

WATER SYSTEM HYDRAULIC CALCULATIONS

for

RIVIERA BELLA UNITS 8-9

CITY OF DEBARY, FLORIDA

Dec 18, 2015

Prepared For:

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PRELIMINARY CALC'S FOR ODP SUBMITTAL

Major Stacy, P.E.
Florida Registration Number 70249

WATER SYSTEM HYDRAULIC CALCULATIONS
for
RIVIERA BELLA UNITS 4-7
CITY OF DeBARY, FLORIDA

1.0 PROJECT DESCRIPTION

These calculations have been prepared on behalf of Henin Group for the proposed 293 lot subdivision in the City of DeBary, Florida to address the project related hydraulic calculations for the proposed water system improvements. The proposed project is the fourth through seventh phase of a single family subdivision. The property is located at the east side of Fort Florida Road adjacent to the St. Johns River.

2.0 EXISTING CONDITIONS

The project is part of the overall Riviera Bella Subdivision. As part of the construction of the units 1 through 7 a 12" water main was constructed from the west end of High Banks Road (near the Elementary School) to the main entrance to the subdivision. All internal water mains within the subdivision are 8" water mains. Because the water pressure at the connection point was too high, Volusia County required a pressure reducer valve be installed on High Banks Road.

A hydrant flow test was conducted by Volusia County on two fire hydrants on Anacona Ave. and Rosa Bella to determine the Hydraulic Conditions. The results can be found in the supporting documents section of this report. The test flow did show that the existing system within the constructed subdivision yielded approximate 1,000 gpm at a static pressure of 86 psi.

3.0 ESTIMATED DEMANDS

See the Supporting Documents for the estimated flow demand. It is estimated that the average daily demand will equal 61.04 gpm and the max day demand will equal 122.08 gpm. The max day demand will have a peak factor of 2 from the average daily demand..

The fire flow needs for this project is estimated at 1,000 gpm (@20 psi min.).

4.0 PROPOSED WATER SYSTEM IMPROVEMENTS

The proposed water main system will consist of an 8" PVC water main. All fire hydrants will connect to the proposed 8" water main.

5.0 METHODOLOGY

Using the WaterCAD computer program from Haestad Methods, Inc., version 8.0 (see attached input and results), the system has been modeled using a single point of connection with an assume working pressure of 55 psi and at an elevation of 20 feet which will yield a Hydraulic Grade Line of 147.05 feet. The point of connection is identified as a reservoir labeled connection to 8" water main.

6.0 SUMMARY

Based on the attached hydraulic calculations, the proposed water system can flow the fire flow and provide a system pressure greater than 20 psi. See Hydraulic Calculation Summary.

