NORTH CREEK BASIN MASTER PLAN

F I N A L

Prepared for:

Sarasota County
Stormwater Environmental Utility

November, 1996
Revised October, 1997
Finaled April, 1999

Contract No. 95-373
Purchase Order No. P509450

Prepared by

GEE & JENSON
Engineers-Architects-Planners, Inc.
West Palm Beach, FL

Job No. 95-250.00, Task 226

5/18/99

Bob Cross
Professional Land Surveying, P.A.

May 18, 1999

To: Whom it may concern

RE: North Creek Drainage Basin Study

I hereby certify that the field information dated May 7, 1996 for the above reference project was true and correct as of that date to the best of my information, knowledge and belief.

BOB CROSS PROFESSIONAL LAND SURVEYING, P.A.

Tony L. Pursley, PSM
Florida Registration Number 4451

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TABLE OF CONTENTS

Page No.

SECTION 4 –
LEVEL OF SERVICE (LOS)

SECTION 5 –
WATER QUALITY MODEL

SECTION 6 –
ALTERNATIVE SOLUTIONS TO UPGRADE THE LEVEL OF SERVICE

SECTION 7 -
CONCLUSIONS

SECTION 8 -
PUBLIC MEETING

SECTION 9 -
REFERENCES

LIST OF FIGURES

SECTION 3

HYDROLOGIC AND HYDRAULIC MODELING

3.1 Data Sources

The data used in the sub-basin boundary delineation and model development are mainly contained in six categories, as follows:

1. Field Inspection Information
2. Field Surveyed Data
3. Previous Study/Design Reports
4. Aerial Photographs
5. 1 Foot Contour Maps by SWFWMD
6. Personal Interviews with various parties knowledgeable in the basin

The data references used in this study are summarized below:

- *Field Survey Data of North Creek Channel; and Lake Cross-Sections, Water Control Structures, Bridge, Culverts* - by Bob Cross Surveying, Inc. (1996)

- *Field Survey Data of Osprey Acres Area Ditch Cross-Sections, Culverts, Swale Geometries* - by Bob Cross Surveying, Inc. (1996)

- *Field Survey Data of Finished Floor Elevations and Center of Road Elevations in The Oaks, Bay Oaks Unit I, Pine Ranch East Subdivisions* - by Sarasota County (1996)

- *Design Plans for U.S. 41* - (DOT)

- Sarasota County's GIS Database

- Sarasota County's Comprehensive Plan (Apoxsee)

- SWFWMD's *Environmental Resource Permitting Information Manual*

- *Bay Street/Old Venice Road, North Creek, Sarasota County Capacity Analysis of Bypass Storm Sewer* - by Kimley Horn & Associates, Inc. (1995)

- Preymore Street Record Drawings - by AM Engineering, Inc. (1994)

- *Old Venice Road & Bay Street Roadway Improvements, Phase I Design Plan, Record Drawing* - by Bishop & Associates (1990)

- *Bay Oaks-Unit I, Preymore Street Improvement Revised Construction Plans & Calculations* - by AM Engineering, Inc. (1994)

- *Sarasota County School Board, Educational Services Center, Drainage Calculations and Design Plans* - by Bishop & Associates, Inc. (1989)

- *Stoneybrook, Parcel R-West, Units I, II, III & IV AdICPR Runs* - by Smally, Wellford & Nalven (1992)

- *Stoneybrook, Parcel R-East, Golf Course, AdICPR Runs* - by Smally, Wellford & Nalven (1992)

- *Gluecks Salvage Yard, AdICPR Runs* - by Smally, Wellford & Nalven (1993)

- *South Creek Interbasin Transfer of Flood Flows to North Creek - Inflow Hydrographs* - by Parson Engineering Science, Inc. (1996)

- *Daily Rainfall Data at Various Locations Around North Creek Basin for 1992 and 1995* - Southwest Florida Water Management District, Water Management Database

- *Hourly Precipitation Data for June 24-30, 1992 Storm Event at USGS Streamflow Gage on South Creek at Bay Street* - by USGS (1992)

- *South Creek Basin Boundary Map* - by Parson Engineering Science, Inc. (1996)

- *Letter Report on Osprey Area Flooding of July 1995 Storm Event* - by AM Engineering, Inc. (1995)

- *Glenwood Avenue Drainage Worksheet (Survey)* - by Sarasota County (1995)

- *The Oaks II, Stormwater Discharge Facility Construction Permit Application Package* - by Post, Buckley, Schuh & Jernigan, Inc. (1989)

- *The Oaks II, Stormwater Treatment System Modifications, Master Drainage Plan* - by Post, Buckley, Schuh & Jernigan, Inc. (1994) (updated)

- *Isohyetal Map for July 18, 1995 - 15-Hour Storm Event* - by Sarasota County (1995)

- *Soil Survey of Sarasota County, FL* - by Soil Conservation Services (1991)

- *Pine View School Master Drainage Calculations and Construction Plans* - by Coleman Knott & Associates, Inc. (1992)

- *Park Trace Estates Stormwater Management Plans* - by AM Engineering, Inc. (1995)

- *Central Sarasota Parkway Link 1 and 2, Paving and Drainage Plans* - by Smally, Wellford and Nalven, Inc. (1989)

- *Palmer Ranch East Side Environmental Systems Analysis, Existing Drainage Map of South Creek* - by Smally, Wellford & Nalven, Inc. (1990)

- *Oak Creek Subdivision Construction Plans and Permit Calculations* - by Ted G. Yeatts, Consulting Engineer (1993)

- *The Oaks I Subdivision, Lot-Tract-Parcel Location Map* - by Smally, Wellford & Nalven, Inc. (1989)

- *North Creek Lateral, Hydrologic/Hydraulic Analysis Through The Oaks* - by Smally, Wellford & Nalven, Inc. (1990)

- *Oaks II Off-site Stormwater Conveyance Preymore Road to North Creek, Construction Plan* - by Post, Buckley, Schuh & Jernigan, Inc. (1990)

- *Bay Street Park Construction Plans* - by Cyrix Engineering, Inc. (1996)

3.2 Development of Hydrologic Model: HEC-1 Modified

Gee & Jenson modified the U.S. Army Corps of Engineers' HEC-1 Flood Hydrograph Package to incorporate two additional hydrograph procedures: Santa Barbara Urban Hydrograph Method and Constant's Unit Hydrograph Method. Constant's Unit Hydrograph Method utilizes Soil Conservation Service's (SCS) Curve Numbers (CN) and variable Peak Rate Factors and produces very similar hydrograph shapes as the SCS Unit Hydrographs. HEC-1 writes all the computed flow hydrographs into the HEC's Data Storage System (HEC-DSS) which is a very convenient and versatile system for data management. Considering the convenience of HEC-DSS and variable Peak Rate Factor capability, the modified HEC-1 model with Constant's Unit Hydrograph Method was chosen to be used for this study.

The hydrologic parameters needed for the hydrologic model were precipitation; rainfall distribution; sub-basin's pervious, impervious, and lake areas; time of concentration (TC); Curve Numbers (CN); and Peak Rate Factors. The precipitation and rainfall distribution were obtained from the SWFWMD's Environmental Resource Permitting Information Manual, except for the calibrating storm event which used data from the USGS gauge on South Creek. The sub-basin's soils type were pre-processed from GIS database files. The other values were obtained from previous calculations, when available, except when the previous calculations were deemed non-representative of the existing conditions, i.e., design conditions vs. vacant or undeveloped conditions. In those instances, the values were calculated as described in the following sub-sections:

3.2.1 Existing Pervious, Impervious, and Lake Areas

For the sub-basins in which no previous calculations were available, the sub-basin boundaries were overlaid on recent aerial photographs to assess pervious, impervious, and lake areas. The residential areas with vacant lots were analyzed by counting the houses built and using average impervious and pervious ratios to compute the aggregated values. Any other impervious areas such as roads, parking lots, lakes and wetland areas were directly measured for each sub-basin.

