City of Naples

SUPPLEMENT A

STORMWATER STANDARDS HANDBOOK

GUTTER SIZING GUIDANCE

&

STORMWATER MANAGEMENT SYSTEMS EXAMPLE CALCULATIONS

Updated August 2021

CONTENTS

Gutter Sizing Guidance:
Examples for the sizing of gutters follows below.

2021 Code – Minimum Stormwater Design Technical Criteria:
The minimum stormwater design technical criteria are in Code Section 16-115 and include the water quantity/conveyance criteria and the water quality/storage criteria.

Water Quantity/Conveyance Criteria:
Note: No changes to the design storms were made from the 2007 code.
As required in Code Section 16-115, the off-site discharge rate, and the size of the discharge pipe, must be computed using a storm event of a one-hour duration, five-year return frequency. The storm event is 2.8 inches in accordance with the 2018 Stormwater Master Plan Update.
The conveyance system will be designed to pass the design flow storm event and ensure the backwater head does not exceed the proposed containment system in a 25-year, 24-hour storm event. The storm event is 8.0 inches in accordance with the 2018 Stormwater Master Plan Update.

Water Quality/Storage Criteria:
The following examples of the application of the water quality/storage criteria follow below.

- Single Family Home – City Approval for Stormwater Management System
  - 213 9th Avenue South
  - 620 6th Avenue North
  - 3221 Fort Charles Drive
- Commercial Property – State Permit Required for Stormwater Management System
  - Seaward, Naples Beach Hotel
  - Basin One, Naples Beach Hotel
  - Basin Two, Naples Beach Hotel
  - Basin Three, Naples Beach Hotel
- Property with ≤ 40% Impervious Area
  - 537 13th Street North
  - 550 13th Street North
  - 1079 6th Lane North

Multi Family Impervious Option:
- Admiralty Point

Gutter Sizing Guidance:

Gutters will be installed as required by Section 16-115 of the Code. The following sizes for Half-Round, or k-Style, gutters will be provided in accordance with one of the following three options.

Half-Round **k-Style**

Option 1:

Gutters may be sized in accordance with the following table.

Required Minimum Gutter Sizes		
Gutter Drainage Area (ft^2)	Half-Round	K-Style
≤ 1,200	5-inch	5-inch
≤ 1,800	6-inch	5-inch
> 1,800	not approved	5-inch
≤ 2,600	n/a	5-inch
≤ 3,700	n/a	6-inch
≤ 4,800	n/a	7-inch
> 4,800	n/a	8-inch

Downspouts will be sized to carry the capacity of the gutters and are recommended to be installed every 40 feet as a minimum.

Option 2:

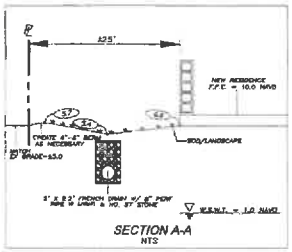
Gutters may be sized in accordance with the following calculations.

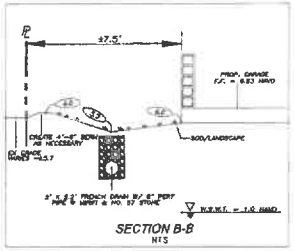
- Calculate the square footage of the gutter's drainage area. For a simple gable-end roof, make a calculation for each slope. For roofs with multiple facets, add up the total surface area within the drainage area.
- Determine the roof pitch factor.
  - 12 in 12 or higher the pitch factor is 1.3
  - 9 in 12 the pitch factor is 1.2

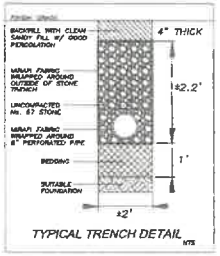
  - 6 in 12 the pitch factor is 1.1
  - 4 in 12 to 5 in 12 the pitch factor is 1.05
  - Flat to 3 in 12 the pitch factor is 1.0
- The maximum rainfall intensity for Naples is 7.8 inches per hour.
- Calculate the adjusted square footage. Example: A 1,000 square foot roof, with a 6 in 12 pitch factor of 1.1, and a rainfall intensity of 7.8 inches per hour yields an adjusted square footage of 8,580. (1,000 * 1.1 * 7.8 = 8,580)
- Choose the required gutter for the adjusted square footage.
  - 5-inch K-Style 5,520 square feet
  - 6-inch K-Style 7,960 square feet
  - 5-inch Half-Round 2,500 square feet
  - 6-inch Half-Round 3,840 square feet
- For runoff that exceeds the capacity of standard gutters three options are available.
  - Increase the size of the gutters to 7 or 8 inches.
  - Increase the pitch of the gutter to greater than the standard ¼ inch per 10 feet.
  - Install additional downspouts above the recommended every 40 feet.
- Downspouts are recommended to be installed every 40 feet as a minimum. Downspout capacity is as follows:
  - Rectangular 2 by 3 inches = 600 square feet
  - Rectangular 3 by 4 inches = 1,200 square feet
  - Round 3 inches = 706 square feet
  - Round 4 inches = 1,255 square feet

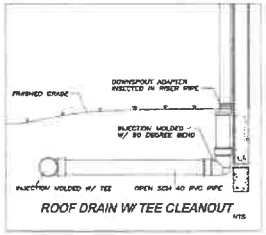
Option 3:

Project contractors may propose an alternative gutter design; however, the design must follow the most recent standards of the Sheet Metal and Air Conditioning Contractors National Association (SMACNA), or other documented national standard for gutter sizing.