HYDRAULIC CALCULATION

SUMMARY

For

Fire Flow Plus Max Day Demand

REV.	DATE	DESCRIPTION	APP'D BY

MASTER WATER DISTRIBUTION + SANITARY SEWER PLAN
 CITY OF DEBARY, FLORIDA
 RIVERA BELLA EAST

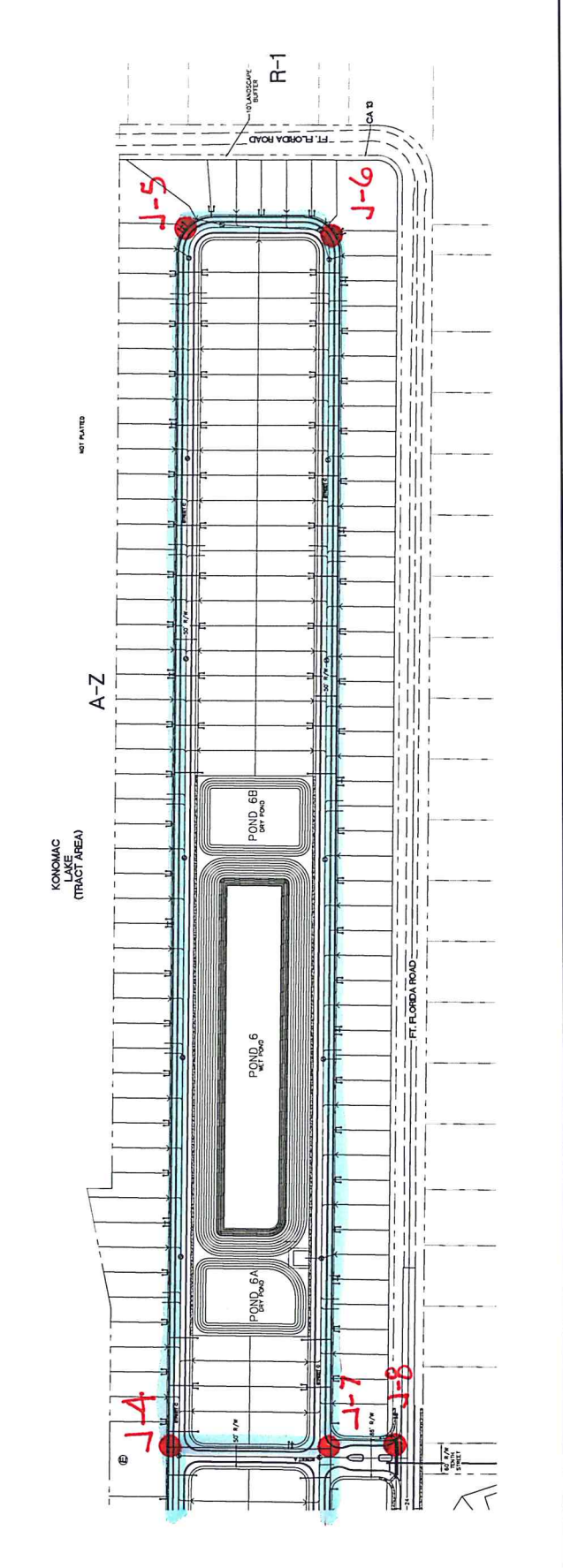
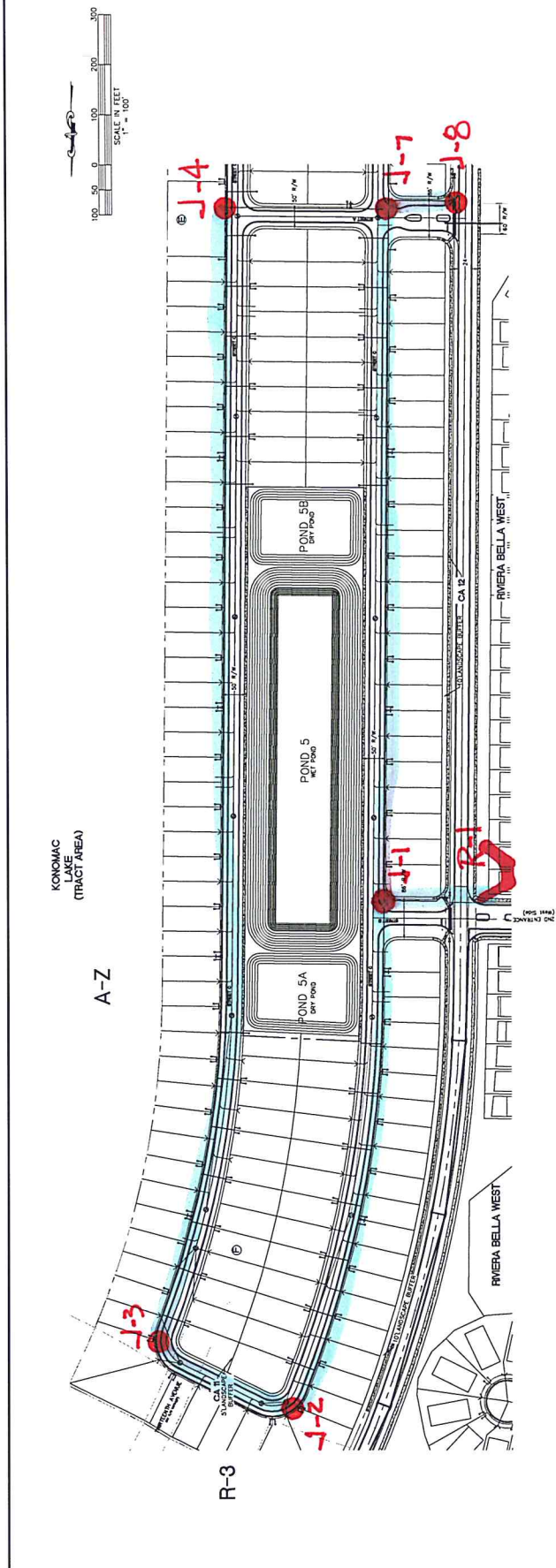
B&S
 B&S ENGINEERING CONSULTANTS, LLC
 2271 Lee Road, Ste. 17
 Winter Park, FL 32789
 407-939-1111
 www.bands.com

