ATTACHMENT F-4

8TH AVE. DRAINAGE IMPROVEMENTS

Drainage Study

8th Avenue West between 4th Street West and 17th Street West

I. Introduction

The City of Palmetto has been experiencing flooding conditions during minor rainfall events along Business Route US 41 (8th Avenue West) between 4th Street West and 17th Street West. Please refer to *Map A* for the Project Location Map. This roadway is used as a local evacuation route and an emergency route for fire, police, and ambulance services in the community. Response times may be delayed during inclement weather due to flooding along this street. Please refer to *Map D* for Manatee County's Evacuation Routes and Zones.

The City of Palmetto has determined that the situation requires improvement to provide essential services to the constituents whom depend upon these services within the community. The City has initiated a study to identify the causes of these flooding conditions, with the intent to address the situation in the future as funds become available and in partnership with the Florida Department of Transportation (FDOT).

The study began with researching prior drainage studies of this area prepared for the City of Palmetto and/or Manatee County. Most notable of the studies are the Master Stormwater Drainage Plan – Area "B" study prepared by Briley, Wilde and Associates, Inc. in April 1986 for Manatee County, and the Master Drainage Plan prepared by Smith and Gillespie Engineers, Inc. in March 1997 for the City of Palmetto. These studies were broad in nature and covered areas outside the scope of this study. No actual calculations were provided to determine the existing flow lines, pipe sizes, or specific routing throughout most of the drainage basins.

Research also included recovering Record Drawings of the existing infrastructure from the FDOT, the Southwest Florida Water Management District (SWFWMD), Manatee County, and the City of Palmetto. These Record Drawings provided the best available

information concerning flow lines and pipe sizes in the basins studied. There are five drainage systems serving Business Route US-41 (8th AvenueWest) between 4th Street West and 17th Street West; only four of the basins are covered by the Record Drawings and detailed maps. Refer to *Figure A* for the basins covered by the Record Drawings.

II. Existing Conditions

Most of the drainage basins reported in the prior studies are inadequate to provide containment of the 25-year storm event. Urbanization of the basins has exasperated the already inadequate systems causing an increased risk of flooding. Most of the urban systems are reported to be unable to handle a 5-year storm event without overflowing the system, thus causing flooding, traffic obstructions, and economic loss to adjacent residents and business property owners. A few improvements in the study area have slightly alleviated the situation, but the majority of the systems still appear to be inadequate to service an emergency evacuation route. The report prepared by Smith and Gillespie Engineers, Inc. suggests that the FDOT criteria be used for modeling and design purposes. This would indicate that the proposed urban storm sewer systems were designed for the 5-year storm event in flood prone areas and the 3-year storm event in other urban areas.

The single basin that was designed for the 25-year storm event is the basin including the 10th Avenue West and 10th Street West Stormwater Drainage Improvements. This new stormwater system has improved drainage for small portions of the northern basins along 8th Avenue West that discharge to the west.

The City of Palmetto is a coastal community, and as such, it is affected by the influence of ocean tides from both the Manatee River and Terra Ceia Bay. The local Federal Emergency Management Agency (FEMA) 100-year flood elevation due to tidal influence near the intersection of 8th Avenue West and 4th Street West is at an elevation of 10.0 feet above sea level. Please refer to *Map B* for the FEMA Flood Area Map and *Map F* for the County's adopted Sea, Lake, and Overland Surges for Hurricanes (SLOSH) map. The

remainder of the project north of 4th Street West is not indicated to be located within the flood zone. There have been documented instances of flooding in the City that were not due to a rainfall event, but rather due to rising tides that have inundated the City infrastructure. The flood boundary is substantiated by the Manatee County Geographic Information System (GIS) mapping of this area. Our model uses an elevation of 3.0 feet for the tailwater condition resulting from a 3-year storm event and the corresponding tidal influence.

Manatee County GIS maps indicate a much more dramatic impact to the City of Palmetto due to the 100-year storm event. Manatee County GIS also indicates major flooding due to a Category 5 Storm surge. These predictions appear to be conservative and are not considered in the development of this study. They are mentioned for informative purposes only.

Smith and Gillespie, Inc. identified flooding problems along 8th Avenue West between 12th Street West and 14th Street West, at the intersection of 8th Avenue West and 8th Street West, and at the intersection of 4th Avenue West and 7th Street West. These locations coincide with the reported flooding experienced by the City during recent storm events.

III. Methodology

The systems were modeled with HydraFlow8 using the existing information available from the Record Drawings. Assumptions were made about the capacities of the systems based on inlet size and standard inlet capacity. Standard inlet capacities range from 5 to 7 cubic feet per second (cfs) per inlet without undo storage around the inlet. This led to the assumption that a standard inlet in the Florida Department of Transportation Rainfall Region 6 could handle approximately one acre of direct runoff without impounding water greater than 6 inches in depth and causing unacceptable flooding. Thus, each inlet in the system was assigned one acre of basin area and a runoff coefficient of 0.75 based on urbanized conditions. The basins were identified in the study area based on the inlet

locations and provide anticipated runoff in these areas. The inlets located along the pipe discharging outside of the study area were accumulated and assigned at random places to provide the expected pipe surcharges.