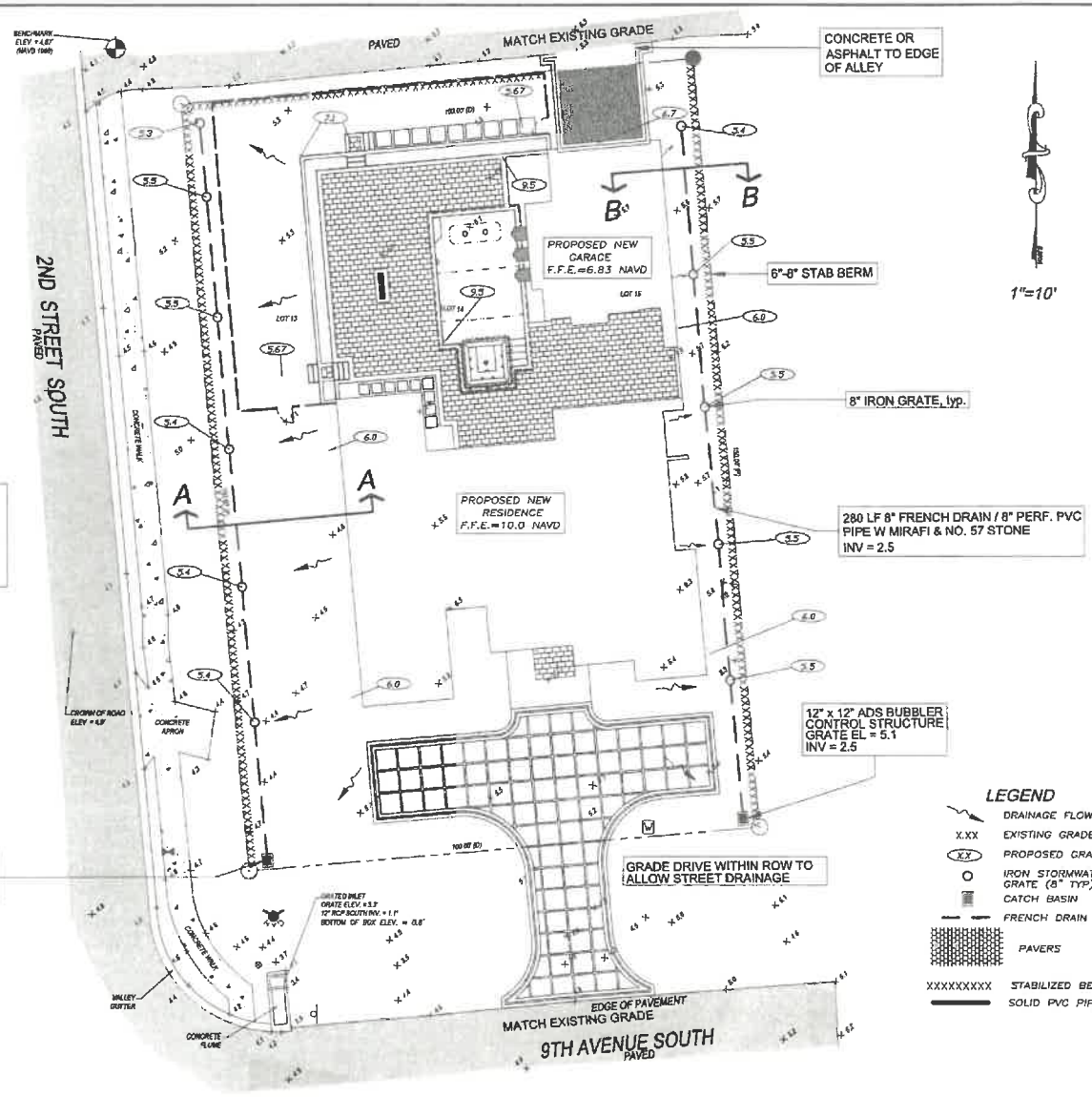


SITE SUMMARY

IMPERVIOUS AREA	SQUARE FOOTAGE	PERCENT OF TOTAL
PROPOSED AREA (ROOF/GARAGE) PROPOSED DRIVE/WALKWAY ENTRY	±8185 SF	54.5
TOTAL PROPOSED IMPERVIOUS	±8185 SF	54.5
TOTAL PERVIOUS AREA	±6838 SF	45.5
TOTAL	15,003 SF	100

WATER QUALITY CALCULATIONS

WATER QUALITY REQUIRED FOR 1/2" PRE-TREATMENT REDUCTION AUTHORIZED - EMPLOYING "DRY RETENTION" TECHNIQUE
1/2" (15003-roof(4038 SF)) * 1/12 = 457 CF REQ'D
SYSTEM PROVIDES:
VOLUME OF FRENCH DRAIN = 280 LF 8" PIPE W/ STONE + VOIDS (40%) = 493 CF (SWALE NOT INCLUDED)
TOTAL WATER QUALITY DETENTION REQUIRED = 457 CF
TOTAL WATER QUALITY DETENTION PROVIDED = 493 CF



NOTES:

1. THE 25 YEAR, 1 DAY STORM EVENT OR 8.5" OVER 24 HOURS SHALL PROVIDE THE BASIS BY ANALYSIS OF FLOOD ROUTING, THAT THE PROJECT HAS CAPACITY AND CAN DISCHAGE TO THE DOWNSTREAM WATER BODY.
2. VERIFY STRUCTURE MEET MINIMUM REQUIRED FLOOD ELEVEATION AS WELL AS ALL APPLICATION ZONING AND ARCHITECTURAL CRITERIA PRIOR TO STARTING OF CONSTRUCTION.
3. MATCH EXISTING GRADES AT PROPERTY LINES.
4. NO STORMWATER RUNOFF DISCHARGED ONTO NEIGHBORING PROPERTIES.
5. GRADE DRIVEWAY TO MOVE STORM WATER TO FRENCH DRAINS.
6. GRADE DRIVEWAY CONNECTION TO ALLEY OR STREET TO MATCH GRADES.
7. CONTRACTOR SHALL VERIFY THE SITE LAYOUT AND NOTIFY ARCHITECT OF ANY DISCREPANCIES BEFORE CONSTRUCTION.
8. SURVEY PROVIDED BY MARCO SURVEY & MAPPING.
9. CONTRACTOR SHALL PROVIDE CONDUIT UNDER PAVING FOR IRRIGATION, TELEPHONE, TV, & GAS AS REQUIRED.
10. GRADE AROUND BUILDING TO SLOPE AWAY FROM BUILDING.
11. ARCHITECTURAL SITE PLAN PROVIDED BY WHK ARCHITECTS & PLANNERS.
12. ELEVATIONS ARE BASED ON NAVD 1988.
13. ROOF DRAINS TO CONNECT TO DRAINAGE SYSTEM OR DIRECT STORMWATER TO STORM GRATES VIA SHEET FLOW.
14. SITE ELEVATION INFORMATION SEE SURVEY.
15. ALL AREA DRAINAGE, DECK DRAINS, POOL DRAINS ECT., SHALL CONNECT TO THEIR OWN MAIN FEEDER PIPE (TO BE SIZED BY THE LANDSCAPE ARCHITECT) AND SHALL NOT CONNECT DIRECTLY INTO THE FRENCH DRAIN SYSTEM SHOWN ON THESE PLANS.

LEGEND

- DRAINAGE FLOW
- X.XX EXISTING GRADE
- (X.X) PROPOSED GRADE
- IRON STORMWATER GRATE (8" TYP)
- CATCH BASIN
- FRENCH DRAIN
- PAVERS
- XXXXXXXXX STABILIZED BERM
- SOLID PVC PIPE

213 9th Ave S
City of Naples, Florida

213 9th Ave S

DRAINAGE PLAN

Single Family Home - City Approval for Stormwater Management System

213 9th Avenue South **Impervious Area = 54%**

Code Section 16-115 **Minimum Stormwater Design Technical Criteria:**

2021 Code - Water Quality/Storage Criteria:
1.0 inch runoff with green-space exemption
(Optional design that would meet the 2021 code.)

Proposed 1": (Total Lot Area - Green-Space Area) * 1.0 inch runoff

(15,003 ft^2 - 6,838 ft^2) * 0.0833 ft = 680 ft^3

Pipe Data

Pipe Diameter D	0.83	ft	(10 in)
No. of Pipes #	1		
Pipe Length L	280	ft	
Pipe Area A_{pipe}	0.545	ft^2	$A_{pipe} = [\pi(D^2/4)] * \#$
Volume in Pipe V_{pipe}	153	ft^3	$V_{pipe} = A_{pipe} * L$

Trench Data

Trench Width w	2.50	ft	
Trench Height h	2.20	ft	
Trench Length L	280	ft	
Trench Area A_{trench}	5.50	ft^2	$A_{trench} = w * h$
Fillable Porosity f	0.40		
Volume of Void Space V_s	555	ft^3	$V_s = (A_{trench} - A_{pipe}) * f * L$

French Drain Volume V_{trench} 708 ft^3 $V_{trench} = V_{pipe} + V_s$

2007 Code - Water Quality/Storage Criteria:
0.5 inch runoff with roof exemption
(This was as-designed to meet the 2007 code.)