State of Professional Engineers
 License No. 15113
 License Expiration Date 12/31/2015

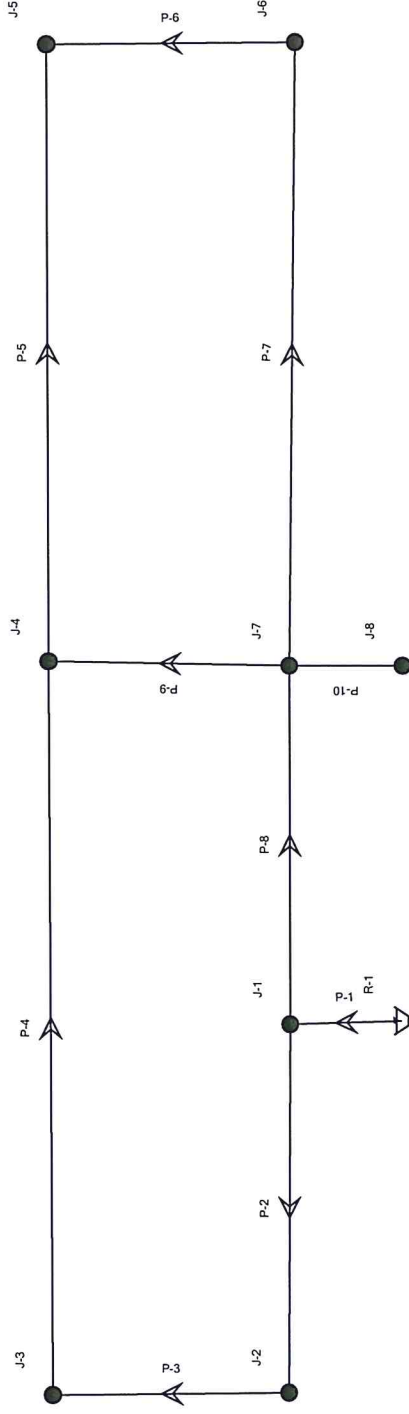
JOB NO. 15-00102
 DRAWN BY: LS
 CHECKED BY: WS
 DATE PLOTTED: 12/27/2015
 SHEET: 06

MADE BELLSVILLE, OH
 REGISTRATION NO. 1024

DATE: _____



Scenario: Base



FlexTable: Junction Table

Current Time: 0.000 hours

ID	Label	Elevation (ft)	Zone	Demand Collection	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
30	J-1	22.00	<None>	<Collection: 0 items>	0	143.54	53
31	J-2	22.00	<None>	<Collection: 0 items>	0	140.19	51
32	J-3	22.00	<None>	<Collection: 1 items>	58	139.13	51
33	J-4	20.00	<None>	<Collection: 0 items>	0	132.99	49
34	J-5	20.00	<None>	<Collection: 2 items>	1,064	120.97	44
35	J-6	20.00	<None>	<Collection: 0 items>	0	122.41	44
36	J-7	20.00	<None>	<Collection: 0 items>	0	133.17	49
37	J-8	20.00	<None>	<Collection: 0 items>	0	133.17	49

FlexTable: Pipe Table

Current Time: 0.000 hours

ID	Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Has Check Valve?
38	P-1	36	R-1	J-1	8.0	PVC	150.0	False
39	P-2	118	J-1	J-2	8.0	PVC	150.0	False
40	P-3	76	J-2	J-3	8.0	PVC	150.0	False
41	P-4	236	J-3	J-4	8.0	PVC	150.0	False
42	P-5	199	J-4	J-5	8.0	PVC	150.0	False
43	P-6	80	J-5	J-6	8.0	PVC	150.0	False
44	P-7	201	J-6	J-7	8.0	PVC	150.0	False
45	P-8	115	J-7	J-1	8.0	PVC	150.0	False
46	P-9	77	J-7	J-4	8.0	PVC	150.0	False
47	P-10	36	J-8	J-7	8.0	PVC	150.0	False

