, 2021); Bowlees Creek (November 16, 2021)
- Underway (21): South County (Glen Creek, Sugarhouse Creek, Williams Creek, Johnson Creek, Cypress Strand, Gates Creek); North County (McMullen Creek, Slaughter Drain, Government Hammock, Carr Drain, Canal Road Drain, Big Chimney Drain, City of Palmetto); Cow Pen Slough; Piney Point Creek/Bishop Harbor/Curiosity Creek; South & West Branch Cedar Hammock/Palma Sola Drain; Lake Manatee/Upper Manatee River.
- Updates Underway (3): Braden River; Buffalo Canal; Gamble Creek
- Future (6): Middle Manatee River (including Goddard Creek and Rye Branch); Little Manatee River; Wares Creek; Myakka River



Watershed Management Plans (WMP)



Stormwater Design Manual Amendment – Watershed Management Plans

DRAFT Language:

Site-specific cumulative rainfall as derived from the National Oceanic and Atmospheric Administration (NOAA) Atlas 14 Point Precipitation Estimates or watershed Design Storm Parameters shall be utilized as noted below:

Critical Design Storm Modeling Parameters:

Storm Frequency:	Annual Probability of Occurrence:	Cumulative Rainfall:	Rainfall Distribution:
3.22-year/24-hour	N/A	4.5	SCSII - FLMOD
10-year/24-hour	10%	NOAA Atlas 14	SCSII - FLMOD
25-year/24-hour	4%	NOAA Atlas 14	SCSII - FLMOD
50-year/24-hour	2%	NOAA Atlas 14	SCSII - FLMOD
100-year/24-hour	1%	NOAA Atlas 14	SCSII - FLMOD
100-year/72-hour	N/A	18 inches	FDOT-72