Current 0.5": (Total Lot Area - Imp. Roof Area) * 0.5 inch runoff

(15,003 ft^2 - 4,035 ft^2) * 0.0417 ft = 457 ft^3

Pipe Data

Pipe Diameter D	0.83	ft	(10 in)
No. of Pipes #	1		
Pipe Length L	280	ft	
Pipe Area A_{pipe}	0.545	ft^2	$A_{pipe} = [\pi(D^2/4)] * \#$
Volume in Pipe V_{pipe}	153	ft^3	$V_{pipe} = A_{pipe} * L$

Trench Data

Trench Width w	2.00	ft	
Trench Height h	2.20	ft	
Trench Length L	280	ft	
Trench Area A_{trench}	4.40	ft^2	$A_{trench} = w * h$
Fillable Porosity f	0.40		
Volume of Void Space V_s	432	ft^3	$V_s = (A_{trench} - A_{pipe}) * f * L$

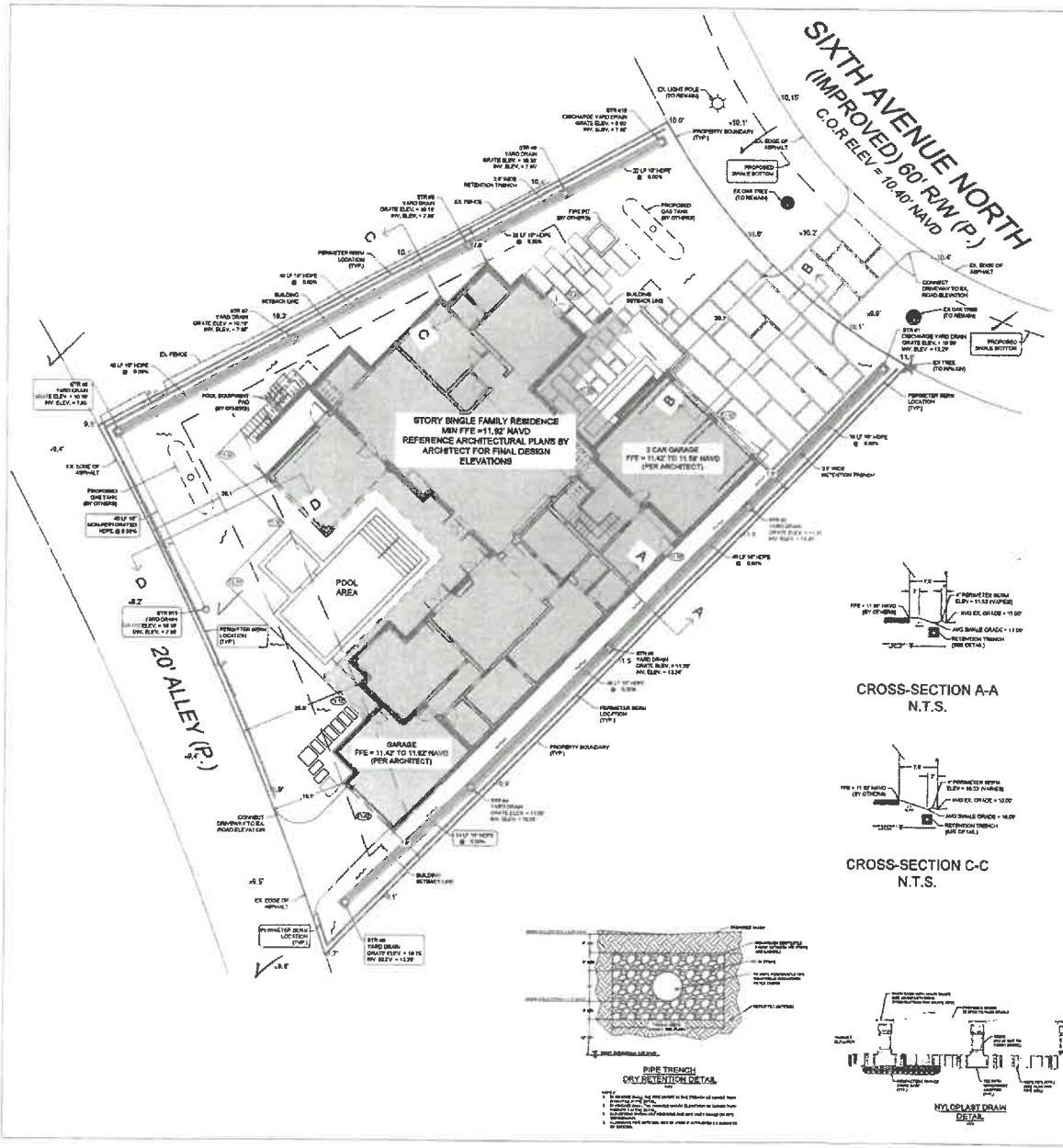
French Drain Volume V_{trench} 584 ft^3 $V_{trench} = V_{pipe} + V_s$

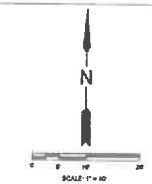
2021 Code - Water Quantity/Conveyance Criteria:
(No change from the 2007 code.)

A design flow storm event of a one-hour duration, and a five-year return frequency, will be used to compute the minimum off-site discharge rate and the size of the discharge pipe. (2.8 inches*)

The conveyance system will be designed to pass the design flow storm event and ensure the backwater head does not exceed the proposed containment system in a 25-year, 24-hour storm event. (8 inches*)

* Rainfalls from the 2018 Stormwater Master Plan Update





LEGEND

- PROPOSED DRAINAGE FLOW
- EX. EXISTING
- 9.5 EXISTING GROUND ELEVATION
- (9.5) PROPOSED GROUND ELEVATION

GENERAL NOTES

1. RINSWATER, POOL OVERFLOW & BACKWASH LINE TO BE RUN INTO STORMWATER TREATMENT SYSTEM.
2. ALL GRADES, ELEVATIONS & XYZ-115 ARE IN NAVD.
3. SURVEY PREPARED BY BENCHMARK LAND SERVICES, INC.
4. ALL SITE GRADING SHALL BE PER THE LANDSCAPE ARCHITECT. PROPOSED GRADES WERE PROVIDED BY THE LANDSCAPE ARCHITECT AND USED TO CREATE THIS STORMWATER MANAGEMENT PLAN.
5. CONNECT ALL ROOF DRAINAGE AND PATIO DRAINAGE INTO THE UNDERGROUND STORMWATER MANAGEMENT SYSTEM.
6. DURING CONSTRUCTION, DRAINAGE STRUCTURE OPENINGS, WHERE APPROPRIATE, SHALL BE COVERED WITH FILTER FABRIC, MIRAFI 140N OR APPROVED EQUAL TO PREVENT DEBRIS AND FILL FROM FALLING INTO THE INLETS.
7. THE LANDSCAPE ARCHITECT PLANS FOR DOWNSPOUT AND TRENCH DRAIN PIPE AND CONNECTION DETAILS. LOCATIONS ARE APPROXIMATE AND SUBJECT TO THE APPROVED LANDSCAPE PLANS. FOR DETAILED SITE GRADING PLEASE REFERENCE THE LANDSCAPE ARCHITECT PLANS.
8. THE PROPOSED BUILDING, DRIVEWAY, POOL, PATIO, AND ACCESSORY USES WERE SITED AND PROVIDED BY THE ARCHITECT. ALL SETBACK INFORMATION WAS PROVIDED BY THE ARCHITECT. ALL IMPROVEMENTS SHALL BE PER THE APPROVED SITE PLAN PER THE ARCHITECTURAL PLANS.
9. THE FEMA FLOOD ZONE IS "X" PER MAP #12021C0631J, ADOPTED ON 09/16/2012.

CONTROL ELEVATION

THE CONTROL ELEVATION FOR THIS PROJECT WAS DETERMINED BY ANALYSING ADJACENT PERMITTED PROJECTS AND BY USING LOCAL KNOWLEDGE OF THE AREA.

THE CONTROL ELEVATION FOR THIS PROJECT WILL BE 9.25 FT-NAVD.

LEGAL DESCRIPTION

LOT 19, BLOCK 4, NICOLI LAKES, ACCORDING TO THE PLAT THEREOF AS RECORDED IN PLAT BOOK 3, PAGE 28, 29, OF THE PUBLIC RECORDS OF COLLIER COUNTY, FLORIDA.