Flow (gpm)	Velocity (ft/s)	Headloss Gradient (ft/ft)	Has User Defined Length?	Length (User Defined) (ft)	Minor Loss Coefficient (Derived)
1,122	7.16	0.023	True	150	1.140
431	2.75	0.003	True	1,050	2.230
431	2.75	0.004	True	300	1.540
372	2.38	0.003	True	2,250	12.280
545	3.48	0.005	True	2,450	4.740
-519	3.31	0.005	True	300	1.150
-519	3.31	0.004	True	2,450	3.280
-692	4.41	0.007	True	1,400	1.530
172	1.10	0.001	True	300	0.750
0	0.00	0.000	True	150	1.530

FlexTable: Reservoir Table

Current Time: 0.000 hours

ID	Label	Elevation (ft)	Zone	Flow (Out net) (gpm)	Hydraulic Grade (ft)
29	R-1	147.05	<None>	1,122	147.05

SUPPORTING DOCUMENTS

Project: Riviera Bella Units 8 -9

Date: 6/18/2015

Job No.: HG-002

Subject: Node Demand

<u>Node</u>	<u>Number of Lots</u>	<u>Avg. Flow (gpm)</u>	<u>Max. Day Flow (gpm)</u>
J-3	140	29.17	58.33
J-5	<u>153</u>	<u>31.88</u>	<u>63.75</u>
Total	293	61.04	122.08

Notes:

1. Avg. Flow (gpm) = (300 GPD x #lots)/1440

Gary Beverly

From: R.J. Dyett <rdyett@volusia.org>
Sent: Wednesday, May 13, 2015 3:16 PM
To: Scott Mays
Cc: Alan Ferguson
Subject: Re: Riviera Bella, Units 4 thru 7

Scott,

Please see below. These numbers are from 2013.

1830310022 - Static 86, Flow 35, GPM 996

1830310026 - Static 86, Flow 35, GPM 996

Thanks,
RJ

>>> Scott Mays 5/12/2015 3:58 PM >>>
Gentlemen,

The engineer for the referenced development is revising the plans for the referenced project.

RJ - Will you please provide the most recent hydrant flow rates/pressures for #1830310022, Anaconda Ave, and #1830310026, Rosa Bella View?

Alan - Can your guys provide pressures at SW 56? Can you provide pressures at the location where Holly Bluff Marina connects to the force main?

Thanks, Scott

Sec. 72-622. - Fire protection systems.

The fire protection system of the proposed development shall be based upon the following requirements:

- (1) *Water supply.* The fire protection water supply for the proposed development shall meet the following fire flow requirements:
 - a. In the case of a single-family or duplex residential development of less than ten dwelling units with lot sizes of less than one acre, or in the case of a single-family or duplex residential development of ten or more dwelling units, but less than 200 dwelling units with lot sizes of one acre or more, fire wells may be utilized.
 - b. In the case of a single-family or duplex residential development with lot sizes of one acre or more totaling 200 or more units, a central water system shall be utilized for fire protection water supply which meets the water flow requirements of fire services. (Refer to Table VII as a reference.)
 - c. In the case of a single-family or duplex residential development with lot sizes of less than one acre, the fire protection water supply shall be provided by a central potable or nonpotable water supply or a combination of central water supply, auxiliary supply of fire wells, which will produce the water flows contained in Table VII. In no case shall the central water supply for fire protection be less than 50 percent of the required fire flow. Auxiliary water supply may be provided by a combination of tank trucks, ground tanks, cisterns, elevated storage, drafting stations on canals or reservoirs, or other methods subject to approval by the department of fire services.
 - d. In the case of a multifamily residential development; a business or industrial development; or a place of assembly, the fire protection water supply shall be as defined in the most current edition of NFPA 1231 - "Standard on Water Supplies for Suburban and Rural Fire Fighting". In all cases the minimum fire flows shall not be less than required for dwellings in Table VII.
 - e. A single water supply system may be used for both potable and fire protection supply provided the requirements of Table VII and/or NFPA 1231 are maintained, as applicable.
 - f. The minimum time duration for required fire flows shall be in accordance with Table VIII.