3.2.2 SCS Curve Numbers (CN)

The SCS CN is an index that represents the combined hydrologic runoff characteristics of soil types, land use mixes, and antecedent soil moisture conditions (AMC). CN value was calculated based on the procedures outlined in SCS's TR 55. Typically, CN was selected based on the hydrologic soil group for the soil and the cover type. CN values in this study are only for pervious land. HEC1 model used in this study is a modified version. The UU card used for this modified HEC1 model has input parameters ID, TC, PRF, APERV, AIMP and ALAKE. These parameters are Card Identification, Time of Concentration in hours, SCS Peak Flow Constant, Pervious Area of the drainage basin in acres, Impervious Area of the drainage basin in acres, and Lake Area of the drainage basin in acres.

3.2.3 Peak Rate Factors (PRF)

The Peak Rate Factor (PRF) is a variable that defines the shape of the hydrograph and it reflects the slope of the terrain and its storage capacity. The PRF used in this study were obtained or derived from previous calculations. Typically, a visual inspection of the aerial photographs was conducted to determine if the existing conditions reflected the conditions in the previous calculations. If they did, the PRF from the previous calculations was adopted for this study. If they did not, the PRF was weighted using the PRF value from the previous calculations for the built-out areas and a PRF of 100 for the vacant or undeveloped areas. The PRF of 100 was used to be consistent with previous calculations where the area was vacant or undeveloped. For the sub-basins in which previous calculations were not available, the PRF was weighted using PRF information consistent with previous studies or adjacent areas. The PRF values, for

3.2.1 Existing Pervious, Impervious, and Lake Areas

For the sub-basins in which no previous calculations were available, the sub-basin boundaries were overlaid on recent aerial photographs to assess pervious, impervious, and lake areas. The residential areas with vacant lots were analyzed by counting the houses built and using average impervious and pervious ratios to compute the aggregated values. Any other impervious areas such as roads, parking lots, lakes and wetland areas were directly measured for each sub-basin.

3.2.2 SCS Curve Numbers (CN)

The SCS CN is an index that represents the combined hydrologic runoff characteristics of soil types, land use mixes, and antecedent soil moisture conditions (AMC). For simulation of the specified storm events mentioned in the contract, Antecedent Moisture Condition II (AMCII) was used in the calculations of the CN. For the sub-basins in which previous calculations were not available, a CN value was calculated based on the procedures outlined in SCS's Technical Release 55 (TR 55). Typically, CN was selected based on the hydrologic soil group for the soil and the cover type. When multiple soils were contained within a sub-basin, a weighted CN value was calculated. The CN values were used in computing excess runoff volumes from the sub-basins.

3.2.3 Peak Rate Factors (PRF)

The Peak Rate Factor (PRF) is a variable that defines the shape of the hydrograph and it reflects the slope of the terrain and its storage capacity. The PRF used in this study were obtained or derived from previous calculations. Typically, a visual inspection of the aerial photographs was conducted to determine if the existing conditions reflected the conditions in the previous calculations. If they did, the PRF from the previous calculations was adopted for this study. If they did not, the PRF was weighted using the PRF value from the previous calculations for the built-out areas and a PRF of 100 for the vacant or undeveloped areas. The PRF of 100 was used to be consistent with previous calculations where the area was vacant or undeveloped. For the sub-basins in which previous calculations were not available, the PRF was weighted using PRF information consistent with previous studies or adjacent areas. The PRF values, for this

study, vary from 100 to 323. The PRF of 323 is from the ICPR computer models for StonyBrook by Smally, Wellford, & Nalven dated May 11, 1992 and June 16, 1993.

3.2.4 Time of Concentration (Tc)

The Tc was estimated based on the procedure outlined in SCS's TR 55. Generally, the time of concentration represents the sum of the time segments of sheetflow over the first 300 ft., shallow concentrated flow, and open channel flow.

Sheetflow was estimated with Manning's Kinematic Solution (Overton & Meadows 1976) as follows:

$$Tc = \frac{0.007\,(nL)^{0.8}}{(P_2)^{0.5}\,S^{0.4}}$$

Where Tc = sheetflow travel time in hours
n = Manning's Roughness Coefficient
L = Flow length in feet
P_2 = 2-year, 24-hour rainfall in inches
S = Slope of hydraulic grade line (land slope) in ft./ft.

Shallow concentrated flow was estimated as the ratio of flow length to flow velocity as follows:

$$Ts = \frac{L}{3600V}$$

Where Ts = shallow concentrated flow travel time in hours
L = Flow length in ft.
V = Average velocity in ft./sec. For slopes less than 0.005 ft./ft.

The following equations were used:

Unpaved: $V = 16.1345(S)^{0.5}$
Paved: $V = 20.3282(S)^{0.5}$
Where:
V = Average velocity in ft./sec.
S = Slope of hydraulic grade line (land slope) in ft./ft.

Open channel flow was estimated with the Manning's equation as follows:

$$V = \frac{1.49R^{2/3}\,S^{1/2}}{n}$$

Where:
V = Average velocity in ft./sec.
R = Hydraulic radius in ft. and is equal to a/Pw
a = Cross-sectional flow areas in $ft.^2$
Pw = Wetted perimeter in ft.
S = Slope of hydraulic grade line (channel slope) in ft./ft.
n = Manning's Roughness Coefficient for open channel flow

Table 3.1 contains summaries of the existing land use hydrologic parameters for each sub-basin. Appendix A contains excerpts from the HEC-1 computer model summarizing the results of the June 1992 storm event and the existing land use 2-, 5-, 10-, 25-, and 100-Year storm events for each sub-basin. Appendix E contains the calculations for the time of concentration.

3.2.5 Projected Future Pervious, Impervious, and Lake Areas

For the sub-basins which were deemed to represent built-out conditions, the projected future pervious, impervious, and lake areas were not revised, i.e., the existing pervious, impervious, and lake areas were used. For the sub-basins which were not deemed to represent built-out conditions, the projected future pervious, impervious, and lake areas were estimated from future land use maps provided by Sarasota County. Table 3.2.5 contains summaries of the future land use hydrologic parameters for each sub-basin. Appendix A contains excerpts from the HEC-1 computer model summarizing the results of the future land use 2-, 5-, 10-, 25-, and 100-year storm events for each sub-basin.

3.3 Development of Hydraulic Model: UNET

Version 3.0 of UNET, the U.S. Army Corps of Engineers' "One-Dimensional Unsteady Flow Through a Full Network of Open Channels" computer program, was selected for this study. UNET can simulate flow in a complex network of open channels and has the capability to include off-channel storage and overbank storage areas. The storage areas can either provide water to, or divert water from, the channels. In addition, UNET can simulate several external and internal boundary conditions, including: flow and stage hydrographs, gated and uncontrolled spillways, bridges, culverts, risers, levee systems, and pumps. UNET uses the HEC-DSS database for data management which provides a convenient and advantageous interface with the modified HEC-1 hydrologic model.