Invert elevations and grate elevations were gathered from the Record Drawings, if available; otherwise, inverts were assumed based on engineering judgment and field observations. Inlets are assumed to be in sag conditions to assure all water is introduced to the pipe system, rather than flowing down the street through the gutter. Existing ground elevations were approximated from the SWFWMD Aerial Photogrammetric Maps if they were not provided in the Record Drawings. It should be noted this is a detailed model, but the results are not exact because of the restraints caused by the lack of an actual field survey.

IV. AREA 1 – 8th Avenue West from 13th Street West to 14th Street West (Oakridge Subdivision)

The updated Oak Ridge Subdivision accepts water from 8th Avenue West and drains east to Carr Drain Canal. Refer to *Figure B1* for an aerial of this system. This system is inadequate to transport the 3-year storm event without surcharging the inlets and causing flooding along 8th Avenue West. The models included indicate this system will not function properly for a 3-year, 5-year or 25-year storm event. The *Area 1 Tab* also contains the model results for this system.

V. AREA 2 – 8th Avenue West from 8th Street West to 9th Street Drive West

The newer system servicing 10th Avenue West appears to be functioning well and also appears to be designed for the 25-year storm event. This system captures runoff from the area immediately south of 11th Street West and from 9th Street West to 8th Street West along 8th Avenue West. The inlets and connecting pipes along 8th Avenue West were not upgraded with the new system, but have lower tailwater conditions to overcome to function more efficiently. The older system servicing 8th Avenue West between 8th Street West and 9th Street West appears to be inadequately sized and is incapable of transporting

the runoff from a 3-year storm event without surcharging the inlets and causing flooding along 8th Avenue West. Refer to *Figure C1* for an aerial of this system. The models included indicate that this system will not function properly for a 3-year, 5-year or 25-year storm event. The *Area 2 Tab* also contains the model results for this system.

VI. AREA 3 – 8th Avenue West from 5th Street West to 7th Street West

The older system servicing 8th Avenue West between 5th Street West and 7th Street West appears to be inadequately sized and is incapable of transporting the runoff from a 3-year storm event without surcharging the inlets and causing flooding along 8th Avenue West. Refer to *Figure D1* for an aerial of this system. The models included indicate that this system will not function properly for a 3-year, 5-year or 25-year storm event. The *Area 3 Tab* also contains the model results for this system.

VII. AREA 4 – 8th Avenue West from 4th Street West to 5th Street West

The older system servicing 8th Avenue West between 4th Street West and 5th Street West appears to be inadequately sized and is incapable of transporting the runoff from a 3-year storm event without surcharging the inlets and causing flooding along 8th Avenue West. Refer to *Figure E1* for an aerial of this system. The models included indicate that this system will not function properly for a 3-year, 5-year or 25-year storm event. The *Area 4 Tab* contains the model results for this system.

VIII. Conclusions

The design of underground storm sewer systems for high frequency (3-year) storm events has resulted in numerous pipe systems that appear to be too small to deliver the required level of service along emergency access routes during minor rainfall events. Flooding is expected along Business Route US-41 in several locations due to undersized piping downstream and tidal influence. These locations include 4th Street West, 7th Street West, and the area between 12th Street West and 14th Street West. During periods of high winds,

it may be possible to observe flooding in these areas even due to 'storm surge' conditions alone.

IX. Recommendations

As previously noted, few of the existing systems are functioning as desired to prevent flooding of the local streets. This fact, combined with the age of the existing system, indicates most pipes will need to be replaced in the near future. Replacement should be accomplished along with upsizing to accommodate the minimum 3-year storm event, as required by current City codes. The replacement costs for the pipes and structures in the study area have been analyzed but do not include utility relocations, paving replacement, or other costs associated with the final project. The total cost for the 8th Avenue West drainage improvements are approximately $900,000. When the other associated costs are considered, the sum will likely exceed $1.75 million for the four systems studied. Each of the systems could be considered stand-alone and be constructed independent of the others. This would allow the City to spread the costs over an extended period if so desired, but improvements to a single system will not relieve the flooding conditions experienced along 8th Avenue West in the other drainage basins identified.

In the model, we began upsizing the pipes at the lower end of the systems in hopes to minimize costs and avoid having to replace entire systems. However, even with these changes, few of the pipes could handle the 3-year storm event. The majority of the pipes will need to be increased in size to minimize the flooding. No attempt was made to provide a system without surcharge during the 3-year storm event, again in the attempt to minimize costs. With the upsizing of the pipes at the lower end of the systems, most of the inlets will store water during a 3-year storm event, but the inlets and pipes will not overflow as they currently do during this storm. The systems will not be able to handle the less frequent storm events and will overflow into the streets during the more intense rainfall occurrences, though the depth of this overflow should be less than that currently experienced.

As discussed in this report, a significant number of pipes and structures will need to be upsized in order to improve existing drainage conditions along 8th Avenue within the study corridor. A breakdown of estimated cost by *Area* is provided below:

Cost Estimate for Proposed Improvements				
	Pipes	**Inlets**	**Manholes**	**Subtotal**
Area 1	$217,799	$55,000	$15,000	$287,799
Area 2	$148,082	$25,000	$25,000	$198,082
Area 3	$235,308	$15,000	$40,000	$290,308
Area 4	$97,929	$20,000	$5,000	$122,929
			TOTAL	**$899,118**

Each *model* indicates the number of upsizing requirements needed to improve conditions in the four study areas. Other improvements may be needed beyond the study area to provide free flow movement throughout other parts of the systems; however, these upgrades will alleviate flooding within the study areas and assist in the overall hydraulic flow of the system. Additionally, the cost estimates do not include permitting, construction, installation, demolition, or right-of-way acquisition. The proposed systems analysis and costs are included with each *Area Tab* of this report.