NOAA Atlas 14

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)¹

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.568 (0.471–0.696)	0.639 (0.530–0.783)	0.751 (0.620–0.923)	0.840 (0.689–1.04)	0.956 (0.752–1.21)	1.04 (0.800–1.33)	1.12 (0.830–1.47)	1.20 (0.848–1.62)	1.30 (0.878–1.80)	1.36 (0.900–1.94)
10-min	0.832 (0.690–1.02)	0.936 (0.776–1.15)	1.10 (0.908–1.35)	1.23 (1.01–1.52)	1.40 (1.10–1.77)	1.52 (1.17–1.95)	1.64 (1.22–2.16)	1.76 (1.24–2.37)	1.90 (1.29–2.64)	2.00 (1.32–2.84)
15-min	1.01 (0.842–1.24)	1.14 (0.946–1.40)	1.34 (1.11–1.65)	1.50 (1.23–1.85)	1.71 (1.34–2.15)	1.86 (1.43–2.38)	2.00 (1.48–2.63)	2.14 (1.51–2.89)	2.31 (1.57–3.22)	2.43 (1.61–3.46)
30-min	1.55 (1.29–1.90)	1.75 (1.45–2.14)	2.06 (1.70–2.53)	2.30 (1.89–2.84)	2.63 (2.07–3.31)	2.86 (2.20–3.67)	3.08 (2.28–4.05)	3.30 (2.33–4.46)	3.56 (2.42–4.96)	3.75 (2.48–5.33)
60-min	2.02 (1.67–2.47)	2.27 (1.88–2.78)	2.68 (2.21–3.29)	3.02 (2.48–3.72)	3.47 (2.74–4.40)	3.82 (2.94–4.91)	4.16 (3.08–5.49)	4.50 (3.19–6.10)	4.94 (3.36–6.89)	5.27 (3.48–7.49)
2-hr	2.48 (2.07–3.02)	2.79 (2.33–3.40)	3.30 (2.75–4.03)	3.73 (3.08–4.57)	4.32 (3.44–5.45)	4.77 (3.70–6.12)	5.23 (3.91–6.87)	5.70 (4.07–7.69)	6.32 (4.32–8.77)	6.79 (4.51–9.59)
3-hr	2.70 (2.26–3.27)	3.04 (2.54–3.68)	3.62 (3.01–4.39)	4.11 (3.41–5.01)	4.82 (3.86–6.09)	5.39 (4.21–6.91)	5.98 (4.49–7.85)	6.60 (4.74–8.91)	7.45 (5.12–10.3)	8.11 (5.42–11.4)
6-hr	3.10 (2.61–3.72)	3.50 (2.94–4.20)	4.22 (3.54–5.08)	4.88 (4.06–5.91)	5.88 (4.77–7.45)	6.72 (5.30–8.62)	7.63 (5.79–10.0)	8.61 (6.25–11.6)	10.0 (6.96–13.9)	11.2 (7.50–15.6)
12-hr	3.56 (3.02–4.25)	4.05 (3.43–4.83)	4.97 (4.19–5.95)	5.86 (4.91–7.04)	7.26 (5.96–9.22)	8.48 (6.75–10.9)	9.83 (7.53–12.9)	11.3 (8.29–15.3)	13.5 (9.46–18.7)	15.3 (10.3–21.2)
24-hr	4.13 (3.52–4.89)	4.70 (4.01–5.57)	5.84 (4.95–6.93)	6.97 (5.88–8.31)	8.80 (7.31–11.2)	10.4 (8.38–13.4)	12.3 (9.48–16.1)	14.3 (10.6–19.2)	17.3 (12.2–23.9)	19.9 (13.5–27.4)
2-day	4.84 (4.15–5.68)	5.50 (4.72–6.47)	6.85 (5.85–8.07)	8.21 (6.97–9.72)	10.4 (8.74–13.2)	12.4 (10.1–15.8)	14.7 (11.4–19.2)	17.2 (12.8–23.0)	21.0 (14.9–28.8)	24.1 (16.5–33.1)
3-day	5.36 (4.62–6.27)	6.13 (5.28–7.17)	7.65 (6.56–8.98)	9.16 (7.81–10.8)	11.6 (9.74–14.6)	13.8 (11.2–17.5)	16.2 (12.7–21.0)	19.0 (14.1–25.2)	23.0 (16.4–31.4)	26.4 (18.1–36.0)
4-day	5.82 (5.03–6.79)	6.66 (5.75–7.78)	8.41 (7.14–9.81)	10.1 (8.41–12.1)	12.7 (10.4–15.6)	15.4 (12.4–19.0)	18.4 (14.6–23.4)	21.8 (16.8–28.8)	26.0 (19.4–34.4)	30.0 (22.4–39.6)
7-day	7.06 (6.13–8.18)	8.01 (6.95–9.29)	10.1 (8.41–12.1)	12.1 (9.98–14.5)	15.1 (12.4–18.4)	18.1 (14.6–23.4)	21.6 (16.8–28.8)	25.4 (19.4–34.4)	30.0 (22.4–39.6)	34.0 (25.6–45.6)
10-day	8.17 (7.12–9.43)	9.20 (8.00–10.6)	11.4 (9.98–13.0)	13.4 (11.1–14.5)	16.4 (13.4–19.0)	19.4 (15.4–25.4)	23.0 (18.4–29.6)	27.0 (21.4–34.6)	32.0 (24.4–41.6)	36.0 (27.6–48.4)
20-day	11.4 (9.98–13.0)	12.7 (11.1–14.5)	15.4 (13.4–17.4)	18.4 (15.4–21.4)	22.4 (18.4–27.4)	26.4 (21.4–32.4)	30.0 (24.4–36.0)	34.0 (27.6–41.6)	39.0 (31.6–48.4)	44.0 (35.6–56.4)
30-day	14.1 (12.4–16.1)	15.7 (13.8–17.9)	19.0 (16.4–21.6)	22.4 (19.4–25.4)	26.4 (21.4–32.4)	30.0 (24.4–36.0)	34.0 (27.6–41.6)	39.0 (31.6–48.4)	44.0 (35.6–56.4)	50.0 (40.0–60.0)
45-day	17.7 (15.7–20.1)	19.7 (17.4–22.4)	23.4 (20.4–26.4)	27.4 (23.4–31.4)	32.4 (27.4–37.4)	37.4 (31.4–43.4)	42.4 (35.6–49.6)	48.4 (40.0–56.8)	54.4 (44.4–64.4)	60.0 (50.0–70.0)
60-day	20.8 (18.5–23.6)	23.3 (20.6–26.4)	27.4 (23.4–31.4)	31.4 (26.4–36.4)	36.4 (31.4–41.4)	41.4 (35.6–47.4)	46.4 (40.0–52.8)	52.4 (44.4–60.4)	58.4 (50.0–66.4)	64.0 (54.4–73.6)