TABLE 3.1
SUMMARY OF HYDROLOGIC PARAMETERS – EXISTING LAND USE

Sub-basin	Total Drainage Area (ac.)	Pervious Area (ac.)	Impervious Area (ac.)	Lake Area (ac.)	T.O.C. (Min.)	SCS CN (Wt.)	Peak Rate Factor
NC-1	9.90	7.20	1.23	1.47	32.4	61	256
NC-2	25.20	21.25	3.53	0.42	43.8	61	256
NC-3	31.01	23.03	5.35	2.63	23.4	61	100
NC-4	65.01	50.23	10.33	4.45	28.8	61	135
NC-5	11.40	6.25	4.20	0.95	28.8	61	171
NC-6	4.50	2.05	2.23	0.22	21.6	61	256
NC-7	6.70	2.78	3.27	0.65	21.0	61	256
NC-8	15.40	13.17	1.80	0.43	22.2	61	256
NC-9	12.10	10.30	1.38	0.42	32.4	61	100
NC-10	9.20	6.44	2.28	0.48	18.6	61	100
NC-11	10.10	8.10	1.52	0.48	28.8	61	131
NC-12	39.80	30.45	7.19	2.16	42.0	61	137
NC-13	4.30	3.13	0.51	0.66	28.0	61	100
NC-14	20.40	15.73	4.15	0.52	35.0	61	100
NC-15	18.10	13.07	4.33	0.70	50.0	61	100
NC-16	6.41	4.38	1.28	0.75	20.0	61	100
NC-17	6.61	4.83	0.90	0.88	32.0	61	142
NC-18	15.99	15.17	0.82	0.00	97.2	75	100
NC-19	44.30	31.06	2.25	10.99	63.0	81	100
NC-19A	16.86	15.86	0.0	1.00	75.0	69	100
NC-20	24.56	19.32	4.21	1.03	113.4	68	133
NC-20A	3.84	2.21	0.00	1.63	5.0	75	100
NC-21	24.73	16.88	6.45	1.40	76.8	68	150
NC-22	41.49	30.08	5.30	6.11	64.8	82	256
NC-23	4.70	4.01	0.30	0.39	36.8	80	256
NC-24	4.58	4.35	0.23	0.00	83.4	84	100
NC-24A	3.26	2.44	0.82	0.00	88.4	80	256
NC-25	6.00	3.68	1.09	1.23	61.8	80	100
NC-26	60.63	39.10	16.00	5.53	124.2	85	155
NC-27	64.99	50.54	1.54	12.91	73.2	70	135
NC-28	10.67	8.99	0.58	1.10	48.0	65	100
NC-28A	10.66	8.99	0.57	1.10	48.0	65	100
NC-29	17.96	15.77	2.19	0.00	85.1	65	100
NC-30	28.20	23.79	1.35	3.06	58.8	65	100
NC-31	5.87	4.07	1.80	0.00	10	65	256
NC-32	4.10	4.10	0.00	0.00	66.0	61	100
NC-33	13.57	10.60	2.97	0.00	64.2	75	256
NC-34 *	82.60	*	*	*	*	*	*
NC-35 **	500.00	500.00	0.0	0.0	210.0	77	115
NC-36 ***	30.30	***	***	***	***	***	***

* *Outflow hydrographs were developed from the information contained in an ADICPR computer run by Smally, Wellford, & Nalven, Inc., dated May 11, 1992. These outflow hydrographs were imported into the UNET model.*

** *Outflow hydrographs were developed from the information contained in "North Creek Lateral Hydrologic/Hydraulic Analysis Through The Oaks, Sarasota County, Florida", by Smally, Wellford, & Nalven, Inc., April 1990.*

*** *Outflow hydrographs were developed from the information contained in an ADICPR computer run by Smally, Wellford, & Nalven, Inc., dated June 16, 1993. These outflow hydrographs were imported into the UNET model.*

Sub-basin	Total Drainage Area (ac.)	Pervious Area (ac.)	Impervious Area (ac.)	Lake Area (ac.)	T.O.C. (Min.)	SCS CN (Wt.)	Peak Rate Factor
NC-37	179.94	178.96	0.00	0.98	313.0	82	100
NC-38	54.60	45.31	9.29	0.00	107.8	81	127
NC-38A	7.55	0.10	0.10	7.35	50.0	84	100
NC-39	35.57	26.89	6.40	2.28	67.8	82	138
NC-39A	9.93	9.07	0.00	0.86	75.0	80	100
NC-40	6.36	5.94	0.00	0.42	117.6	82	100
NC-41	41.57	40.83	0.30	0.44	111.2	79	100
NC-42	11.27	10.66	0.61	0.00	99.6	82	100
NC-43	38.98	36.54	0.16	2.28	139.8	78	100
NC-44	48.14	38.10	6.55	3.49	186.0	82	133
NC-44A	18.41	16.37	1.78	0.26	184.2	79	117
NC-45	47.74	39.89	6.96	0.89	88.2	79	126
NC-45A	16.73	15.17	1.56	0.00	172.8	82	115
NA-46A	6.78	5.21	1.57	0.00	195.6	83	256
NC-48	110.37	95.06	15.31	0.00	177.0	75	122
NC-49	154.77	120.60	25.34	8.83	139.8	75	134
NC-50	10.69	6.58	0.00	4.11	36.0	69	100
NC-51	16.91	13.04	3.87	0.00	126.6	79	256
NC-52	6.92	4.58	2.34	0.00	108.0	69	256
NC-53	17.86	7.88	9.98	0.00	114.0	79	256
NC-53A	40.74	24.24	16.5	0.00	145.0	79	256
NC-54	22.88	13.68	9.2	0.00	100.0	82	256
NC-55	14.21	14.21	0.00	0.00	104.4	74	100
NC-55A	8.87	4.73	0.97	3.17	217.2	79	256
NC-56	5.31	4.78	0.53	0.00	67.2	79	256
NC-56A	2.19	1.15	1.04	0.00	60.0	75	256
NC-56B	3.83	3.14	0.69	0.00	167.4	79	256
NC-56C	8.17	7.67	0.50	0.00	153.0	83	256
NC-57	3.09	1.79	1.30	0.00	77.5	79	256
NC-58	6.22	2.62	3.60	0.00	366.0	79	256
NC-100	0.80	0.32	0.42	0.06	12.0	79	256
NC-101	5.50	0.60	4.38	0.52	37.0	69	256
NC-102	6.90	1.31	4.98	0.61	59.0	69	256
NC-103	25.10	5.94	15.46	3.70	112.0	69	256
NC-104	2.04	0.94	0.00	1.10	49.0	80	100
NC-105	5.58	2.24	0.00	3.34	28.0	80	100
NC-106	4.98	1.12	3.40	0.46	31.0	69	256
NC-107	10.0	3.72	0.00	6.28	14.0	84	100
TOTALS	**2333.5**	**1844.38**	**259.04**	**117.18**	**N/A**	**N/A**	**N/A**

TABLE 3.2.5
SUMMARY OF HYDROLOGIC PARAMETERS – FUTURE LAND USE

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NC-5	11.40	6.25	4.20	0.95	28.8	61	171
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NC-7	6.70	2.78	3.27	0.65	21.0	61	256
NC-8	15.40	13.17	1.80	0.43	22.2	61	256
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NC-14	20.40	15.73	4.15	0.52	35.0	61	100
NC-15	18.10	13.07	4.33	0.70	50.0	61	100
NC-16	6.41	4.38	1.28	0.75	20.0	61	100
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NC-18	15.99	13.67	2.32	0.00	97.2	75	100
NC-19	44.30	29.87	3.44	10.99	63.0	81	100
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NC-28A	10.66	8.85	0.71	1.10	48.0	65	100
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NC-38A	7.55	0.10	0.10	7.35	50.0	84	100
NC-39	35.57	24.29	9.0	2.28	67.8	82	256
NC-39A	9.93	9.07	0.00	0.86	75.0	80	100
NC-40	6.36	5.94	0.00	0.42	117.6	82	100
NC-41	41.57	29.35	8.90	3.32	71.0	79	256
NC-42	11.27	7.77	2.60	0.90	99.6	82	100
NC-43	38.98	19.10	14.89	4.99	30.0	78	256
NC-44	48.14	38.10	6.55	3.49	186.0	82	133
NC-44A	18.41	16.37	1.78	0.26	184.2	79	117
NC-45	47.74	35.23	8.71	3.80	88.2	79	256
NC-45A	16.73	15.17	1.56	0.00	172.8	82	115
NA-46A	6.78	5.21	1.57	0.00	195.6	83	256
NC-48	110.37	48.56	48.57	13.24	60.0	75	256
NC-49	154.77	117.74	28.20	8.83	90.0	75	134
NC-50	10.69	6.58	0.00	4.11	36.0	69	100
NC-51	16.91	13.04	3.87	0.00	126.6	79	256
NC-52	6.92	4.58	2.34	0.00	108.0	69	256
NC-53	17.86	7.88	9.98	0.00	114.0	79	256
NC-53A	40.74	21.34	19.4	0.00	145.0	79	256
NC-54	22.88	8.88	14.0	0.00	100.0	82	256
NC-55	14.21	14.21	0.00	0.00	104.4	74	100
NC-55A	8.87	4.73	0.97	3.17	217.2	79	256
NC-56	5.31	4.78	0.53	0.00	67.2	79	256
NC-56A	2.19	1.15	1.04	0.00	60.0	75	256
NC-56B	3.83	3.14	0.69	0.00	167.4	79	256
NC-56C	8.17	7.67	0.50	0.00	153.0	83	256
NC-57	3.09	1.79	1.30	0.00	77.5	79	256
NC-58	6.22	2.62	3.60	0.00	366.0	79	256
NC-100	0.80	0.32	0.42	0.06	12.0	79	256
NC-101	5.50	0.60	4.38	0.52	37.0	69	256
NC-102	6.90	1.31	4.98	0.61	59.0	69	256
NC-103	25.10	5.94	15.46	3.70	112.0	69	256
NC-104	2.04	0.94	0.00	1.10	49.0	80	100
NC-105	5.58	2.24	0.00	3.34	28.0	80	100
NC-106	4.98	1.12	3.40	0.46	31.0	69	256
NC-107	10.0	3.72	0.00	6.28	14.0	84	100
TOTALS	**2333.5**	**1730.56**	**349.81**	**140.23**	**N/A**	**N/A**	**N/A**