Designed by:	MTS	Date: JUNE 2008	
Drawn by:	DMI	Job No. P5901	
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Approved by:	JCP	*Certificate of Authorization No. 3215*	
Scale:	N.T.S	© 2008	

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PROPOSED 8TH AVE IMPROVEMENTS
13TH STREET WEST TO 14TH STREET WEST
CITY OF PALMETTO
PALMETTO/MANATEE, FLORIDA

FIGURE
B2

Storm Sewer Summary Report

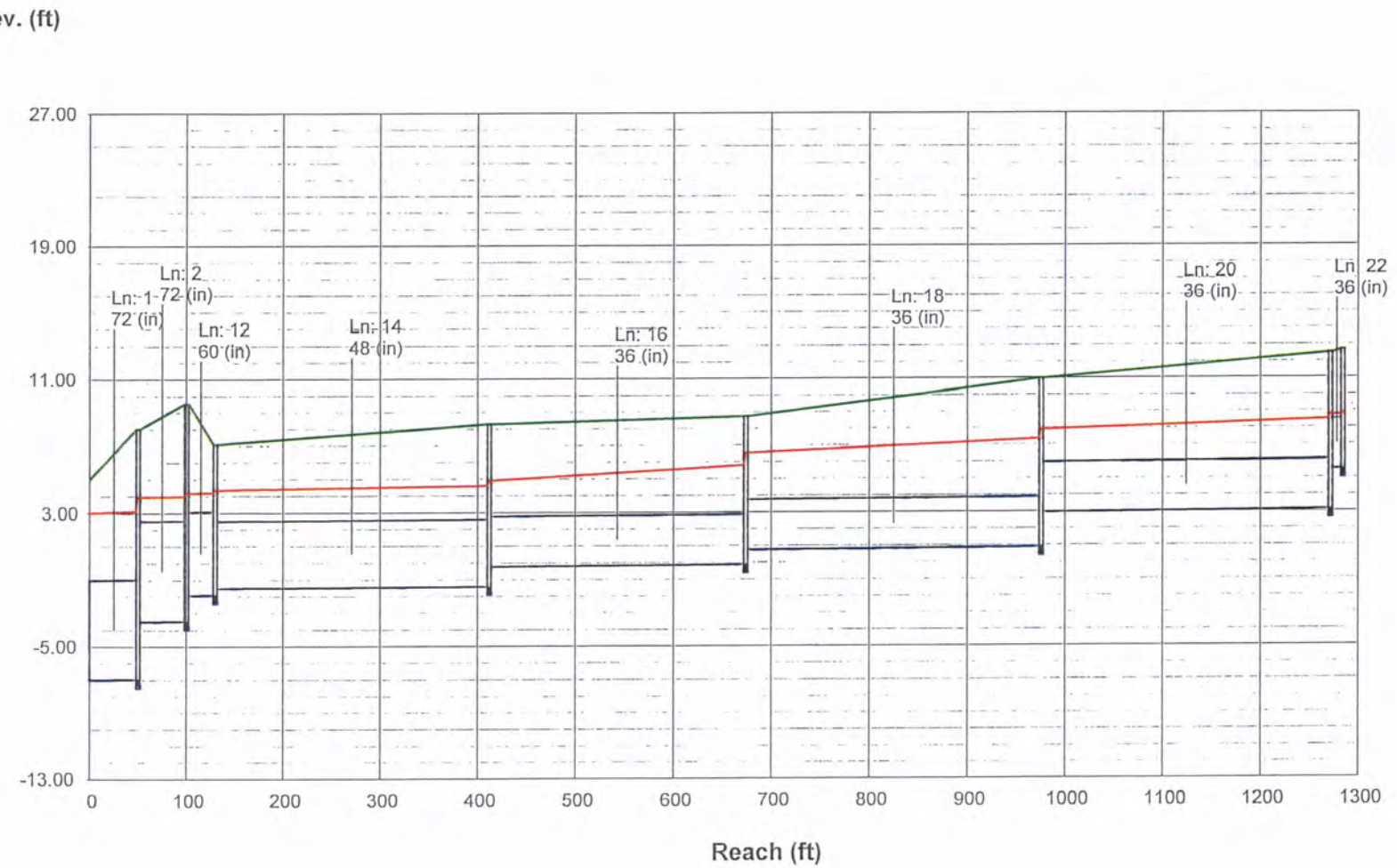
Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	Dns line No.
1		168.4	72 c	50.0	-7.00	-6.99	0.020	3.00*	3.08*	0.83	End
2		104.5	72 c	50.0	-3.50	-3.49	0.020	3.91*	3.94*	0.21	1
3		54.96	60 c	160.0	-0.27	-0.22	0.031	4.73	4.78	0.06	2
4		32.68	36 c	130.0	1.02	1.08	0.046	4.84*	5.15*	0.33	3
5		32.68	36 c	24.0	1.08	1.10	0.083	5.49*	5.54*	0.50	4
6		5.94	18 c	20.0	3.10	3.12	0.100	6.04*	6.11*	0.18	5
7		23.27	36 c	515.0	1.62	1.91	0.056	6.04*	6.67*	0.25	5
8		9.41	18 c	9.0	2.93	2.94	0.111	6.92*	6.99*	0.07	7
9		9.41	18 c	9.0	2.94	2.95	0.111	7.06*	7.13*	0.44	8
10		8.67	24 c	334.0	3.45	3.85	0.120	6.92*	7.41*	0.18	7
11		3.22	18 c	22.0	6.00	6.05	0.227	7.59*	7.61*	0.05	10
12		49.52	60 c	30.0	-1.94	-1.93	0.033	4.15*	4.16*	0.15	2
13		1.98	18 c	20.0	2.01	2.07	0.300	4.31*	4.32*	0.02	12
14		44.56	48 c	282.0	-1.53	-1.43	0.035	4.31*	4.58*	0.29	12
15		1.98	18 c	20.0	3.21	3.27	0.300	4.87*	4.88*	0.02	14
16		39.61	36 c	262.0	-0.23	-0.12	0.042	4.87*	5.80*	0.73	14
17		1.98	18 c	20.0	3.67	3.73	0.300	6.53*	6.54*	0.02	16
18		34.66	36 c	302.0	0.73	0.87	0.046	6.53*	7.35*	0.56	16
19		1.98	18 c	20.0	5.90	5.96	0.300	7.91*	7.91*	0.02	18
20		29.71	36 c	296.0	2.96	3.10	0.047	7.91*	8.49*	0.27	18
21		14.85	36 c	8.0	5.50	5.51	0.125	8.77*	8.77*	0.07	20
22		14.85	36 c	12.7	5.50	5.51	0.079	8.77*	8.78*	0.07	20