TABLE VII. FIRE FLOWS FOR GROUPS OF DWELLINGS

Exposure Distances (feet)	Required Fire Flow* (gallons per minute)
Over 100	500
31 to 100	750—1,000
11 to 30	1,000—1,500

10 or less	1,500—2,000
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* Add 500 GPM where wood shingles would contribute to fire spread.

† Use 2,500 GPM minimum if buildings are continuous.

TABLE VIII

Minimum Flow at Source of Supply (GPM)	Minimum Duration (hours)
1,000 or less	2
1,250	2
1,500	2
1,750	2
2,000	2
2,250	2
2,500	2
3,000	3
3,500	3
4,000	4
4,500	4
5,000	5
5,500	5
6,000	6
7,000	7
8,000	8
9,000	9

10,000	10
11,000	10
13,000	10

The calculations of required fire flows in gallons per minute (GPM) considers the construction, occupancy, exposure and communication as outlined in the NFPA Fire Protection Handbook (latest edition).

- (2) *Fire hydrants.* Fire hydrants shall be installed according to the following requirements, with distances measured along street rights-of-way. No distance shall be measured across thoroughfares:
- a. In the case of a single-family or duplex residential development; one- or two-story motels, hotels, or multifamily dwellings, or mobile home parks, hydrants shall be installed at intervals not to exceed 500 feet with a minimum main size of six inches.
 - b. In the case of a business or industrial development, excluding developments in a. above, hydrants shall be installed at intervals not to exceed 300 feet with a minimum main size of eight inches.
 - c. In the case of a building which will provide standpipe and/or sprinkler systems, a fire hydrant shall be installed within 150 feet of the exterior fire department connection with a minimum main size of eight inches.
 - d. In the case of the development of a high-hazard area including, without limitations, a large shopping center, a storage facility for flammable chemical or compressed gases or a manufacturing plant, the spacing and main sizes of hydrants shall be determined after computing the required fire flow, subject to review and approval by the department of fire services.
 - e. All fire hydrants shall deliver the required gallonage with a residual pressure of 20 p.s.i.
 - f. Uniform marking of fire hydrants. Color coding of fire hydrants is of substantial value to water and fire departments and is based on water flow available from them. Fire hydrant bonnets and nozzle caps shall be painted according to the following chart which shall be used to classify fire hydrants according to flow:

Class	Flow	Color of Bonnets and Nozzle Caps
A	1,500 GPM or greater	Blue
B	1,001 GPM or 1,499	Green
C	500 GPM to 1,000 GPM	Orange
D	Less than 500 GPM	Red

(3) *Fire wells.*

- a. Fire wells may be utilized where permitted by subsection (1) of this section, providing they have a separate power source and meet one of the following criteria:
 1. The minimum size of a designated fire well shall not be less than six inches in diameter. A pump shall be attached capable of providing a minimum fire flow of 250 GPM; or
 2. A fire well four inches in diameter may be utilized provided that it has been tested and certified by an engineer that the fire well can produce a minimum fire flow of 250 GPM.
- b. Fire wells shall be located adjacent to rights-of-way, unless otherwise approved by the department of fire services and the DRC.
- c. Fire wells of sufficient capacity to serve adjacent development may be provided and, when so provided, may be included in a public services and facilities agreement pursuant to subsection 72-501(f).
- d. Fire wells shall be considered as public improvements subject to all provisions of division 5 of this article.

(Ord. No. 96-32, § XXVIII, 12-19-96; Ord. No. 2008-25, § III, 12-4-08)

20.2.2 FIRE FLOW REQUIREMENTS

Fire flow requirements shall be determined in accordance with applicable Volusia County Fire Department and Land Development Codes. As a minimum, the requirements outlined in the Volusia County Subdivision Regulations shall be met. Where fire flow requirements exceed the anticipated available fire flow from the central water system, on-site fire protection system or other Fire Department approved mitigation measures shall be utilized.