The hydraulic parameters needed for the hydraulic model were channel geometry, structure geometry, and boundary conditions. The channel geometry was obtained from a survey conducted for this study. The structure geometry was obtained from existing information, whenever available. When information was not available for a structure, the information was obtained from a survey. The boundary conditions were selected based on the channel and structure geometry, drainage patterns, topography, basin interconnections, tidal records for the Little Sarasota Bay, discussion/work sessions with various parties knowledgeable in the North Creek Basin, and coordination with Parsons Engineering Science (overflow from the South Creek Basin).

The study area was broken down into 14 reaches, which are briefly described as follows:

Reach 1 - North Creek from its headwaters to the confluence with the North Creek Tributary (approximately the east property line of The Oaks Development).

Reach 2 - North Creek Tributary from its headwaters to the confluence with North Creek (approximately the east property line of The Oaks Development).

Reach 3 - North Creek from its confluence with the North Creek Tributary (approximately the east property line of The Oaks Development) to the confluence with the South Lateral.

Reach 4 - South Lateral from its confluence with the East Lateral, to its confluence with North Creek.

Reach 5 - East Lateral from its headwaters to the confluence with the South Lateral.

Reach 6 - South Lateral from its confluence with Osprey Acres South Lateral to the East Lateral.

Reach 7 - South Lateral from the intersection of Pine Ranch East Road with Bay Street to the confluence with Osprey Acres South Lateral.

Reach 8 - Osprey Acres South Lateral from approximately the east property line of Osprey Acres to the confluence with the South Lateral.

Reach 9 - North Creek from its confluence with the South Lateral to the confluence with the North Lateral.

Reach 10 - North Lateral from Preymore Street to the confluence with North Creek.

Reach 11 - North Creek from its confluence with the North Lateral to the confluence with Osprey Acres North Lateral.

Reach 12 - Osprey Acres North Lateral from The Oaks Development to the confluence with North Creek.

Reach 13 - Osprey Acres North Lateral from Washington Avenue to The Oaks Development.

Reach 14 - North Creek from its confluence with Osprey Acres North Lateral to the downstream study limits (downstream of U.S. 41 and upstream of the confluence with Catfish Creek).

The hydraulic model included approximately 60 interconnected storage cells (i.e., lakes, wetlands, depressed areas), 35 bridge and culvert crossings, and 300 cross-sections. Plates 7 and 8 display the UNET routing diagrams for the calibration event (June 1992) and the existing conditions with existing and future land use events.

3.3.1 Calibration of Model

Calibration of the model was a challenging activity because no gauge information was available within the North Creek Basin, to verify flows and stages. Recently, the June 1992 and July 1995 storm events caused severe flooding conditions in the basin and a number of high water marks are available for both storm events. Given the aforementioned scenario, both storm events were considered to calibrate the model. The information available for each storm event can be generally summarized as follows:

- June 1992 Storm Event: A temporary USGS rainfall gauging station, located near the southeastern limits of the basin boundary on the South Creek, recorded a total accumulation of 17.86 inches over a 140-hour period during June 24 through 30, 1992. Sarasota County surveyed four flood high water marks. Overflow from the South Creek Basin was observed across Pine Ranch East Road. In general, the elevations of the June 1992 storm event were approximately 6" lower than the July 1995 storm event. Unfortunately, reliable starting water surface elevations at the junction with the Catfish Creek are not available and the number and location of high water marks do not represent the North Creek Basin to the degree that a reliable relationship among them can be developed. There is also uncertainty regarding the time of the peak stage and the high water marks.

- July 1995 Storm Event: An Isohyetal Map for July 18, 1995, prepared by Sarasota County, shows an average of 3.0 to 11.0 inches of rainfall during a 15-hour period. For the North Creek Basin, the Isohyetal Map shows an average rainfall amount of approximately 10 inches. Unfortunately, a reliable rainfall amount and distribution pattern for the North Creek Basin is not available. A letter report by Mr. D. Shawn Leins, a Professional Engineer with AM Engineering, Inc., listed 13 high water marks in and around the North Creek Basin. A letter by Mr. Ronald G. Gallien, a local resident, offering comments to Mr. Leins' letter. A letter by Mr. William H. Hyatt, a local resident, offering comments to Mr. Leins' letter. A letter by Mr. Ralph Bush, a local resident, offering his findings on the July 1995 storm event. Seven houses in the Osprey Acres area experienced structural flooding. Overflow from the South Creek Basin was observed across Pine Ranch East Road. A number of obstructions which reduced the conveyance capacity of the waterways and contributed to augment the flooding conditions were reported throughout the basin. They included overgrown vegetation, clogged pipes, and clogged grates. The South Creek experienced blockages, i.e., fallen trees, which contributed to the amount of overflow from the South Creek. The South Creek blockage was observed and described by Mr. Harry Glaze of Sarasota County. Unfortunately, there is no reliable starting water surface elevation at the junction with the Catfish Creek. There is also uncertainty regarding the time of the peak stage and the high water marks.

Considering these facts, i.e., uncertainties with rainfall amounts and distribution patterns, high water elevations, and obstructions, it is not warranted to do a detailed calibration for the July 1995 storm event. However, since the magnitude of the July 1995 storm event appears to be very similar to the magnitude of the 100-year, 24-hour storm event, a comparison of the estimated 100-year, 24-hour existing conditions with existing land use peak flood stages to some of the observed flood stages within the North Creek Basin will be made. The June 1992 storm event was adopted as the calibration event for this study.

The existing conditions during the June 1992 storm event were different than today's existing conditions; therefore, two different hydrologic and hydraulic models were developed. These models are identified as the June 1992 model and the existing conditions model. The June 1992 model represents the existing conditions around June 1992. The existing conditions model represents the conditions during the time of the survey, approximately in early 1996. The primary differences between the models are as follows:

<u>June 1992 Model</u>:

- No perimeter berm on The Oaks Development along Bay Street.
- No lakes along the perimeter of The Oaks Development.
- The northern half of Pine Ranch East Road was not built, i.e., north of Pine Ranch East Subdivision.
- 60" CMP culvert at Pine Ranch East Road over the North Creek, i.e., north of Pine Ranch East Subdivision.
- Culvert with welded plate at Preymore Street over North Lateral. The available opening was estimated to be equivalent to a 34"H x 53"W RCP.
- Bay Oaks Estates, Unit I, was not built.
- Sub-basins NC-3, NC-6, NC-7, NC-9, NC-10, and NC-15 within The Oaks Development had no lakes in 1992. Sub-basin NC-30, also within The Oaks Development, did not have as much lake surface areas. Sub-basin NC-31, Oak Creek Subdivision, was not developed. Sub-basin NC-35, in Stoneybrook Golf

Course, was not developed. However, since this sub-basin's outflow hydrograph was imported from a previous study, which represented the pre-development conditions, the hydrologic parameters for the June 1992 and existing conditions models are the same, i.e., post-development outflow hydrograph is equal to pre-development outflow hydrograph. Sub-basin NC-38, in Bay Oaks Estates, Unit I, was not developed.