Project File: Improvements - 8th Ave. from 13th St. W. to 14th St. W. (3-Yr).stm | Number of lines: 22 | Run Date: 06-24-2008

NOTES: c = circular; e = elliptical; b = box; Return period = 3 Yrs.; * Indicates surcharge condition.

Storm Sewer Profile

Proj. file: Improvements - 8th Ave. from 13th St. W. to 14th St. W. (3-Yr).stm



Storm Sewer Profile

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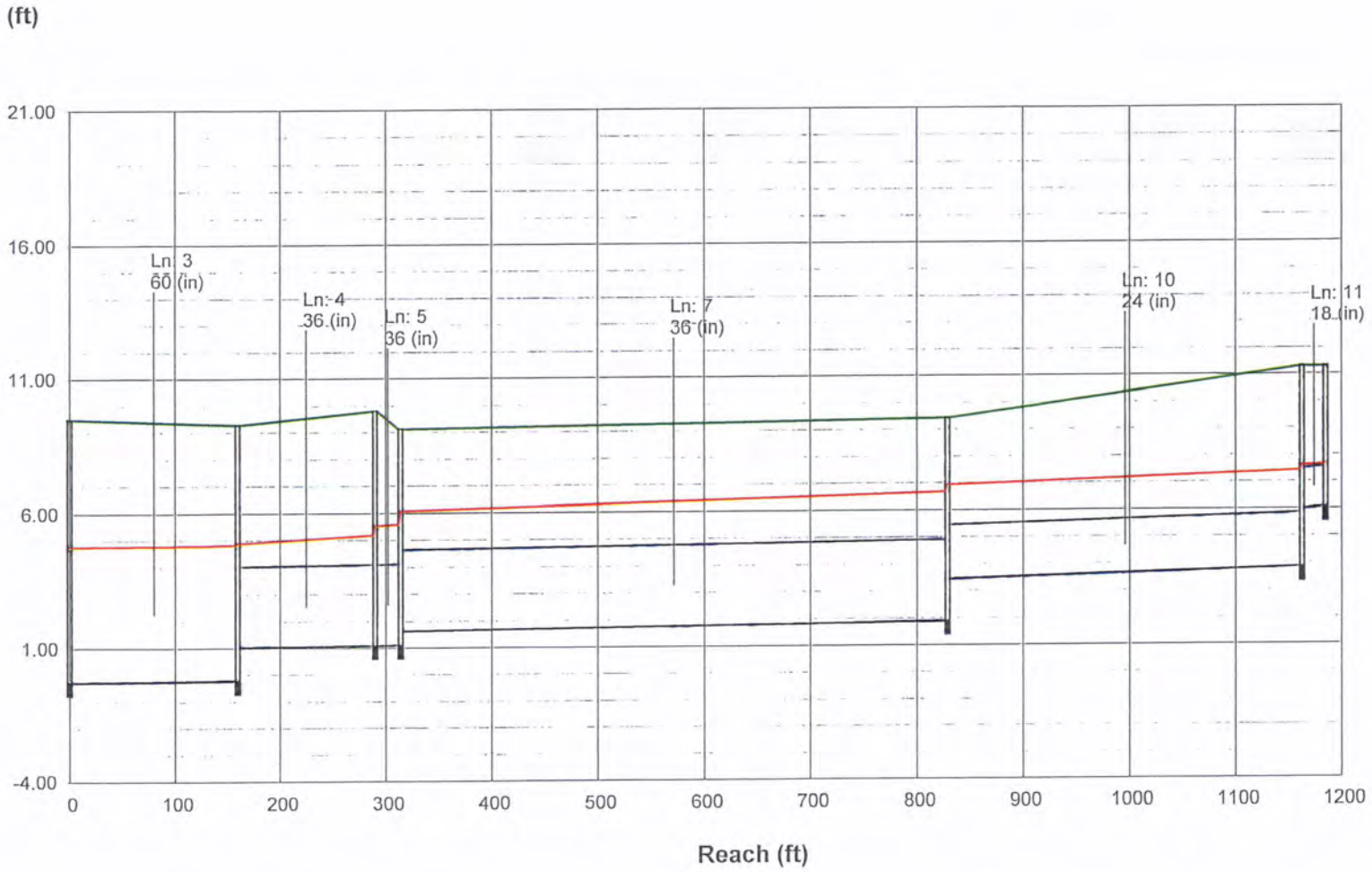
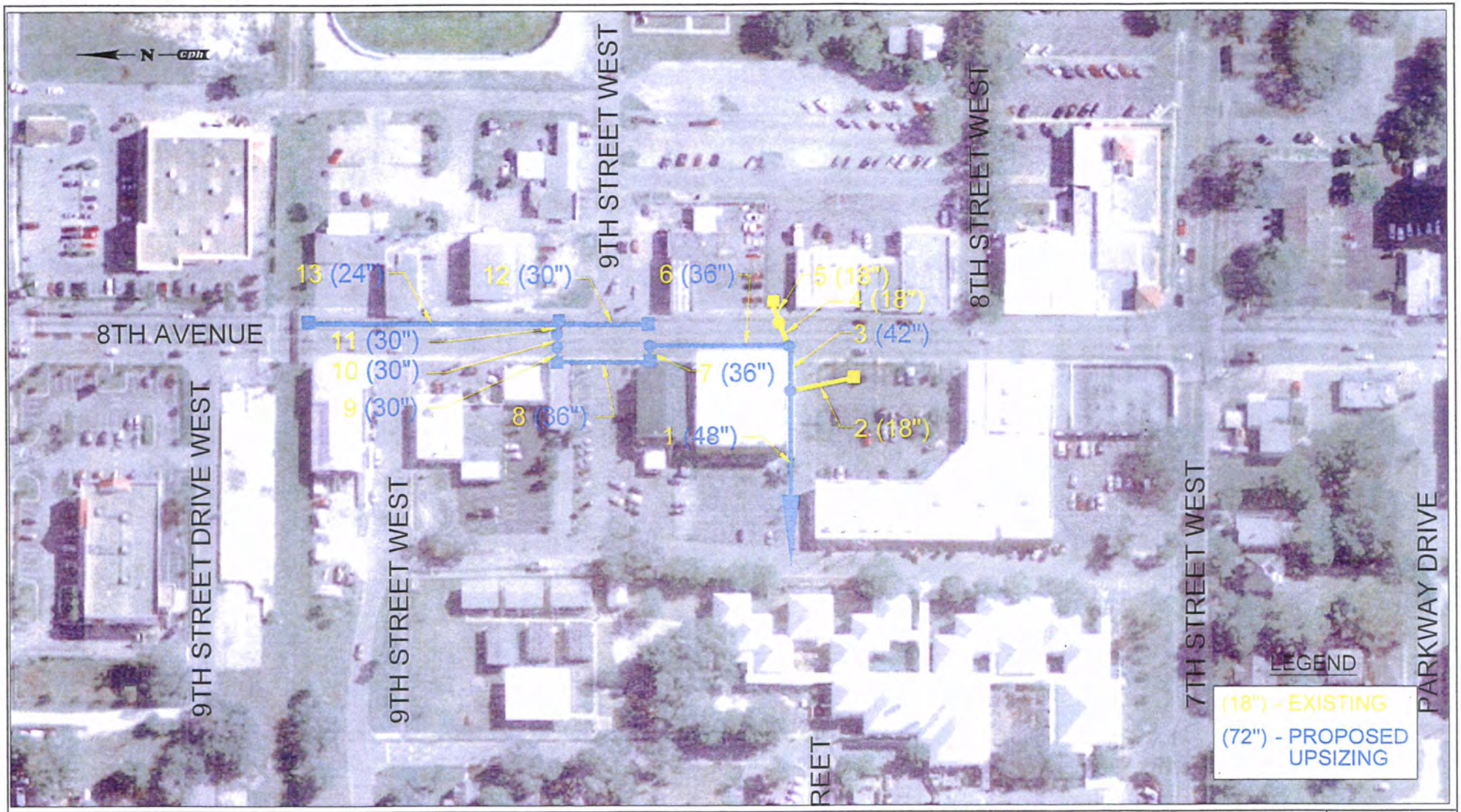