STORMWATER DISCHARGE CALCULATIONS

USE	AREA (SF)	AREA (ac)	RUNOFF COEFFICIENT	Q = Ci(A) (cfs)
ROOFS & PAVE	3,760	0.09	0.95	0.082
PAVER DRIVEWAY	3,600	0.08	0.85	0.070
POOL AND SPA	900	0.02	0.95	0.020
PATIO AND WALKWAY	1,240	0.03	0.90	0.027
OPEN SPACE AND LANDSCAPING	4,100	0.09	0.20	0.020
TOTAL	13,600	0.31	0.67	0.199

SURFACE WATER MANAGEMENT SUMMARY

CONTROL ELEVATION (FT-NAVD)	9.25
25-YEAR, 1-DAY RAINFALL (INCHES)	6.50
WATER QUALITY VOLUME REQUIRED (CF)	918
WATER QUALITY VOLUME PROVIDED (CF)	955

PROVIDED WATER QUALITY CALCULATIONS

TOTAL SITE AREA	13,835 SF
1/2" OVER SITE RETENTION = (9 SF/12) * TOTAL SITE AREA	539 CF
3/8" x % IMPERVIOUS AREA = [(9 SF/12)* (SW WIDTH* AREA + PATIO AREA)/TOTAL SITE AREA] - BUILDING AREA)* TOTAL SITE AREA	1,052 CF
WATER QUALITY REQUIRED	1,591 CF
30% REDUCTION FOR RETENTION	918 CF

VOLUME PROVIDED WITHIN 36" PIPE WITH 2.5' WIDE TRENCH	
PIPE DIAMETER	18 INCH
AREA OF PIPE = (3.14 x [(PIPE DIA. / 2) / 12) ^ 2]	1.7671 SF
LENGTH OF PIPE	282 LF
PIPE RETENTION VOLUME = (AREA OF PIPE x LENGTH OF PIPE)	494 CF

VOLUME PROVIDED WITHIN 18" PIPE 2.5' WIDE TRENCH	
TRENCH WIDTH	2.5 LF
TRENCH LENGTH	365 LF
TRENCH DEPTH	1.5 LF
TRENCH VOLUME = (TRENCH WIDTH x LENGTH x DEPTH)	1,753 CF
VOID PERCENTAGE	45 %
EFFECTIVE TRENCH VOLUME = (TRENCH VOLUME - PIPE RETENTION VOLUME) x VOID PERCENTAGE	462 CF

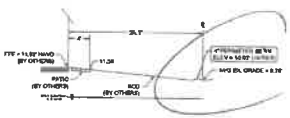
VOLUME PROVIDED WITHIN 18" PIPE WITHOUT TRENCH	
PIPE DIAMETER	18 INCH
AREA OF PIPE = (3.14 x [(PIPE DIA. / 2) / 12) ^ 2]	0.8481 SF
LENGTH OF PIPE	45 LF
PIPE RETENTION VOLUME = (AREA OF PIPE x LENGTH OF PIPE)	38 CF

WATER QUALITY VOLUME PROVIDED CHART	
WATER QUALITY VOLUME PROVIDED	955 CF
WATER QUALITY VOLUME REQUIRED	918 CF
THEREFORE, WATER QUALITY VOLUME HAS BEEN PROVIDED.	

CROSS-SECTION A-A
N.T.S.

CROSS-SECTION B-B
N.T.S.

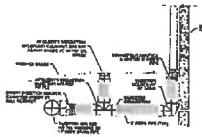
CROSS-SECTION C-C
N.T.S.



CROSS-SECTION D-D
N.T.S.

PIPE TRENCH
DRY RETENTION DETAIL

NYLOPLAST DRAIN
DETAIL



ROOF DOWNSPOUT
CONNECTION
DETAIL

RESIDENCE - 620 6TH AVENUE NORTH

MASTER STORMWATER MANAGEMENT PLAN

DATUM NOTE:

ALL SITE WATCHME REFERENCE NAVD88 VERTICAL DATUM. APPROXIMATE CONVERSION FOR PROJECT AREA: NAVD88 = +1.39 = NGVD29
ANY DATUM CONVERSIONS SHOULD BE CONFIRMED BY A LICENSED SURVEYOR PRIOR TO USE.

Single Family Home - City Approval for Stormwater Management System

620 6th Avenue North **Impervious Area = 68%**

Code Section 16-115 **Minimum Stormwater Design Technical Criteria:**

2021 Code - Water Quality/Storage Criteria:
1.0 inch runoff with green-space exemption
(Optional design that would meet the 2021 code.)

Proposed 1": (Total Lot Area - Green-Space Area) * 1.0 inch runoff

(12,935 ft^2 - 4,160 ft^2) * 0.0833 ft = 731 ft^3

Pipe Data			
Pipe Diameter D	0.83	ft	(10 in)
No. of Pipes #	1		
Pipe Length L	282	ft	
Pipe Area A_{pipe}	0.545	ft^2	$A_{pipe} = [\pi(D^2/4)] * \#$
Volume in Pipe V_{pipe}	154	ft^3	$V_{pipe} = A_{pipe} * L$

Trench Data			
Trench Width w	3.00	ft	
Trench Height h	2.00	ft	
Trench Length L	286	ft	
Trench Area A_{trench}	6.00	ft^2	$A_{trench} = w * h$
Fillable Porosity f	0.40		
Volume of Void Space V_s	624	ft^3	$V_s = (A_{trench} - A_{pipe}) * f * L$

French Drain Volume V_{trench} 778 ft^3 $V_{trench} = V_{pipe} + V_s$

2007 Code - Water Quality/Storage Criteria:
0.5 inch runoff with roof exemption
(This was as-designed to meet the 2007 code.)

Current 0.5": (Total Lot Area - Imp. Roof Area) * 0.5 inch runoff

(12,935 ft^2 - 5,296 ft^2) * 0.0417 ft = 318 ft^3

Pipe Data			
Pipe Diameter D	0.83	ft	(10 in)
No. of Pipes #	1		
Pipe Length L	282	ft	
Pipe Area A_{pipe}	0.545	ft^2	$A_{pipe} = [\pi(D^2/4)] * \#$
Volume in Pipe V_{pipe}	154	ft^3	$V_{pipe} = A_{pipe} * L$

Trench Data			
Trench Width w	2.50	ft	
Trench Height h	1.80	ft	
Trench Length L	286	ft	
Trench Area A_{trench}	4.50	ft^2	$A_{trench} = w * h$
Fillable Porosity f	0.40		
Volume of Void Space V_s	452	ft^3	$V_s = (A_{trench} - A_{pipe}) * f * L$