Existing Conditions Model

- Perimeter berm on The Oaks Development along Bay Street. The perimeter berm has six cuts in it between the GTE sub-station and the east property line of The Oaks Development.
- Lakes along the perimeter of The Oaks Development.
- Pine Ranch East Road is built from Bay Street to Preymore Street.
- Double 42" RCP culverts at Pine Ranch East Road over the North Creek, i.e., north of Pine Ranch East Subdivision.
- 48"H x 72"W RCP culvert at Preymore Street over North Lateral.
- Bay Oaks Estates, Unit I, was built.
- Sub-basins NC-3, NC-6, NC-7, NC-9, NC-10, and NC-15, within The Oaks Development, had lakes. Sub-basin NC-30, also within The Oaks Development, had a larger lake surface area. Sub-basin NC-31, Oak Creek Subdivision, is partially developed. Sub-basin NC-35, in Stoneybrook Golf Course, was developed. Sub-basin NC-38, in Bay Oaks Estates, Unit I, was developed.

The June 1992 model was assembled using information available from previous studies/design reports, gathered through field reconnaissance, provided by various parties knowledgeable in the basin, obtained from aerial photographs and topographical maps, and obtained by field surveys. The June 1992 model was tested and debugged and the results were discussed at several meetings attended by Sarasota County staff and various interested parties. The June 1992 model was adjusted to reflect input/ comments from the meetings.

The June 1992 model uses Mean High Tide (MHT) as its downstream boundary. MHT was estimated from the tide stations at Venice and Sarasota Bay. The Venice tide station is south of the Little Sarasota Bay and the Sarasota Bay tide station is north of the Little Sarasota Bay. The MHT for both stations is 2.1'. A starting water surface elevation of 2.1' was selected for the June 1992 simulation. The June 1992 model was based on unobstructed flow and assuming that the hydraulic structures remain unobstructed, operate properly, and do not fail. The roughness coefficients used in the June 1992 model were selected based on observations of the November 1992 and February 1993 aerial photographs of the area, today's existing conditions, and engineering judgment. The roughness coefficients for the channel portion vary from 0.013 to 0.100 and those for the overbanks vary from 0.040 to 0.100. Table 3.2 presents a summary of the roughness coefficients used in the June 1992 model by reaches:

TABLE 3.2
JUNE 1992 ROUGHNESS COEFFICIENTS

	Roughness Coefficients		
Reach #	Channel	Left Overbank	Right Overbank
1	0.035	0.080	0.080
	0.070	0.100	0.100
2	0.070	0.100	0.100
3	0.100	0.100	0.100
	0.090	0.100	0.100
4	0.025	0.040	0.040
	0.035	0.060	0.060
5	0.025	0.040	0.040
6	0.025	0.040	0.040
7	0.030	0.060	0.060
8	0.033	0.070	0.070
9	0.070	0.100	0.100
	0.035	0.070	0.070

	Roughness Coefficients		
Reach #	Channel	Left Overbank	Right Overbank
10	0.033	0.080	0.070
	0.030	0.065	0.065
	0.030	0.060	0.060
	0.013	0.060	0.060
	0.035	0.070	0.070
11	0.035	0.070	0.070
	0.030	0.070	0.070
12	0.035	0.080	0.080
	0.030	0.070	0.070
13	0.035	0.060	0.060
14	0.035	0.070	0.070

The results of the June 1992 model were compared against the high water marks for the June 24-30, 1992 storm event. Table 3.3 presents a summary of the comparison:

TABLE 3.3
HIGH WATER MARKS VS. COMPUTED PEAK STAGES
FOR THE JUNE 24-30 STORM EVENT

Location	High Water Mark Elevation (Ft. NGVD)	Computed Peak Stage (Ft. NGVD)
1. Downstream Face of U.S. Hwy. 41 Bridge over North Creek	3.49	2.7[1]
2. Upstream Face of MacEwen Drive Bridge over North Creek	10.69	10.7[2]
3. Downstream Face of MacEwen Drive Culverts over South Lateral	9.69	9.8[3]
4. Upstream Face of MacEwen Drive Culverts over South Lateral	10.74	10.8[4]

[1]At Reach 14, cross-section 0.591, approximately 50' downstream of face of U.S. Highway 41 bridge.
[2]At Reach 3, cross-section 1.748, approximately 10' upstream of face of MacEwen Drive bridge.
[3]At Reach 6, cross-section 0.565, downstream face of MacEwen Drive culverts.
[4]At Reach 6, cross-section 0.578, upstream face of MacEwen Drive culverts.

As illustrated in Table 3.3, the high water mark elevations and the computed peak stages for the locations on the North Creek are in very close agreement. The computed peak stages at locations 1 and 2 are 0.79' and 0.01' below and above the high water mark elevations, respectively. However, the computed peak stages for the South Lateral at locations 3 and 4 are 0.11' and 0.16' above the high water mark elevations, respectively.

Field observations for past flood events indicate that clogged culverts and plugged ditch bottom inlets along the south side of Bay Street have resulted in street and structure flooding. According to observations during the 1992 storm event, the ditches along the Seminole Gulf Railroad right of way and South Creek downstream of Bay Street were heavily overgrown with vegetation; consequently, reducing stormwater conveyance.

After the 1995 storm event, Sarasota County removed vegetation in parts of the South Creek Channel within the Oscar Scherer State Park. On November 13, 1997, a storm event occurred similar to that of 1992 and 1995. Observed flood levels were significantly less. This appears to be good evidence that the 1992 and 1995 storm events were aggravated by reduced conveyance conditions along the railroad right-of-way and in Oscar Scherer Park.

Appendix B contains excerpts from the UNET modeling of the June 1992 storm event.

3.3.2 Modeling of Standard Storm Events for Existing Conditions

The existing conditions model, with existing and future land use, was used to simulate the following storm events:

- 2-Year, 24-Hour
- 5-Year, 24-Hour

- 10-Year, 24 Hour
- 25-Year, 24 Hour
- 100-Year, 24 Hour

The rainfall depths and distribution were obtained from SWFWMD's Environmental Resource Permitting Information Manual. Table 3.4 shows the rainfall depth and distribution for each storm event.

TABLE 3.4
RAINFALL DEPTH / DISTRIBUTION

Storm Event	Rainfall Depth (Inches)	Rainfall Distribution
2-Year, 24-Hour	4.5	SCS Type II FL Modified
5-Year, 24-Hour	6.0	SCS Type II FL Modified
10-Year, 24-Hour	7.0	SCS Type II FL Modified
25-Year, 24-Hour	8.0	SCS Type II FL Modified
100-Year, 24-Hour	10.0	SCS Type II FL Modified

The existing conditions model was assembled using information available from previous studies/design reports, gathered through field reconnaissance, provided by various parties knowledgeable in the basin, obtained from aerial photographs and topographical maps, and obtained by field surveys. The existing conditions model was tested and debugged with the 100-year, 24-hour storm event with existing land use and the results were discussed at several meetings attended by Sarasota County staff and various interested parties. The existing conditions model was adjusted to reflect input/comments from the meetings. Like the June 1992 model, the existing conditions model also uses MHT as its downstream boundary. A starting water surface elevation of 2.1' was selected for the existing conditions simulations. The existing conditions model was also based on unobstructed flow and assuming that the hydraulic structures remain unobstructed, operate properly, and do not fail. The roughness coefficients used in the existing conditions model were selected based on observations of the November 1992, February 1993, March 1995, and April 1995 aerial photographs of the area;

today's existing conditions, and engineering judgment. Even though the June 1992 conditions and the existing conditions are different, the roughness coefficients used in the June 1992 model were determined to be representative of the existing conditions; therefore, they were adopted for the existing conditions model. The roughness coefficients for the channel portion vary from 0.013 to 0.100 and those for the overbanks vary from 0.040 to 0.100.