AREA 1 - Cost Estimate for Improvements

Cut (ft)	0 - 4	4 - 6	6 - 8	8 - 10	10 - 12	12 - 14	14 - 16	16 - 18	> 18	Total
Size (in)	Lft $/Lft Cost	Lft $/Lft Cost	Lft $/Lft Cost	Lft $/Lft Cost	Lft $/Lft Cost	Lft $/Lft Cost	Lft $/Lft Cost	Lft $/Lft Cost	Lft $/Lft Cost	Quantity Cost
24	46.80 $0	57.20 $0	334.0 67.60 $22,578	78.00 $0	84.50 $0	91.00 $0	97.50 $0	104.00 $0	110.50 $0	$22,578
36	57.20 $0	67.60 $0	535.5 78.00 $41,769	1000.5 88.40 $88,444	13.5 98.80 $1,334	109.20 $0	119.60 $0	126.10 $0	136.50 $0	$131,547
48	62.40 $0	72.80 $0	83.20 $0	282.0 97.50 $27,495	110.50 $0	119.60 $0	130.00 $0	143.00 $0	156.00 $0	$27,495
60	71.50 $0	84.50 $0	97.50 $0	172.5 110.50 $19,061	17.5 123.50 $2,161	136.50 $0	149.50 $0	162.50 $0	175.50 $0	$21,223
72	84.50 $0	97.50 $0	110.50 $0	123.50 $0	16.5 136.50 $2,252	66.5 149.50 $9,942	17.0 162.50 $2,763	175.50 $0	188.50 $0	$14,957
Subtot	$0	$0	$64,347	$135,000	$5,747	$9,942	$2,763	$0	$0	**$217,799**

	Quantity	Cost	
Inlets	11	$5,000	**$55,000**
Manholes	3	$5,000	**$15,000**

Total	**$287,799**



Designed by:	MTS	Date: JUNE 2008	
Drawn by:	DMI	Job No. P5901	
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Approved by:	JCP	*Certificate of Authorization No. 3215*	
Scale:	N.T.S.	© 2008	

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PROPOSED 8TH AVE IMPROVEMENTS
8TH STREET WEST TO 9TH STREET DRIVE WEST
CITY OF PALMETTO
PALMETTO/MANATEE, FLORIDA

FIGURE
C2

Storm Sewer Summary Report

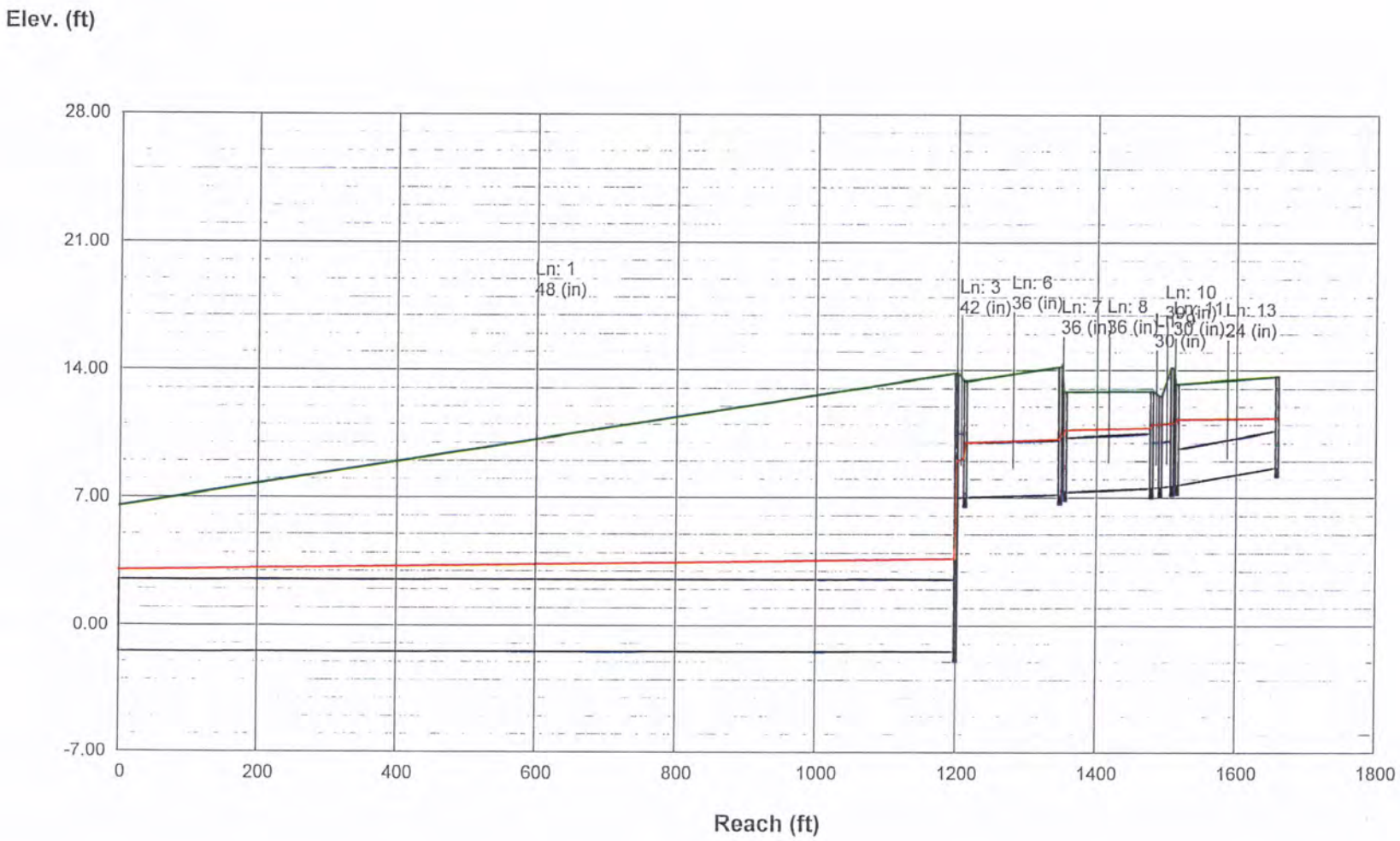
Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	Dns line No.
1		34.66	48 c	1200.0	-1.50	-1.45	0.004	3.00*	3.70*	0.12	End
2		4.95	18 c	41.6	9.06	9.48	1.010	9.78	10.83	n/a	1
3		29.71	42 c	12.7	7.00	7.03	0.236	8.98	9.16	n/a	1
4		4.95	18 c	19.8	9.11	9.25	0.709	9.92	10.60	n/a	3
5		4.95	18 c	6.0	9.25	9.35	1.667	10.60	10.59	0.16	4
6		24.76	36 c	135.8	7.03	7.16	0.096	10.03*	10.22*	0.19	3
7		24.76	36 c	6.8	7.30	7.35	0.732	10.41*	10.42*	0.29	6
8		19.81	36 c	124.0	7.30	7.50	0.161	10.70*	10.81*	0.18	7
9		14.85	30 c	12.7	7.52	7.56	0.315	11.00*	11.01*	0.02	8
10		14.85	30 c	16.8	7.56	7.63	0.417	11.03*	11.06*	0.02	9
11		14.85	30 c	7.0	7.63	7.69	0.857	11.08*	11.09*	0.21	10
12		4.95	30 c	124.0	7.73	8.50	0.621	11.30*	11.32*	0.02	11
13		4.95	24 c	143.0	7.69	8.65	0.671	11.30*	11.37*	0.04	11