¹ Precipitation frequency (PF) estimates in this table are based on NOAA Atlas 14 data. Numbers in parenthesis are PF estimates at low (for a given duration and average recurrence interval) and high (for a given duration and average recurrence interval) bounds are not checked against probable maximum precipitation (PMP) values. Please refer to NOAA Atlas 14 document for more information.



- a) Select location
Move crosshair or double click.
b) Click on station icon
☐ Show stations on map

Location information:
Name: Bradenton, Florida, USA*
Latitude: 27.4762°
Longitude: -82.5526°
Elevation: 30 ft **

* Source: ESRI Maps
** Source: USGS

4.1 Design Storm Simulations

In accordance with section 2.3.4.3 of the Project Plan, and as previously discussed in Section 2.1.6, twelve design storm simulations were performed and are shown below in **Table 4-1**. All single day rainfall depths were obtained from NOAA Atlas 14. The 3-day, 7-day, and 10-day rainfall depths were also obtained from NOAA Atlas 14. The 5-day rainfall depths were obtained from the DISTRICT Guidelines and Specifications, Appendix E.

Table 4-1 Design Storms Simulated for the PDGC Watershed

Simulation Name	Storm Duration (Hours)	Rainfall Distribution	Rainfall (inches)	Simulation Time (Hours)
100YR240H	240 (10 day)	FDOT 240	20.2	370
100YR168H	168 (7 day)	FDOT 168	18.9	320
100YR120H	120 (5 day)	SWFWMD 5 Day	18.5	240
100Y72H	72 (3 day)	FDOT 72	16.1	120
100YR24H	24	FLMOD	12.1	72
50Y120H	120 (5 day)	SWFWMD 5 Day	16.1	240
50YR24H	24	FLMOD	10.4	24
25YR24H	24	FLMOD	8.77	24
10YR24H	24	FLMOD	6.97	24
10Y120H	120 (5 day)	SWFWMD 5 Day	11.6	120
5YR24H	24	FLMOD	5.85	24
2YR24H	24	FLMOD	4.71	24

4.1 Design Storm Simulations

Twelve design storm simulations were performed (**Table 4-1**). Rainfall depths for 5-day storms were obtained from the SWFWMD G&S, Appendix E. The other rainfall depths were obtained from the NOAA Atlas 14 Point Precipitation Frequency Estimates for the 63rd Ave E crossing of Bowlees Creek (accessed on 2/11/2019; see Appendix C).

Table 4-1 Design Storm Parameters

Frequency (years)	Event Duration (hours)	Depth (in)	Distribution
2	24	4.72	SCSII – FLMOD
5	24	5.85	SCSII – FLMOD
10	24	6.97	SCSII – FLMOD
10	120	11.60	SWFWMD-120
25	24	8.79	SCSII – FLMOD
50	24	10.40	SCSII – FLMOD
50	120	16.10	SWFWMD-120
100	24	12.20	SCSII – FLMOD
100	72	16.20	FDOT-72
100	120	18.50	SWFWMD-120
100	168	19.00	FDOT-168
100	240	20.20	FDOT-240

Coming Soon: NOAA Atlas 15

Welcome to the NOAA Atlas 15 Informational Page

NOAA ATLAS 15:

Update to the National Precipitation
Frequency Standard



Annual Exceedance Probability (%)