As mentioned in Sub-Section 3.3.1, above, a comparison between the high water marks for the July 1995 storm event and the computed peak stages for the existing conditions with existing land use 100-year, 24-hour storm event was conducted. Table 3.5 presents a summary of the comparison.

TABLE 3.5

HIGH WATER MARKS FROM THE JULY 1995 STORM EVENT VS. COMPUTED PEAK STAGES FOR THE EXISTING CONDITIONS WITH EXISTING LAND USE 100-YEAR, 24-HOUR STORM EVENT

Location	High Water Mark Elevation (Ft. NGVD)	Calculated Peak Stage (Ft. NGVD)
1. Street sign at NE corner of Pine Ranch East Road and Bay Street	16.0	15.7[1]
2. Nail in south edge of pavement of Bay Street in front of proposed Bay Oaks II Subdivision	15.95	15.6[2]
3. Nail in fence post between Lots 2 & 3, Pine Ranch Subdivision	15.7	15.6[3]
4.Nail in road on Bay Street, 200'± west of Pine Ranch Subdivision	15.5	15.1[4]
5. Nail in Bay Street 500'± east of Old Venice Rd.	15.24	14.7[5]
6. Wood hub set on Bay Street at "No Outlet" sign just east of Old Venice Road	14.19	14.4[6]
7. Storm inlet on north side of Bay Street just east of Old Venice Road	12.6	13.5[7]

Location	High Water Mark Elevation (Ft. NGVD)	Calculated Peak Stage (Ft. NGVD)
8. Pipe discharging to north to ditch which discharges to The Oaks Subdivision, north side of Bay Street, west of Old Venice Road	10.5	12.2[8]
9. Nail in pine tree on The Oaks Golf Course along east property line, south of where North Creek Lateral enters The Oaks Subdivision from the east	14.14	11.6[9]
10. Nail in Oak tree on The Oaks Golf Course along east property line north of where North Creek Lateral enters The Oaks Subdivision from the east	14.10	11.6[10]
11. Water level at Bay Oaks Estates, Unit I, control structure	16.0	14.9[11]
12. Pine Ranch East Subdivision	15.6	13.7[12]
13. Bottom of railroad trestle east of Bay Oaks Estates, Unit I	16.7	15.7[13]

[1]At Reach 7, cross-section 1.894, intersection of Bay Street and Pine Ranch East Road.

[2]At Reach 7, cross-section 1.668, approximately 33' downstream of driveway culvert in front of proposed Bay Oaks II Subdivision, i.e., 18" RCP (27' long).

[3]At Reach 7, cross-section 1.613, approximately 30' upstream of Longbow Trail driveway culvert, i.e., 13"H x 22"W CMP (44' long).

[4]At Reach 7, cross-section 1.382, approximately 40' downstream of Shotgun Lane driveway culvert, i.e., 32"H x 49"W CMP (20' long).

[5]At Reach 7, cross-section 0.985, approximately 40' upstream of School Board facility culvert, i.e., 29"H x 45"W ERCP (120' long).

[6]At Reach 7, cross-section 0.900, approximately 10' upstream of Bay Street/Old Venice Road culverts, i.e., double 24"H x 38"W ERCP (74' long across Bay Street).

[7]At Reach 7, cross-section 0.8856, downstream face of Bay Street/Old Venice Road culverts, i.e., double 24"H x 38"W ERCP (74' long across Bay Street).

[8]*At Reach 7, cross-section 0.8017, downstream face of Bay Street/Old Venice Road culvert, i.e., 38"H x 60"W ERCP (32' long).*

[9]*At Reach 3, cross-section 2.087, approximately 20' downstream of a golf course timber foot bridge over the North Creek near the east property line of The Oaks Development.*

[10]*At Reach 3, cross-section 2.087, approximately 20' downstream of a golf course timber foot bridge over the North Creek near the east property line of The Oaks Development.*

[11]*At Reach 1, storage area 35, wetland A in Bay Oaks Estates, Unit I.*

[12]*At Reach 2, cross-section 0.156, approximately 30' upstream of Pine Ranch Trail culvert, i.e., 26"H x 42"W RCP (106' long).*

[13]*At Reach 1, cross-section 2.421, upstream face of Seminole Gulf Line RR over the North Creek east of Pine Ranch East Road.*

As illustrated in Table 3.5, the high water mark elevations and the computed peak stages for locations 1 through 5, along Bay Street, are in very close agreement. The difference in water surface elevation varies from 0.1' to approximately 0.5' lower than the high water mark elevations. However, the computed peak stages for locations 6, 7, and 8, along Bay Street, are 0.21', 0.9', and 1.7' above the high water mark elevations, respectively. The computed peak stages for locations 9 and 10, along the North Creek near the east property line of The Oaks Development, are approximately 2.5' below the high water mark elevations. Similarly, the computed peak stages for locations 11, 12, and 13 at Bay Oaks Estates, Unit I control structure, Pine Ranch East Subdivision, and the bottom of the Seminole Gulf Line RR bridge are 1.1', 1.9', and 1.1' below the high water marks elevation, respectively.

Discussions with Mr. Shawn Leins revealed that the high water marks for locations 1, 2, 3, 4, and 5 were obtained from water levels between the morning and noontime on July 18, 1995. The high water marks for locations 6, 7, and 8 were obtained from water levels approximately around 4 p.m. or 5 p.m. on July 18, 1995. The high water marks for locations 9 and 10 were obtained from debris lines on the following day and were based on a bench mark on a tree within The Oaks Development. Mr. Leins indicated that no access to these locations was possible on July 18, 1995 and the water seemed

to be leveled and hardly moving and it appeared to be just piling up at these locations. The high water marks for locations 11 and 12 were based on water levels approximately around 4 p.m. or 5 p.m. on July 18, 1995. The high water mark for location 13 was obtained from debris line approximately around 4 p.m. and 5 p.m. on July 18, 1995.

Field observations for past flood events indicate that clogged culverts and plugged ditch bottom inlets along the south side of Bay Street have resulted in street and structure flooding. After the 1995 storm event, Sarasota County removed vegetation in parts of the South Creek Channel within the Oscar Scherer State Park. On November 13, 1997, a storm event occurred similar to that of the 1995 storm event. Observed flood levels were significantly less. This appears to be good evidence that the 1995 storm event was aggravated by reduced conveyance conditions.

3.3.3 Existing Conditions Computed Flood Stages

Plate 9 contains profiles of each Reach showing the channel bottom, crossings, and existing conditions computed peak stage for the 2-, 5-, 10-. 25-. And 100-year storm events.

SECTION 4

LEVEL OF SERVICE (LOS)

4.1 Existing Flooding Conditions

Flooding conditions in the North Creek Basin generally result from tropical storm events and hurricanes causing intense rainfall, excessive runoff, and tidal surge influences, and from overflow from the South Creek Basin. The information collected for the June 1992 and July 1995 storm events, which are two of the more significant flooding events to impact the basin, indicated that many streets and yards were flooded throughout the basin, as well as structural flooding in the Osprey Acres area. This information also revealed that a considerable amount of overflow from the South Creek Basin was observed across Pine Ranch East Road. In addition, a number of obstructions, which reduced the conveyance capacity of the waterways and contributed to augment the flooding conditions, were reported throughout the basin. The obstructions included overgrown vegetation, clogged pipes, clogged grates, and fallen trees.

Appendix C contains information which summarizes the peak stage for each cross-section modeled for the 2-, 5-, 10-, 25-, and 100-year storm events. The Existing Conditions Water Surface Profiles contained in Plate 9 show this information in a graphical format in addition to showing the channel bottom and the locations of channel crossings. Plate 10 contains a map showing the 100-year floodplain delineation based on existing conditions. One foot interval contour maps from SWFWMD (date of photography: September 1981; date of mapping: May 1982) were used to delineate the 100-year floodplain of the following areas:

- East of Pine Ranch East Road;
- South of Bay Street and east of Old Venice Road, except for the School Board Facility;
- Osprey Acres;
- Sarasota County Park site, except for the existing wet detention facility.