Project File: Improvements - 8th Ave. from 8th St. W. to 9th St. Dr. W. (3-Yr).stm | Number of lines: 13 | Run Date: 06-24-2008

NOTES: c = circular; e = elliptical; b = box; Return period = 3 Yrs.; * Indicates surcharge condition.

Storm Sewer Profile

Proj. file: Improvements - 8th Ave. from 8th St. W. to 9th St. Dr. W. (3-Yr).stm

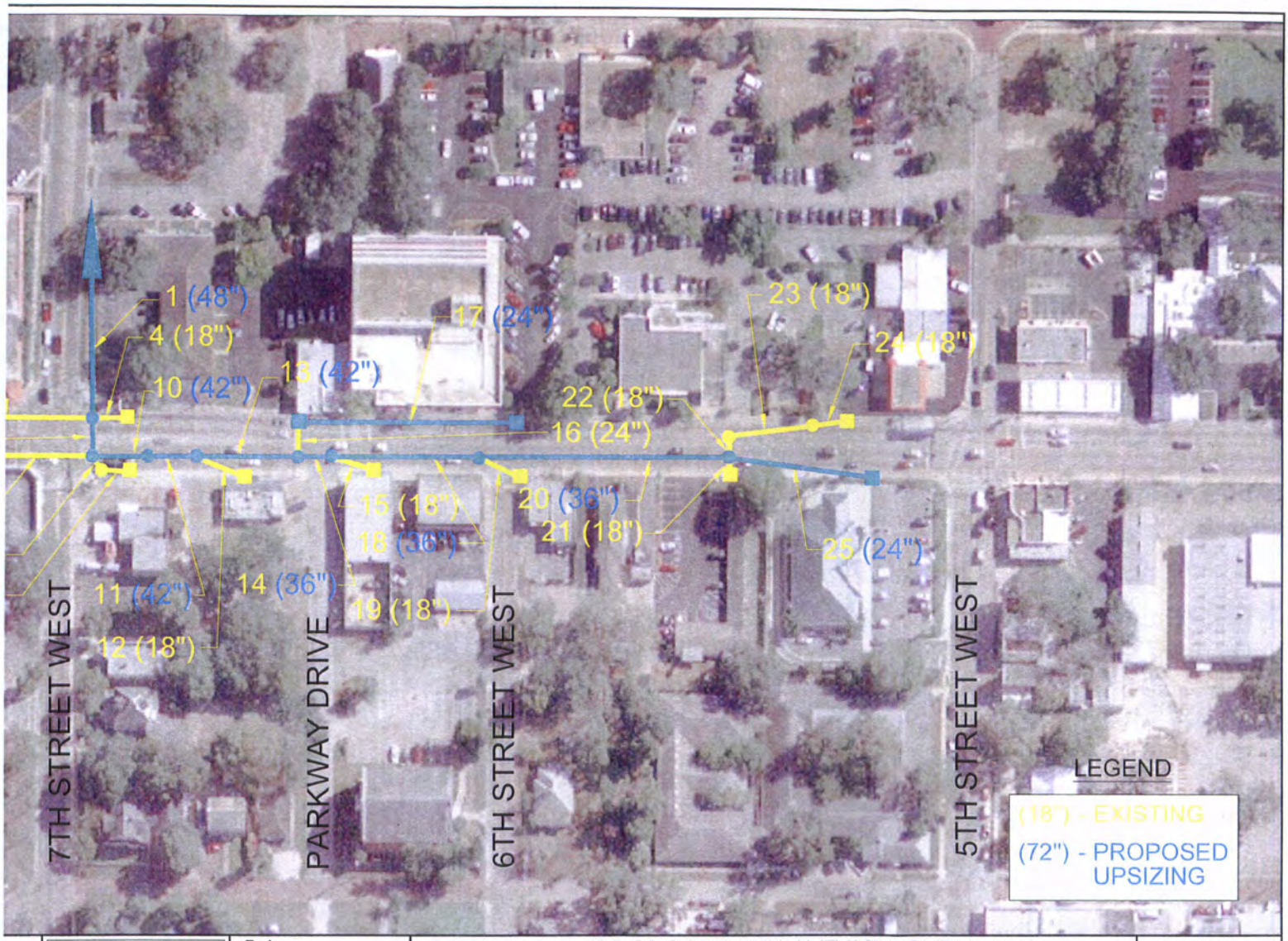


AREA 2 - Cost Estimate for Improvements

Cut (ft)	0 - 4	4 - 6	6 - 8	8 - 10	10 - 12	12 - 14	14 - 16	16 - 18	> 18	Total
Size (in)	Lft $/Lft Cost	Lft $/Lft Cost	Lft $/Lft Cost	Lft $/Lft Cost	Lft $/Lft Cost	Lft $/Lft Cost	Lft $/Lft Cost	Lft $/Lft Cost	Lft $/Lft Cost	Quantity Cost
24	46.80 $0	143.0 57.20 $8,180	67.60 $0	78.00 $0	84.50 $0	91.00 $0	97.50 $0	104.00 $0	110.50 $0	$8,180
30	21.5 52.00 $1,118	138.5 62.40 $8,642	72.80 $0	83.20 $0	93.60 $0	104.00 $0	110.50 $0	117.00 $0	123.50 $0	$9,760
36	118.0 57.20 $6,750	144.5 67.60 $9,768	3.5 78.00 $273	88.40 $0	98.80 $0	109.20 $0	119.60 $0	126.10 $0	136.50 $0	$16,791
42	59.80 $0	70.20 $0	12.5 80.60 $1,008	91.00 $0	101.40 $0	111.80 $0	123.50 $0	130.00 $0	143.00 $0	$1,008
48	217.5 62.40 $13,572	174.0 72.80 $12,667	174.0 83.20 $14,477	174.0 97.50 $16,965	174.0 110.50 $19,227	174.0 119.60 $20,810	112.5 130.00 $14,625	143.00 $0	156.00 $0	$112,343
Subtot	$21,440	$39,257	$15,757	$16,965	$19,227	$20,810	$14,625	$0	$0	**$148,082**

	Quantity	Cost	
Inlets	5	$5,000	**$25,000**
Manholes	5	$5,000	**$25,000**

Total	**$198,082**



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Engineers
Architects
Surveyors
Planners
Landscape Architects
Environmental Scientists
Construction Management
Design / Build

PROPOSED 8TH AVE IMPROVEMENTS