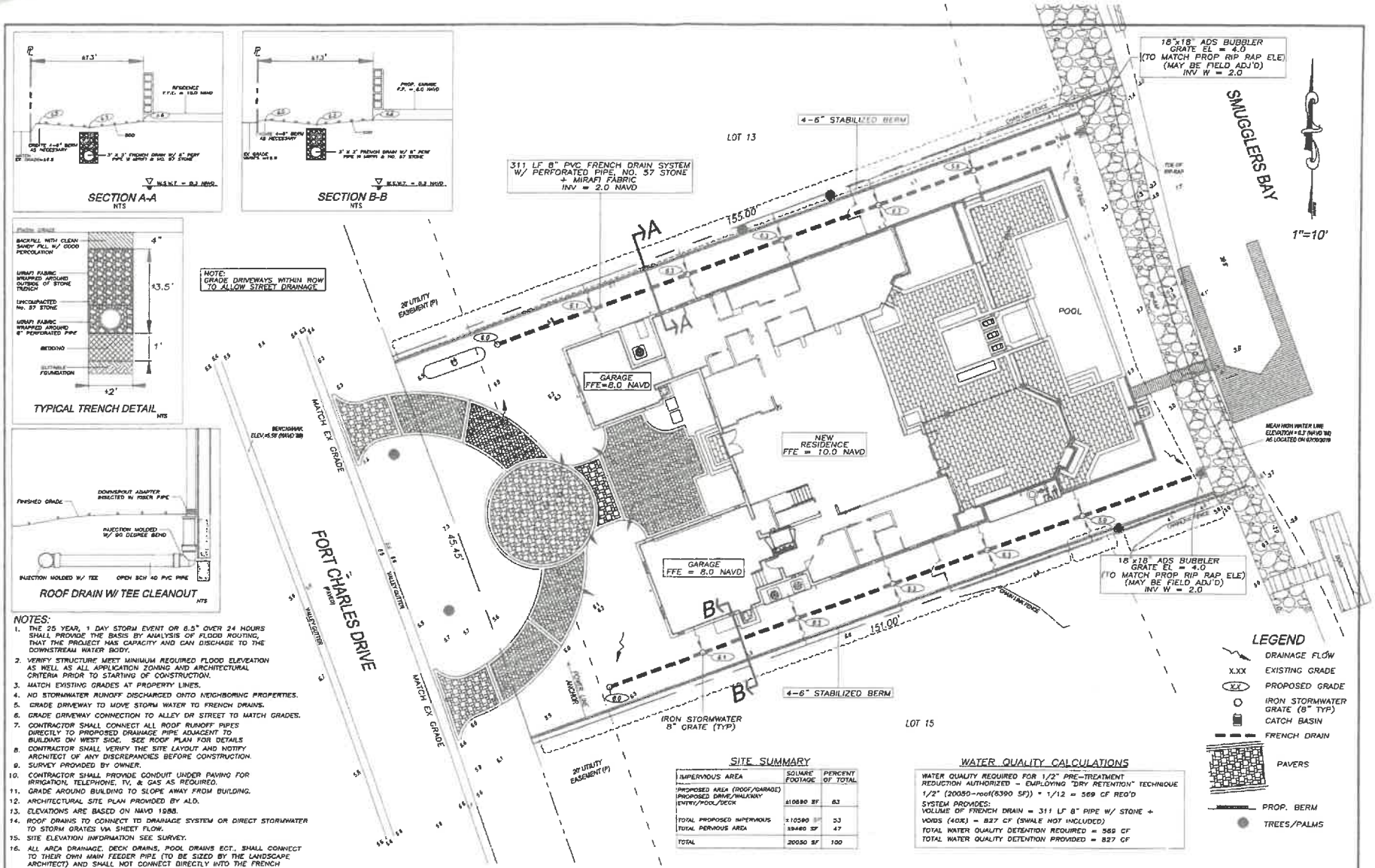
French Drain Volume V_{trench} 606 ft^3 $V_{trench} = V_{pipe} + V_s$

2021 Code - Water Quantity/Conveyance Criteria:
(No change from the 2007 code.)

A design flow storm event of a one-hour duration, and a five-year return frequency, will be used to compute the minimum off-site discharge rate and the size of the discharge pipe. (2.8 inches*)

The conveyance system will be designed to pass the design flow storm event and ensure the backwater head does not exceed the proposed containment system in a 25-year, 24-hour storm event. (8 inches*)

* Rainfalls from the 2018 Stormwater Master Plan Update



NOTES:

1. THE 25 YEAR, 1 DAY STORM EVENT OR 8.5" OVER 24 HOURS SHALL PROVIDE THE BASIS BY ANALYSIS OF FLOOD ROUTING, THAT THE PROJECT HAS CAPACITY AND CAN DISCHAGE TO THE DOWNSTREAM WATER BODY.
2. VERIFY STRUCTURE MEET MINIMUM REQUIRED FLOOD ELEVEATION AS WELL AS ALL APPLICATION ZONING AND ARCHITECTURAL CRITERIA PRIOR TO STARTING OF CONSTRUCTION.
3. MATCH EXISTING GRADES AT PROPERTY LINES.
4. NO STORMWATER RUNOFF DISCHARGED ONTO NEIGHBORING PROPERTIES.
5. GRADE DRIVEWAY TO MOVE STORM WATER TO FRENCH DRAINS.
6. GRADE DRIVEWAY CONNECTION TO ALLEY OR STREET TO MATCH GRADES.
7. CONTRACTOR SHALL CONNECT ALL ROOF RUNOFF PIPES DIRECTLY TO PROPOSED DRAINAGE PIPE ADJACENT TO BUILDING ON WEST SIDE. SEE ROOF PLAN FOR DETAILS
8. CONTRACTOR SHALL VERIFY THE SITE LAYOUT AND NOTIFY ARCHITECT OF ANY DISCREPANCIES BEFORE CONSTRUCTION.
9. SURVEY PROVIDED BY OWNER.
10. CONTRACTOR SHALL PROVIDE CONDUIT UNDER PAVING FOR IRRIGATION, TELEPHONE, TV, & GAS AS REQUIRED.
11. GRADE AROUND BUILDING TO SLOPE AWAY FROM BUILDING.
12. ARCHITECTURAL SITE PLAN PROVIDED BY ALD.
13. ELEVATIONS ARE BASED ON NAVD 1988.
14. ROOF DRAINS TO CONNECT TO DRAINAGE SYSTEM OR DIRECT STORMWATER TO STORM GRATES VIA SHEET FLOW.
15. SITE ELEVATION INFORMATION SEE SURVEY.
16. ALL AREA DRAINAGE, DECK DRAINS, POOL DRAINS ECT., SHALL CONNECT TO THEIR OWN MAIN FEEDER PIPE (TO BE SIZED BY THE LANDSCAPE ARCHITECT) AND SHALL NOT CONNECT DIRECTLY INTO THE FRENCH DRAIN SYSTEM SHOWN ON THESE PLANS.

SITE SUMMARY

IMPERVIOUS AREA	SQUARE FOOTAGE	PERCENT OF TOTAL
PROPOSED AREA (ROOF/GARAGE) PROPOSED DRIVE/WALKWAY ENTRY/POOL/DECK	10590 SF	53
TOTAL PROPOSED IMPERVIOUS	10590 SF	53
TOTAL PERVIOUS AREA	9460 SF	47
TOTAL	20050 SF	100

WATER QUALITY CALCULATIONS

WATER QUALITY REQUIRED FOR 1/2" PRE-TREATMENT REDUCTION AUTHORIZED - EMPLOYING "DRY RETENTION" TECHNIQUE

1/2" (20050-roof(6390 SF)) * 1/12 = 569 CF REQ'D

SYSTEM PROVIDES:
VOLUME OF FRENCH DRAIN = 311 LF 8" PIPE W/ STONE + VOIDS (40%) = 827 CF (SWALE NOT INCLUDED)
TOTAL WATER QUALITY DETENTION REQUIRED = 569 CF
TOTAL WATER QUALITY DETENTION PROVIDED = 827 CF

3221 Ft Charles Dr.

3221 Fort Charles Drive
City of Naples, Florida

DRAINAGE PLAN

Single Family Home - City Approval for Stormwater Management System

3221 Fort Charles Drive **Impervious Area = 53%**

Code Section 16-115 **Minimum Stormwater Design Technical Criteria:**

2021 Code - Water Quality/Storage Criteria:
1.0 inch runoff with green-space exemption
(Optional design that would meet the 2021 code.)