In addition, the 1 ft. interval contour maps were used to supplement the surveyed information of the North Creek, Tributary to North Creek, North Lateral, South Lateral, and Osprey Acres North Lateral when deemed applicable. The applicability of the 1 ft. interval contour maps was estimated by comparing it to information from permit information, "as-built" information, and design plans. When the 1 ft. interval contour maps were deemed inapplicable, the information shown in the aforementioned documents was utilized to estimate the limits of the 100-year floodplain. The accuracy of the 100-year floodplain boundary is entirely dependent of the accuracy of the aforementioned topographical sources. The 100-year floodplain shown in Plate 10 includes the results of the 100-year floodplain information provided by FEMA's FIRM, Panel 228 of 460, revised September 3, 1992, which identified the study area as Zone AE, EL 11.0' NGVD and Zone AE, EL 12.0' NGVD. For the purpose of establishing LOS, the FEMA information was not considered.

4.2 Level of Service Analysis

Table 4.1 presents the Level of Service (LOS) criteria for water quantity.

TABLE 4.1

WATER QUANTITY LEVEL OF SERVICE (LOS) CRITERIA

Flooding Reference (Buildings, Roads and Sites)	**Level of Service (LOS) (Flood Intervals are in Years)**
I. Buildings: Pre-FIRM or Post-FIRM structures are at or above the flood water elevation.	
A. Emergency Shelters and Essential Services	> 100
B. Habitable	100
C. Employment/Service Centers	100
II.Road Access: Roads shall be passable during flooding. Roadway flooding ≤ 6" depth at the outside edge of pavement is considered passable.	
A. Evacuation	> 100
B. Arterials	100
C. Collectors	25
D. Neighborhood	10
III. The water quantity LOS can be adjusted to allow for greater amounts of flooding of roads and sites if the flooding does not adversely impact public health and safety, natural resources or property. The LOS for improvements to existing roadways may be adjusted based on existing conditions such as adjacent topography and economic impacts.	

ACCEPTABLE FLOODING CRITERIA

Roadways	10-Year	25-Year	100-Year
A. Evacuation	None	None	None
B. Arterials	None	None	6 inches
C. Collectors	None	6 inches	9 inches
D. Neighborhood	6 inches	9 inches	12 inches
Open Space	Flooding of open space is acceptable if it does not compromise public health and safety		

Based on the water quantity LOS presented in Table 4.1 and the result of the hydraulic analysis, an evaluation to determine the LOS was conducted as follows:

I – Buildings

A. Emergency Shelters and Essential Services: A review of Sarasota County's "1996 Hurricane Evacuation Map and Shelter Listings" revealed that no emergency shelters are located within the North Creek Basin's drainage boundaries. The North Creek Basin drains primarily residential areas; however, there are commercial developments along U.S. 41 and two substations (FPL and GTE) along Bay Street. The commercial developments along U.S. 41 are not expected to provide essential services. The two substations are expected to provide essential services and as such, their structures are above the 100-year flood elevations. Plate 10 contains a map showing the 100-year floodplain delineation based on existing conditions.

B. Habitable: Plate 10 contains a map showing the 100-year floodplain delineation based on existing conditions. Habitable structures which were determined to be deficient are shown on this plate.

C. Employment/Service Centers: Refer to Plate 10 which contains a map showing the 100-year floodplain delineation based on existing conditions.

II – Road Access

Table 4.2 summarizes the water quantity LOS deficiencies for the existing conditions at selected locations. The selected locations are crossings over the North Creek and its laterals where a detailed hydraulic analysis was conducted.

TABLE 4.2
LOS DEFICIENCIES FOR EXISTING CONDITIONS

⇐ This design reflects LOS deficiency				*Top # = Existing Conditions w/Existing Land Use* *Bottom # = Existing Conditions w/Future Land Use* Computed Peak Stage (Ft. NGVD)				
Location	**Reach No./ X-Section**	**LOS Category**	**Elevation (Ft.NGVD)**	**2 Year**	**5 Year**	**10 Year**	**25 Year**	**100 Year**
Seminole Gulf Line RR over North Creek	1 / 2.421	Neighborhood	18.61[8]	13.83 13.82	14.30 14.36	14.73 14.79	15.20 15.23	15.73 15.75
Pine Ranch East Road over North Creek	1 / 2.400	"	16.02[20]	13.78 13.77	14.26 14.31	14.67 14.73	15.12 15.15	15.64 15.66
Pine Ranch East Road over Tributary to North Creek	2 / 0.350	"	16.02[21]	12.80 13.03	13.05 13.48	13.26 13.78	13.47 14.05	13.96 14.53
Pine Ranch Trail over Tributary to North Creek	2 / 0.235	"	15.0	12.74 12.97	12.97 13.39	13.16 13.67	13.36 13.92	13.79 14.39
Pine Ranch Trail over Tributary to North Creek	2 / 0.151	"	14.5	12.13 12.52	12.51 12.96	12.68 13.27	12.89 13.56	13.33 14.08
Golf Course Timber Footbridge over North Creek	3 / 2.092	"	10.7	9.87 10.25	10.46 10.88	10.85 11.20	11.14 11.47	11.62 11.79
Mac Ewen Drive over North Creek	3 / 1.746	"	13.90	8.14 8.52	8.74 9.13	9.10 9.45	9.38 9.70	9.90 10.10
Golf Course Concrete Footbridge over North Creek	3 / 1.667	"	12.55	7.22 7.52	7.70 8.06	8.03 8.33	8.27 8.57	8.70 8.94
Golf Course Bridge/Spillway over South Lateral	4 / 0.053	"	10.29	8.98 9.28	9.45 9.76	9.72 10.04	9.93 10.35	10.33 10.80
Mac Ewen Drive over South Lateral	6 / 0.578	"	12.14	9.36 10.32	10.29 11.53	10.86 12.17	11.36 12.51	12.22 12.80
Golf Course Bridge over South Lateral	6 / 0.477	"	11.9	9.00 9.32	9.49 9.81	9.76 10.10	9.98 10.41	10.40 10.88
Golf Course Concrete Bridge over South Lateral	6 / 0.397	"	11.37	9.00 9.32	9.49 9.81	9.76 10.09	9.98 10.41	10.40 10.87
Golf Course Concrete Bridge over South Lateral	6 / 0.314	"	12.55	9.00 9.31	9.49 9.80	9.76 10.09	9.98 10.40	10.39 10.86