☐	Duration	50% ☐	20% ☐	10% ☐	4% ☐	2% ☐	1% ☐
☐	60 minutes	0.499 (0.446 - 0.549)	0.729 (0.64 - 0.818)	0.919 (0.793 - 1.05)	1.21 (1.02 - 1.41)	1.48 (1.22 - 1.75)	1.79 (1.45 - 2.16)
☐	120 minutes	0.619 (0.563 - 0.675)	0.841 (0.747 - 0.937)	1.01 (0.888 - 1.15)	1.3 (1.11 - 1.51)	1.56 (1.31 - 1.84)	1.86 (1.53 - 2.24)
☐	3 hours	0.71 (0.649 - 0.771)	0.951 (0.851 - 1.06)	1.14 (1 - 1.28)	1.43 (1.23 - 1.64)	1.68 (1.42 - 1.96)	1.97 (1.64 - 2.35)
☐	6 hours	0.89 (0.817 - 0.966)	1.18 (1.07 - 1.31)	1.4 (1.25 - 1.57)	1.71 (1.5 - 1.95)	1.96 (1.69 - 2.26)	2.23 (1.9 - 2.62)

- Per the Information Page, NOAA Atlas 15 is the new authoritative, spatially continuous National Precipitation Frequency Atlas of the United States, currently under development by the NOAA National Weather Service (NWS) Office of Water Prediction (OWP).
- In contrast to NOAA Atlas 14, NOAA Atlas 15 will provide spatially continuous coverage over the entire United States and, for the first time, will also account for future temporal trends (through the year 2100).
- Implementation through state agencies including FDOT, FDEP, and SWFWMD.



Street level of Service (LOS)

The purpose of a Street Level of Service is categorize roadway flooding within the county with a consistent and universal approach. Regional examples include the FDOT, Sarasota County, Pinellas County, Hillsborough County, and Pasco County.

Facility	Frequency
Roadside, Median and Collector ditches or swales	10-year
Outfall ditches, Major Channels and Canals	25-year
Storm Drains (also applies to parking areas)	10-year
Bridges and Cross Drains on Evacuation Routes	100-year
Bridges and Cross Drains on Arterial and High-Use (ADT > 1,500) Roads	50-year
Bridges and Cross Drains on all Other Roads and Facilities	25-years
Roadside Ditch Culverts	10-year

Table 4-2 Acceptable Flooding Criteria				
Description	5-year	10-year	25-year	100-year
Roadway: Evacuation	None	None	None	None
Roadway: Arterials	None	None	None	6 inches
Roadway: Collectors	None	None	6 inches	9 inches
Roadway: Neighborhood	None	6 inches	9 inches	12 inches
Parking Areas	3 inches	9 inches	9 inches	12 inches
Open Space	Flooding of open space is acceptable if it does not compromise public health and safety.			



Figure 4-1 Acceptable Flooding for a 100-Year Storm

Street level of Service (LOS)

DRAFT Language:

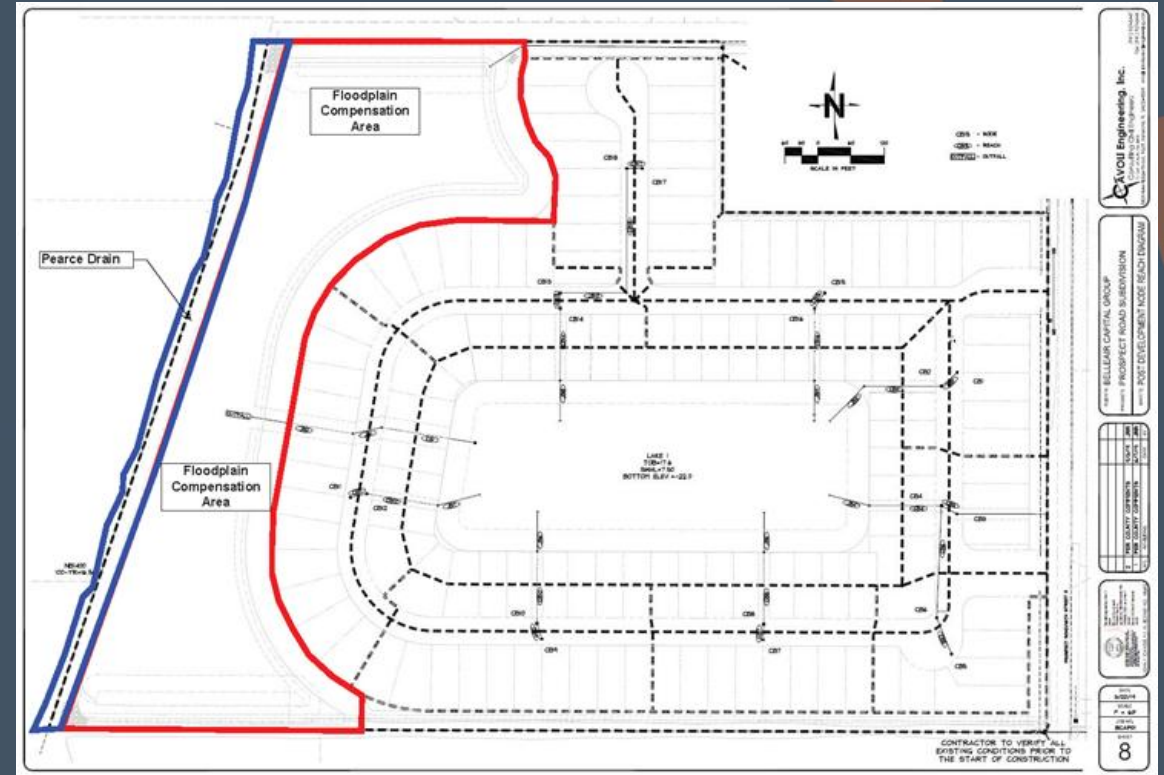
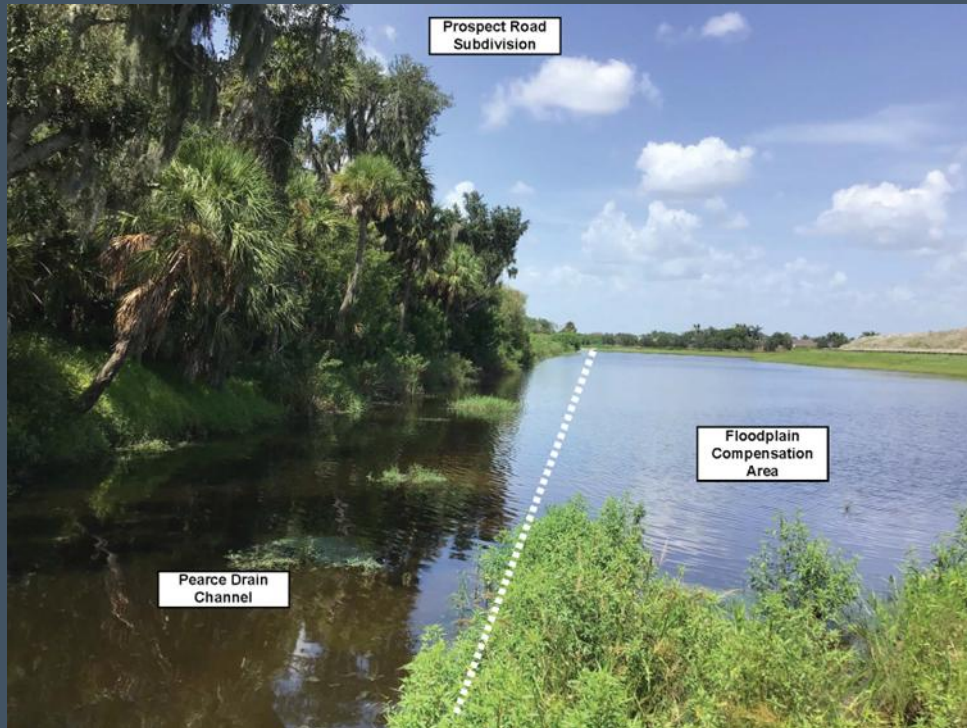
Flood inundation depth 6 inches or less over the crown or inside median curb shall be designed pursuant to road classification criteria and associated storm frequency event/Annual Probability of Occurrence referenced below:

Road Classification:	Storm Frequency Event:	Annual Probability of Occurrence:
Evacuation Route	No flood inundation preferred	N/A
Arterial	100-year/24-hour	1%
Collector	50-year/24-hour	2%
Local Street	25-year/24-hour	4%

Furthermore, flood inundation depth shall not exceed 12 inches for any road classification associated with the 10-year/24-hour storm frequency event (10% Annual Probability of Occurrence).