20.2.3 DESIGN CALCULATIONS

DEVELOPER'S ENGINEER shall submit signed, sealed and dated design calculations with the PLANS for all water distribution projects. Calculation shall show the water mains will have sufficient hydraulic capacity to transport peak hourly flows and the combination of maximum daily flows and fire flows while meeting the requirements of Section 20.3.1. Head losses through meters and backflow devices shall also be included in calculations.

20.3 DETAILS OF DESIGN AND CONSTRUCTION

20.3.1 PRESSURE

All water mains shall be designed in accordance with Section 20.2.3 above. The system shall be designed to maintain a minimum pressure of 20 psi at all points in the distribution system under all conditions of flow. Higher minimum pressures may be required at commercial, industrial and high density residential areas. The normal working pressure in the distribution system should be approximately 60 psi, but in no case less than 35 psi on the downstream side of a meter. For pressures greater than 90 psi special provisions may be required.

20.3.2 DIAMETER

Four (4) inch water mains shall be permitted only in cul-de-sac areas with a maximum length of 500 feet of pipe. In cul-de-sac areas only, a 4 inch looped connection may be allowed to prevent dead ends. As a minimum, six (6) inch looped systems shall be required in low density residential projects. Where looping of mains is not practical, minimum eight (8) inch mains shall be required, unless detailed calculations are submitted to substantiate the sufficiency of a 6 (6) inch main, for fire flows.

In commercial, industrial, and high density residential areas, minimum eight (8) inch looped mains shall be required. Larger size mains shall be required if necessary to allow the withdrawal of the required fire flow while maintaining the minimum residual pressure specified.

20.3.3 FIRE HYDRANT LOCATION AND SPACING

As a minimum, specifications outlined in the latest version of Volusia County Subdivision Regulations and applicable Volusia County Fire Department Codes shall apply. Hydrants shall be placed at 500 feet intervals, unless approved otherwise by the Utility Engineer and Fire Department.

20.3.4 DEAD ENDS

In order to provide increased reliability of service and reduce head loss, dead ends shall be minimized by making appropriate tie-ins whenever practical, as determined by the COUNTY.

Where dead-end mains occur, they shall be provided with a fire hydrant or with an approved flushing hydrant or approved blow-off for flushing purposes. Flushing devices shall be sized to provide flows which will give a velocity of at least 2.5 feet per second in the water main being flushed. No flushing device shall be directly connected to any sewer.

20.3.5 VALVES

Sufficient valves shall be provided on water mains so that inconvenience and sanitary hazards will be minimized during repairs. Valves shall be located at not more than 500 foot intervals in commercial, industrial and high density residential areas and at not more than 1000 foot intervals in all other areas. Appropriate valving shall also be provided at all areas where water mains intersect to ensure effective isolation of water lines for repair, maintenance or future extension.

20.3.6 SEPARATION OF WATER MAINS AND SEWERS

Refer to Section 22.3 of these SPECIFICATIONS for applicable requirements. No water pipe shall pass through or come in contact with any part of a sewer manhole.

In no case shall the separation of water lines and sewer lines, or any other potential hazard to the drinking water system not comply with Florida Department of Environmental Protection or Volusia County Health Unit regulations.

Extreme caution should be exercised when locating water mains at or near certain sites such as sewage treatment plants or industrial complexes. Individual septic tanks must be located and avoided. Proper separation shall be provided between water lines and septic systems.

20.3.7 SURFACE WATER CROSSINGS

The COUNTY shall be consulted before final PLANS are prepared. Requirements outlined in Sections 50.3.6 and 50.3.7 shall apply. All above ground pipe shall be painted as specified in Section 21.4.4 for water mains.

20.3.8 AIR RELIEF VALVES

At high points in water mains where air can accumulate, provisions shall be made to remove the air by means of hydrants or automatic air relief valves. Automatic air relief valves shall not be used in situations where flooding of the device may occur. See details in STANDARD DRAWINGS.

20.3.9 CHAMBER DRAINAGE

Chambers, pits or manholes containing valves, blow-offs, meters, or other such appurtenances to a distribution system shall not be connected directly to any storm drain or sanitary sewer, nor shall blow-offs or air relief valves be connected directly to any sewer.