⇐ This design reflects LOS deficiency				*Top # = Existing Conditions w/Existing Land Use* *Bottom # = Existing Conditions w/Future Land Use* Computed Peak Stage (Ft. NGVD)				
Location	**Reach No./ X-Section**	**LOS Category**	**Elevation (Ft.NGVD)**	**2 Year**	**5 Year**	**10 Year**	**25 Year**	**100 Year**
Bay Oaks Estates, Unit II, Driveway Culvert over South Lateral	7 / 1.679	Neighborhood	15.28[1]	14.79 14.55	15.42 15.06	15.48 15.39	15.55 15.48	15.65 15.63
Longbow Trail Driveway Culvert over South Lateral	7 / 1.607	"	15.61[1]	14.77 14.56	15.41 15.05	15.47 15.38	15.55 15.47	15.65 15.63
Shotgun Lane Driveway Culvert over South Lateral	7 / 1.394	"	15.37[1]	14.12 14.37	14.59 14.71	14.70 14.82	14.93 15.03	15.23 15.31
Trinity Acres Driveway Culvert over South Lateral	7 / 1.290	"	14.92[1]	14.05 14.34	14.51 14.66	14.69 14.82	14.82 14.95	15.08 15.17
Faith Avenue Driveway Culvert over South Lateral	7 / 1.207	"	14.72[1]	13.96 14.29	14.42 14.62	14.60 14.79	14.74 14.93	15.02 15.14
School Board Facility Driveway Culvert over South Lateral	7 / 1.165	"	14.58[1]	13.69 14.13	14.29 14.53	14.51 14.72	14.67 14.87	14.97 15.10
School Board Facility Driveway Culvert over South Lateral	7 / 1.057	"	14.71[1]	13.08 13.51	13.92 14.34	14.31 14.57	14.51 14.73	14.85 14.98
School Board Facility Driveway Culvert over South Lateral	7 / 0.977	"	14.49[1]	12.05 12.64	13.04 13.77	13.63 14.32	14.16 14.54	14.66 14.82
Bay Street/Old Venice Road Culvert over South Lateral	7 / 0.898	Collector	14.58[1]	10.65 11.36	11.67 12.81	12.38 13.56	13.00 14.16	14.33 14.56
Bay Street/Old Venice Road Culvert over South Lateral	7 / 0.8848	"	14.38[2]	10.40 11.03	11.23 12.31	11.83 13.03	12.39 13.49	13.48 13.81
Bay Street/Old Venice Road Culvert over South Lateral	7 / 0.8078	"	14.21[2]	10.12 10.70	10.77 11.85	11.25 12.50	11.75 12.89	12.70 13.21
Preymore Street over North Lateral	10 / 0.264	Neighborhood	12.63[3]	8.99 8.99	9.82 9.82	10.84 10.84	12.39 12.39	14.16 14.31
Golf Course Over North Lateral	10 / 0.235	"	14.0[4]	8.30 8.30	9.07 9.07	9.82 9.82	10.91 10.91	14.07 14.22
Mac Ewen Drive over North Lateral	10 / 0.160	"	13.5[4]	7.40 7.40	8.20 8.20	8.80 8.80	9.48 9.48	11.81 12.39
Golf Course Over North Lateral	10 / 0.096	"	11.7[4]	6.51 6.51	7.26 7.27	7.81 7.81	8.33 8.33	9.89 10.46

⇐ This design reflects LOS deficiency				*Top # = Existing Conditions w/Existing Land Use* *Bottom # = Existing Conditions w/Future Land Use* **Computed Peak Stage (Ft. NGVD)**				
Location	**Reach No./ X-Section**	**LOS Category**	**Elevation (Ft.NGVD)**	**2 Year**	**5 Year**	**10 Year**	**25 Year**	**100 Year**
Mac Ewen Drive Over North Lateral	10 / 0.0478	Neighborhood	11.6[4]	4.16 4.30	4.82 4.97	5.31 5.53	5.94 6.21	7.42 7.80
Golf Course Concrete Bridge over North Creek	11 / 1.174	"	10.19	3.02 3.24	3.57 3.80	3.90 4.13	4.21 4.48	4.78 5.15
Oaks Development Berm Over Osprey Acres North Lateral	13 / 0.044	"	14.5[5]	11.17 11.18	11.56 11.57	11.70 11.74	12.32 12.39	12.89 12.91
Utility Crossing over North Creek	14 / 0.627	"	8.04[6]	2.41 2.53	2.76 2.93	3.02 3.21	3.29 3.52	3.80 4.16
Northbound U.S. Hwy. 41 Bridge over North Creek	14 / 0.620	Evacuation	8.96[7]	2.34 2.44	2.62 2.76	2.83 2.98	3.05 3.24	3.48 3.77
Southbound U.S. Hwy. 41 Bridge over North Creek	14 / 0.609	"	8.96[7]	2.26 2.33	2.46 2.56	2.62 2.74	2.80 2.95	3.16 3.41
Glenwood Avenue south of Church Street	8 / SA-39	Neighborhood	12.89[9]	12.20 12.30	12.42 12.43	12.44 12.46	12.45 12.76	12.48 13.05
Glenwood Avenue north of Church Street	13 / SA-38	"	12.61[10]	13.04 13.08	13.77 13.79	14.10 14.11	14.24 14.24	14.44 14.45
Patterson Avenue south of Church Street	8 / SA-39	"	14.04[11]	12.20 12.30	12.42 12.43	12.44 12.46	12.45 12.76	12.48 13.05
Patterson Avenue north of Church Street	13 / SA-38	"	14.02[12]	13.04 13.08	13.77 13.79	14.10 14.11	14.24 14.24	14.44 14.45
Pennsylvania Avenue south of Church Street	8 / SA-39	"	13.80[13]	12.20 12.30	12.42 12.43	12.44 14.46	12.45 12.76	12.48 13.05
Pennsylvania Avenue north of Church Street	13 / SA-38	"	14.35[14]	13.04 13.08	13.77 13.79	14.10 14.11	14.24 14.24	14.44 14.45
Washington Avenue south of Church Street	8 / SA-39	"	13.07[15]	12.20 12.30	12.42 12.43	12.44 12.46	12.45 12.76	12.48 13.05
Washington Avenue north of Church Street	13 / SA-37	"	14.24[16]	13.53 13.55	14.18 14.19	14.23 14.24	14.26 14.26	14.27 14.27
Ogburn Street	8 / SA-39	"	12.42[17]	12.20 12.30	12.42 12.43	12.44 12.46	12.45 12.76	12.48 13.05

⇐ This design reflects LOS deficiency				*Top # = Existing Conditions w/Existing Land Use* *Bottom # = Existing Conditions w/Future Land Use* **Computed Peak Stage (Ft. NGVD)**				
Location	**Reach No./ X-Section**	**LOS Category**	**Elevation (Ft.NGVD)**	**2 Year**	**5 Year**	**10 Year**	**25 Year**	**100 Year**
Oak Street	8 / SA-39	Neighborhood	14.30[18]	12.20 12.30	12.42 12.43	12.44 12.46	12.45 12.76	12.48 13.05
Church Street	13 / SA-38	"	12.61[10]	13.04 13.08	13.77 13.79	14.10 14.11	14.24 14.24	14.44 14.45
Green Street	13 / SA-38	"	13.31[19]	13.04 13.08	13.77 13.79	14.10 14.11	14.24 14.24	14.44 14.45

[1]Edge of pavement on south side of Bay Street
[2]Edge of pavement on north side of Bay Street
[3]Edge of pavement on north side of Preymore Street
[4]From Construction Plans for "Oaks II Off-Site Stormwater Conveyance Preymore Road to North Creek; Post, Buckley, Schuh & Jernigan, Inc., May 9, 1990, Sheets 1, 2, and 3 of 3"
[5]Ground elevation at the extension of Glenwood Avenue. The Oaks Development berm is estimated to be higher than elevation 14.5' at this location (estimate is based on visual inspection)
[6]Bottom of beam supporting utility pipe
[7]Roadway elevation on northbound U.S. 41 on north side of bridge
[8]Top of trestle
[9]Curb inlet throat at southwest corner of intersection of Glenwood Avenue with Church Street
[10]Curb inlet throat at northwest corner of intersection of Glenwood Avenue with Church Street
[11]Edge of pavement at southeast corner of intersection of Patterson Avenue with Church Street
[12]Edge of pavement at northwest corner of intersection of Patterson Avenue with Church Street
[13]Edge of pavement at west side of Pennsylvania Avenue, approximately 200' north of intersection of Pennsylvania Avenue with Oak Street
[14]Edge of pavement at northeast corner of intersection of Pennsylvania Avenue with Church Street
[15]Edge of pavement at west side of Washington Avenue, approximately 370' south of intersection of Washington Avenue with Church Street
[16]Edge of pavement at east side of Washington Avenue, approximately 400' south of intersection of Washington Avenue with U.S. 41
[17]Top of grate on inlet at northwest corner of intersection of Ogburn Street with Glenwood Avenue
[18]Edge of pavement at north side of Oak Street, approximately 150' west of intersection of Oak Street with Pennsylvania Avenue
[19]Edge of pavement at south side of Green Street, approximately 60' west of intersection of Green Street with Glenwood Avenue
[20]Edge of pavement – provided by Sarasota County, based on a survey of Pine Ranch East Road
[21]Edge of pavement – provided by Sarasota County, based on a survey of Pine Ranch East Road