Example: Sole-use/Directly -Connected Floodplain Compensation Areas



Pursuant to LDC Section 801.3.M: Floodplain Compensation. Developments within a project area greater than one hundred (100) acres shall provide sole use floodplain compensation. Floodplain Compensation Areas directly-connected to drainage system where possible. Available floodplain mitigation volume from initial stage of the drainage system.



Questions?



**Presented by:
Thomas Gerstenberger, P.E.**

Stormwater Engineering Project List

Watershed Management Plans (WMP)

Updated: September 2026

Project Name	Watershed	Status	New/Amended	District	* Completion Date *	Notes	Number of Watersheds
Bowlees Creek	Mill Creek	Complete			4/27/2021		1
Pearce Drain	Bowlees Creek	Complete			11/16/2021		1
Mill Creek	Pearce Drain	Complete			11/16/2021		1
South County	Glen Creek Sugarhouse Creek Williams Creek Johnson Creek Cypress Strand Gates Creek	Ongoing	New	2, 5	6/30/2029	Drainage Modeling SWFWMD Extension to extend Deadline to June 30, 2029, approved by the BCC on May 5, 2026.	6
North County	McMullen Creek Slaughter Drain Government Hammock Carr Drain Canal Road Drain Big Chimney Drain City of Palmetto	Ongoing	New	1, 2	6/30/2029	Drainage Modeling SWFWMD Extension to extend Deadline to June 30, 2029, approved by BCC on May 5, 2026.	7
Cow Pen Slough	Cow Pen Slough	Ongoing	New	1, 5	6/30/2028	Alternatives Analysis SWFWMD Extension to extend Deadline to June 30, 2028, Approved by BCC on May 5, 2026.	1
Northwest County	Piney Point Creek Bishop Harbor Curiosity Creek	Ongoing	New	1	4/30/2028	Watershed Evaluation Proposed Amendment to extend deadline to July 31, 2030.	3
Southwest County	South Branch Cedar Hammock West Branch Cedar Hammock Palma Sola Drain	Ongoing	New	3, 4	4/30/2028	Watershed Evaluation Proposed Amendment to extend deadline will be needed.	3
Buffalo Canal	Buffalo Canal	Ongoing	Amended	1, 3	4/30/2028	Watershed Evaluation	1
Braden River	Braden River	Ongoing	Amended	1	4/30/2028	Watershed Evaluation Proposed Amendment to extend deadline to July 31, 2030.	1
Gamble Creek	Gamble Creek	Ongoing	Amended	1	9/30/2030	Watershed Evaluation Proposed Amendment to extend deadline will be needed.	1
Upper Manatee River	Lake Manatee/Upper Manatee River	Ongoing	New	1, 5	12/31/2031	Watershed Evaluation	1
Manatee River Below Lake Manatee	Manatee River	Proposed	New	1, 2, 5	TBD	Proposed 100% County funded WMP (commence in FY 2027) Total Budget subject to proposal from Engineering Professional Services Proposals	3
Myakka River	Myakka River/Big Slough	Future	New	1	TBD	Future WMP for SWFWMD CFI or by County	1
Little Manatee River	Little Manatee River	Future	New	1	TBD	Future WMP for SWFWMD CFI or by County	1
Wares Creek	Wares Creek	Future	Amended	2, 3, 4	TBD	This is a critical watershed, should be scheduled for update to the COB WMP CFI2028 or by County	1
Grand Total							33
Ongoing WMP: 9							
Proposed WMP: 1							
Future WMP: 3							

NOTES:

CFI - Cooperative Funding Initiative through Southwest Florida Water Management District (SWFWMD).

* Unless adopted by SWFWMD Governing Board, completion dates are subject to CFI extensions through amendment to Cooperative Funding Agreement.