Proposed 1": (Total Lot Area - Green-Space Area) * 1.0 inch runoff

(20,050 ft^2 - 9,430 ft^2) * 0.0833 ft = 885 ft^3

Pipe Data			
Pipe Diameter D	0.67	ft	(8 in)
No. of Pipes #	1		
Pipe Length L	311	ft	
Pipe Area A_{pipe}	0.349	ft^2	$A_{pipe} = [\pi(D^2/4)] * \#$
Volume in Pipe V_{pipe}	109	ft^3	$V_{pipe} = A_{pipe} * L$

Trench Data			
Trench Width w	2.00	ft	
Trench Height h	3.50	ft	
Trench Length L	311	ft	
Trench Area A_{trench}	7.00	ft^2	$A_{trench} = w * h$
Fillable Porosity f	0.40		
Volume of Void Space V_s	827	ft^3	$V_s = (A_{trench} - A_{pipe}) * f * L$

French Drain Volume V_{trench} 936 ft^3 $V_{trench} = V_{pipe} + V_s$

2007 Code - Water Quality/Storage Criteria:
0.5 inch runoff with roof exemption
(This was as-designed to meet the 2007 code.)

Current 0.5": (Total Lot Area - Imp. Roof Area) * 0.5 inch runoff

(20,050 ft^2 - 6,390 ft^2) * 0.0417 ft = 569 ft^3

Pipe Data			
Pipe Diameter D	0.67	ft	(8 in)
No. of Pipes #	1		
Pipe Length L	311	ft	
Pipe Area A_{pipe}	0.349	ft^2	$A_{pipe} = [\pi(D^2/4)] * \#$
Volume in Pipe V_{pipe}	109	ft^3	$V_{pipe} = A_{pipe} * L$

Trench Data			
Trench Width w	2.00	ft	
Trench Height h	3.50	ft	
Trench Length L	311	ft	
Trench Area A_{trench}	7.00	ft^2	$A_{trench} = w * h$
Fillable Porosity f	0.40		
Volume of Void Space V_s	827	ft^3	$V_s = (A_{trench} - A_{pipe}) * f * L$

French Drain Volume V_{trench} 936 ft^3 $V_{trench} = V_{pipe} + V_s$

2021 Code - Water Quantity/Conveyance Criteria:
(No change from the 2007 code.)

A design flow storm event of a one-hour duration, and a five-year return frequency, will be used to compute the minimum off-site discharge rate and the size of the discharge pipe. (2.8 inches*)

The conveyance system will be designed to pass the design flow storm event and ensure the backwater head does not exceed the proposed containment system in a 25-year, 24-hour storm event. (8 inches*)

* Rainfalls from the 2018 Stormwater Master Plan Update

Commercial Property - State Permit Required for Stormwater Management System

Seaward - Naples Beach Hotel
Code Section 16-115

Impervious Area = 74%
Minimum Stormwater Design Technical Criteria:

Building Area (roof area):	2.80 acres	121,968 ft^2
Pool Area:	0.26 acres	11,326 ft^2
Pavement Area:	2.00 acres	87,120 ft^2
Underground Parking Area:	0.92 acres	40,075 ft^2
Lake Area:	0.00 acres	0 ft^2
Impervious Area:	5.98 acres	260,489 ft^2
Dry Detention Area:	0.16 acres	6,970 ft^2
Open Space (Greenspace) Area:	1.92 acres	83,635 ft^2
Conservation (Greenspace) Area:	0.00 acres	0 ft^2
Pervious Area:	2.08 acres	90,605 ft^2
Total Area:	8.06 acres	351,094 ft^2

The design engineer determined the required water quality volume for dry detention to be 1.14 acre-feet.
The reduction for dry detention is not allowed under the 2021 Code.

2021 Code - Water Quality/Storage Criteria:
SFWMD ERP Standard Reductions for dry detention and retention will not be allowed.

SFWMD Wet Detention Storage - Option 1

Total Lot Area * 1.0 inch runoff
29,258 ft^3 0.67 acre-feet
Impaired Water plus 50%
43,887 ft^3 1.01 acre-feet

OR - WHICHEVER IS GREATER

SFWMD Wet Detention Storage - Option 2

Site Area = Total Area - Lake Area - Roof Area
Site Area = 5.26 acres
Impervious Area = Site Area - Pervious Area
Imp. Area = 3.18 acres
Vol. Required = 2.5" * (Imp. Site/Site) * (Total - Lake)
Vol. Req. = 1.02 acre-feet 44,220 ft^3
Impaired Water plus 50%
1.52 acre-feet 66,331 ft^3

Commercial Property - State Permit Required for Stormwater Management System

Basin One - Naples Beach Hotel — **Impervious Area = 22%**

Code Section 16-115 — **Minimum Stormwater Design Technical Criteria:**

Building Area (roof area):	4.86 acres	211,702 ft^2
Pool Area:	0.00 acres	0 ft^2
Pavement Area:	3.58 acres	155,945 ft^2
Underground Parking Area:	0.00 acres	0 ft^2
Lake Area:	0.31 acres	13,504 ft^2
Impervious Area:	8.75 acres	381,150 ft^2
Dry Detention Area:	0.00 acres	0 ft^2
Open Space (Greenspace) Area:	31.90 acres	1,389,564 ft^2
Conservation (Greenspace) Area:	0.00 acres	0 ft^2
Pervious Area:	31.90 acres	1,389,564 ft^2
Total Area:	40.65 acres	1,770,714 ft^2

The design engineer determined the required water quality volume for dry detention to be 3.52 acre-feet.
The reduction for dry detention is not allowed under the 2021 Code.

2021 Code - Water Quality/Storage Criteria:
SFWMD ERP Standard Reductions for dry detention and retention will not be allowed.

SFWMD Wet Detention Storage - Option 1

Total Lot Area * 1.0 inch runoff

147,560 ft^3 — 3.39 acre-feet

Impaired Water plus 50%

221,339 ft^3 — **5.08 acre-feet**

OR - WHICHEVER IS GREATER

SFWMD Wet Detention Storage - Option 2

Site Area = Total Area - Lake Area - Roof Area

Site Area = 35.48 acres

Impervious Area = Site Area - Pervious Area

Imp. Area = 3.58 acres

Vol. Required = 2.5" * (Imp. Site/Site) * (Total - Lake)

Vol. Req. = 0.85 acre-feet — 36,939 ft^3

Impaired Water plus 50%

1.27 acre-feet — 55,408 ft^3

Commercial Property - State Permit Required for Stormwater Management System

Basin Two - Naples Beach Hotel — **Impervious Area = 34%**

Code Section 16-115 — **Minimum Stormwater Design Technical Criteria:**

Building Area (roof area):	0.12 acres	5,227 ft^2
Pool Area:	0.00 acres	0 ft^2
Pavement Area:	0.28 acres	12,197 ft^2
Underground Parking Area:	0.00 acres	0 ft^2
Lake Area:	1.81 acres	78,844 ft^2
Impervious Area:	2.21 acres	96,268 ft^2
Dry Detention Area:	0.00 acres	0 ft^2
Open Space (Greenspace) Area:	4.31 acres	187,744 ft^2
Conservation (Greenspace) Area:	0.00 acres	0 ft^2
Pervious Area:	4.31 acres	187,744 ft^2
Total Area:	6.52 acres	284,011 ft^2

The design engineer determined the required water quality volume for dry detention to be 0.54 acre-feet.
The reduction for dry detention is not allowed under the 2021 Code.

2021 Code - Water Quality/Storage Criteria:
SFWMD ERP Standard Reductions for dry detention and retention will not be allowed.

SFWMD Wet Detention Storage - Option 1

Total Lot Area * 1.0 inch runoff

23,668 ft^3 — 0.54 acre-feet

Impaired Water plus 50%

35,501 ft^3 — **0.82 acre-feet**

OR - WHICHEVER IS GREATER

SFWMD Wet Detention Storage - Option 2

Site Area = Total Area - Lake Area - Roof Area

Site Area = 4.59 acres

Impervious Area = Site Area - Pervious Area

Imp. Area = 0.28 acres

Vol. Required = 2.5" * (Imp. Site/Site) * (Total - Lake)

Vol. Req. = 0.06 acre-feet — 2,607 ft^3

Impaired Water plus 50%

0.09 acre-feet — 3,911 ft^3

Commercial Property - State Permit Required for Stormwater Management System

Basin Three - Naples Beach Hotel — **Impervious Area = 14%**

Code Section 16-115 — **Minimum Stormwater Design Technical Criteria:**

Building Area (roof area):	0.26 acres	11,326 ft^2
Pool Area:	0.00 acres	0 ft^2
Pavement Area:	0.99 acres	43,124 ft^2
Underground Parking Area:	0.00 acres	0 ft^2
Lake Area:	8.12 acres	353,707 ft^2
Impervious Area:	9.37 acres	408,157 ft^2
Dry Detention Area:	0.00 acres	0 ft^2
Open Space (Greenspace) Area:	57.49 acres	2,504,264 ft^2
Conservation (Greenspace) Area:	0.00 acres	0 ft^2
Pervious Area:	57.49 acres	2,504,264 ft^2
Total Area:	66.86 acres	2,912,422 ft^2

The design engineer determined the required water quality volume for dry detention to be 5.57 acre-feet.
The reduction for dry detention is not allowed under the 2021 Code.

2021 Code - Water Quality/Storage Criteria:
SFWMD ERP Standard Reductions for dry detention and retention will not be allowed.

SFWMD Wet Detention Storage - Option 1

Total Lot Area * 1.0 inch runoff

242,702 ft^3 — 5.57 acre-feet

Impaired Water plus 50%

364,053 ft^3 — **8.36 acre-feet**

OR - WHICHEVER IS GREATER

SFWMD Wet Detention Storage - Option 2

Site Area = Total Area - Lake Area - Roof Area

Site Area = 58.48 acres

Impervious Area = Site Area - Pervious Area

Imp. Area = 0.99 acres

Vol. Required = 2.5" * (Imp. Site/Site) * (Total - Lake)

Vol. Req. = 0.21 acre-feet — 9,024 ft^3

Impaired Water plus 50%

0.31 acre-feet — 13,536 ft^3

537 13th Street North - Property with ≤ 40% Impervious Area:

Note 1: These are existing homes. They are not permitted new, remodel, or redevelopment.

Note 2: An estimated calculation of ft^2 was made from Naples GIS.

Note 3: An increase in impervious area of > 250 ft^2 is considered redevelopment and would require a stormwater management system.

Site Information:

- 1,640 ft^2 impervious - home plus driveway
- 0 ft^2 impervious - outbuilding
- 1,640 ft^2 impervious - total
- 5,630 ft^2 total
- 29 % impervious
- 612 ft^2 impervious can be added
  - If 250 ft^2 added, would be at 34% impervious.
- 3,990 ft^2 permeable greenspace

2021 Code - Water Quality/Storage Criteria
Code Section 16-115
Impervious Area ≤ 40% - 0.5 Inch Retention Volume (Greenspace Exemption)
Example of Surface Dry Retention with a 6-Inch Berm

(Total Lot Area - Green-Space Area) * 0.5 inch runoff

(5,630 ft^2 - 3,990 ft^2) * 0.0417 ft = 68 ft^3

Berm Data

Berm Height	0.50	ft
Required Area Within Berm	137	ft^2
Length & Width	11.7	ft

Note: Does not account for the slope of the berm.

2021 Code - Water Quality/Storage Criteria
Code Section 16-115
Impervious Area ≤ 40% - 0.5 Inch Retention Volume (Greenspace Exemption)
Example of Surface Dry Retention with a 1-Foot Berm

(Total Lot Area - Green-Space Area) * 0.5 inch runoff

(5,630 ft^2 - 3,990 ft^2) * 0.0417 ft = 68 ft^3

Berm Data

Berm Height	1.00	ft
Required Area Within Berm	68	ft^2
Length & Width	8.3	ft

Note: Does not account for the slope of the berm.

2021 Code - Water Quality/Storage Criteria
Code Section 16-115
Impervious Area ≤ 40% - 1.25 Inch Detention Volume (Greenspace Exemption)
Example of Surface Dry Detention with a 6-Inch Berm

(Total Lot Area - Green-Space Area) * 1.25 inch runoff

(5,630 ft^2 - 3,990 ft^2) * 0.1042 ft = 171 ft^3

Berm Data

Berm Height	0.50	ft
Required Area Within Berm	342	ft^2
Length & Width	18.5	ft

Note: Does not account for the slope of the berm.

2021 Code - Water Quality/Storage Criteria
Code Section 16-115
Impervious Area ≤ 40% - 1.25 Inch Detention Volume (Greenspace Exemption)
Example of Surface Dry Detention with a 1-Foot Berm

(Total Lot Area - Green-Space Area) * 1.25 inch runoff

(5,630 ft^2 - 3,990 ft^2) * 0.1042 ft = 171 ft^3

Berm Data

Berm Height	1.00	ft
Required Area Within Berm	171	ft^2
Length & Width	13.1	ft

Note: Does not account for the slope of the berm.

550 13th Street North - Property with ≤ 40% Impervious Area:

Note 1: These are existing homes. They are not permitted new, remodel, or redevelopment.

Note 2: An estimated calculation of ft^2 was made from Naples GIS.

Note 3: An increase in impervious area of > 250 ft^2 is considered redevelopment and would require a stormwater management system.

Site Information:

- 1,809 ft^2 impervious - home plus driveway
- 0 ft^2 impervious - outbuilding
- 1,809 ft^2 impervious - total
- 5,648 ft^2 total
- 32 % impervious
- 450 ft^2 impervious can be added
  - If 250 ft^2 added, would be at 36% impervious.
- 3,839 ft^2 permeable greenspace

2021 Code - Water Quality/Storage Criteria
Code Section 16-115
Impervious Area ≤ 40% - 0.5 Inch Retention Volume (Greenspace Exemption)
Example of Surface Dry Retention with a 6-Inch Berm

(Total Lot Area - Green-Space Area) * 0.5 inch runoff

(5,648 ft^2 - 3,839 ft^2) * 0.0417 ft = 75 ft^3

Berm Data

Berm Height	0.50	ft
Required Area Within Berm	151	ft^2
Length & Width	12.3	ft

Note: Does not account for the slope of the berm.

2021 Code - Water Quality/Storage Criteria
Code Section 16-115
Impervious Area ≤ 40% - 0.5 Inch Retention Volume (Greenspace Exemption)
Example of Surface Dry Retention with a 1-Foot Berm

(Total Lot Area - Green-Space Area) * 0.5 inch runoff

(5,648 ft^2 - 3,839 ft^2) * 0.0417 ft = 75 ft^3

Berm Data

Berm Height	1.00	ft
Required Area Within Berm	75	ft^2
Length & Width	8.7	ft

Note: Does not account for the slope of the berm.

2021 Code - Water Quality/Storage Criteria
Code Section 16-115
Impervious Area ≤ 40% - 1.25 Inch Detention Volume (Greenspace Exemption)
Example of Surface Dry Detention with a 6-Inch Berm

(Total Lot Area - Green-Space Area) * 1.25 inch runoff

(5,648 ft^2 - 3,839 ft^2) * 0.1042 ft = 188 ft^3

Berm Data

Berm Height	0.50	ft
Required Area Within Berm	377	ft^2
Length & Width	19.4	ft

Note: Does not account for the slope of the berm.

2021 Code - Water Quality/Storage Criteria
Code Section 16-115
Impervious Area ≤ 40% - 1.25 Inch Detention Volume (Greenspace Exemption)
Example of Surface Dry Detention with a 1-Foot Berm

(Total Lot Area - Green-Space Area) * 1.25 inch runoff

(5,648 ft^2 - 3,839 ft^2) * 0.1042 ft = 188 ft^3

Berm Data

Berm Height	1.00	ft
Required Area Within Berm	188	ft^2
Length & Width	13.7	ft

Note: Does not account for the slope of the berm.

1079 6th Lane North - Property with ≤ 40% Impervious Area:

Note 1: These are existing homes. They are not permitted new, remodel, or redevelopment.

Note 2: An estimated calculation of ft^2 was made from Naples GIS.

Note 3: An increase in impervious area of > 250 ft^2 is considered redevelopment and would require a stormwater management system.

Site Information:

2,630 ft^2 impervious - home plus driveway
0 ft^2 impervious - outbuilding
2,630 ft^2 impervious - total
9,221 ft^2 total
29 % impervious
1,058 ft^2 impervious can be added
If 250 ft^2 added, would be at 31% impervious.
6,591 ft^2 permeable greenspace

2021 Code - Water Quality/Storage Criteria
Code Section 16-115
Impervious Area ≤ 40% - 0.5 Inch Retention Volume (Greenspace Exemption)
Example of Surface Dry Retention with a 6-Inch Berm

(Total Lot Area - Green-Space Area) * 0.5 inch runoff
(9,221 ft^2 - 6,591 ft^2) * 0.0417 ft = 110 ft^3

Berm Data
Berm Height 0.50 ft
Required Area Within Berm 219 ft^2
Length & Width 14.8 ft
Note: Does not account for the slope of the berm.

2021 Code - Water Quality/Storage Criteria
Code Section 16-115
Impervious Area ≤ 40% - 0.5 Inch Retention Volume (Greenspace Exemption)
Example of Surface Dry Retention with a 1-Foot Berm

(Total Lot Area - Green-Space Area) * 0.5 inch runoff
(9,221 ft^2 - 6,591 ft^2) * 0.0417 ft = 110 ft^3

Berm Data
Berm Height 1.00 ft
Required Area Within Berm 110 ft^2
Length & Width 10.5 ft
Note: Does not account for the slope of the berm.

2021 Code - Water Quality/Storage Criteria
Code Section 16-115
Impervious Area ≤ 40% - 1.25 Inch Detention Volume (Greenspace Exemption)
Example of Surface Dry Detention with a 6-Inch Berm

(Total Lot Area - Green-Space Area) * 1.25 inch runoff
(9,221 ft^2 - 6,591 ft^2) * 0.1042 ft = 274 ft^3

Berm Data
Berm Height 0.50 ft
Required Area Within Berm 548 ft^2
Length & Width 23.4 ft
Note: Does not account for the slope of the berm.

2021 Code - Water Quality/Storage Criteria
Code Section 16-115
Impervious Area ≤ 40% - 1.25 Inch Detention Volume (Greenspace Exemption)
Example of Surface Dry Detention with a 1-Foot Berm

(Total Lot Area - Green-Space Area) * 1.25 inch runoff
(9,221 ft^2 - 6,591 ft^2) * 0.1042 ft = 274 ft^3

Berm Data
Berm Height 1.00 ft
Required Area Within Berm 274 ft^2
Length & Width 16.6 ft
Note: Does not account for the slope of the berm.

Multi-Family Impervious Option

Refer to Code Sections 30-331 and 30-336

Admiralty Point:

Total Impervious Area = 4.8 acres = 209,088 ft^2

Admiralty Point (2300 GSBN) area = 3.0 acres = 130,680 ft^2
ARU's = 100 units * (130,680 ft^2/(100 * 1,934 ft^2)) = 67.5698 units

Admiralty Point (2400 GSBN) area = 1.8 acres = 78,408 ft^2
ARU's = 47 units * (78,408 ft^2/(47 * 1,934 ft^2)) = 40.54188 units

Total ARU's = 108.1117 units

This is a reduction from 147 units to 109 units for the multi-family impervious option.

Memo

Streets & Stormwater

Streets & Traffic • Stormwater

TO: A. William Moss, City Manager

THROUGH: Gregg R. Strakaluse, Director

FROM: Scott May, Manager

DATE: February 15, 2012

SUBJECT: Multifamily Imp. Request: Admiralty Point Condominium (2300 & 2400 GSBN)

Cust. ID 21093-18 and 21103-218

On February 13, 2012, Admiralty Point Condominiums submitted a request to convert to the multifamily impervious option in accordance with City Ordinance Section 30-339. The property is a 147-unit multifamily residential development and meets the definition of the code for multifamily property. The current billing is broken down into two billings for 100-units and 47-units. The site does not currently receive a stormwater utility fee credit.

SITE DATA

1. Admiralty Point Condominiums (2300 GSBN): Impervious Area: 130,680 sf (as certified by licensed land surveyor in the State of FL)
2. Admiralty Point Condominiums (2400 GSBN): Impervious Area: 78,408 sf (as certified by licensed land surveyor in the State of FL)

Grady Minor performed (and certified) a site survey on February 9, 2012. The impervious survey data as submitted has been reviewed and is consistent with the City's GIS database. The number of ARU's based on the surveyed impervious data has been calculated at 108.1, which rounds to 109 for billing purposes. This would create the billing at 68 ARU's for 2300 GSBN and 41 ARU's for 2400 GSBN.

FISCAL IMPACT

Approving the multifamily impervious option for this property reduces the site's original billable ARU's from 147 to 109. The annual stormwater utility bill is reduced from $21,855.96 per year to **$16,206.12** per year (at $12.39 per ARU). This would change 2300 GSBN annual stormwater utility bill from $14,868.00 to $10,110.24 and 2400 GSBN annual stormwater utility bill from $6,987.96 to 6,095.88.

RECOMMENDATIONS

Staff recommends that the City Manager's office approve the applicant's application for billing conversion and direct the Finance Department to change billable ARU's for this property to 109.

2300 Gulf Shore Boulevard North
Naples, FL 34103
239-262-3051
Fax 239-262-1297

February 13, 2012

Mr. Scott May
Engineering Manager
City of Naples
295 Riverside Circle
Naples, FL 34102

Re: Application for Stormwater Credits through the Multifamily Impervious Option

Dear Mr. May,

Enclosed please find a Certified signed and sealed survey of the impervious surface area for Admiralty Point Condominium Association. The Impervious Surface areas are located in the bottom right hand section of the survey.

If you have any questions please feel free to call or email me at jim@admiraltypoint.org.

Sincerely,

Jim O'Donnell
General Manager

Jim O'Donnell
General Manager

Admiralty Point
Doctors Pass, Gulf of Mexico

2300 Gulf Shore Blvd. No. • Naples, FL 34103
Office: 239-262-3051 • Fax 239-262-1297
jim@admiraltypoint.org

IMPERVIOUS SURFACE TABLE

ADMIRALTY POINT	2.3 ACRES (100,188 SQUARE FEET)
68.75% OF COMMON AREA	0.7 ACRES (30,492 SQUARE FEET)
SUBTOTAL	3.0 ACRES (130,680 SQUARE FEET)
ADMIRALTY POINT 2	1.5 ACRES (65,340 SQUARE FEET)
31.25% OF COMMON AREA	0.3 ACRES (13,068 SQUARE FEET)
SUBTOTAL	1.8 ACRES (78,408 SQUARE FEET)
GRAND TOTAL	4.8 ACRES (209,088 SQUARE FEET)

CERTIFIED TO:
ADMIRALTY POINT CONDOMINIUM ASSOCIATION
CITY OF NAPLES

ERVIOUS SURFACE AS-BUILT SURVEY

OMIRALTY POINT CONDOMINIUMS

LYING IN
28, TOWNSHIP 49 SOUTH, RANGE 25 EAST

2/9/12
DATE SIGNED

Todd Lee Stewart

ECTS-SURVEY 2012\ADMIRALITY POINT (6)\MASTER PLAN\SURVEY\12-06-001.DWG