5TH STREET WEST TO 7TH STREET WEST
CITY OF PALMETTO
PALMETTO/MANATEE, FLORIDA

FIGURE
D2

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	Dns line No.
1		59.42	48 c	1700.0	-3.00	-2.98	0.001	3.00*	5.91*	0.35	End
2		4.95	36 c	73.0	7.90	8.95	1.438	8.41	9.91	n/a	1
3		4.95	24 c	3.0	8.95	9.05	3.333	9.91	10.18	n/a	2
4		4.95	18 c	42.0	7.95	8.02	0.167	9.45	9.52	0.12	1
5		49.52	42 c	35.0	7.90	8.36	1.314	9.51	11.31	0.51	1
6		4.95	36 c	60.0	8.36	8.54	0.300	11.82*	11.82*	0.01	5
7		4.95	24 c	2.5	8.54	8.58	1.606	11.83*	11.83*	0.04	6
8		4.95	18 c	11.0	8.36	8.40	0.364	11.82*	11.85*	0.02	5
9		4.95	18 c	25.8	8.40	8.56	0.619	11.86*	11.92*	0.12	8
10		39.61	42 c	102.0	8.36	8.43	0.069	11.86*	12.02*	0.04	5
11		39.61	42 c	50.0	8.43	8.47	0.080	12.06*	12.14*	0.20	10
12		4.95	18 c	6.3	8.38	8.40	0.316	12.33*	12.35*	0.12	11
13		34.66	42 c	110.0	8.38	8.45	0.064	12.33*	12.46*	0.20	11
14		24.76	36 c	11.0	8.45	8.52	0.636	12.67*	12.68*	0.14	13
15		4.95	18 c	13.3	8.52	8.63	0.825	12.82*	12.85*	0.12	14
16		9.90	24 c	36.0	8.45	9.02	1.583	12.67*	12.73*	0.23	13
17		4.95	24 c	260.0	9.02	9.53	0.196	12.97*	13.09*	0.04	16
18		19.81	36 c	179.0	8.52	9.11	0.330	12.82*	12.98*	0.09	14
19		4.95	18 c	6.0	9.11	9.18	1.167	13.07*	13.09*	0.12	18
20		14.85	36 c	211.0	9.11	9.50	0.185	13.07*	13.18*	0.07	18
21		4.95	18 c	6.0	9.48	9.50	0.333	13.25*	13.26*	0.12	20
22		4.95	18 c	4.5	9.48	9.50	0.444	13.25*	13.26*	0.12	20
23		4.95	18 c	21.6	9.48	9.56	0.371	13.38*	13.43*	0.05	22

Project File: Improvements - 8th Ave. from 5th St. W. to 7th St. W. (3-Yr).stm Number of lines: 23 Run Date: 06-24-2008

NOTES: c = circular; e = elliptical; b = box; Return period = 3 Yrs.; * Indicates surcharge condition.

Storm Sewer Summary Report

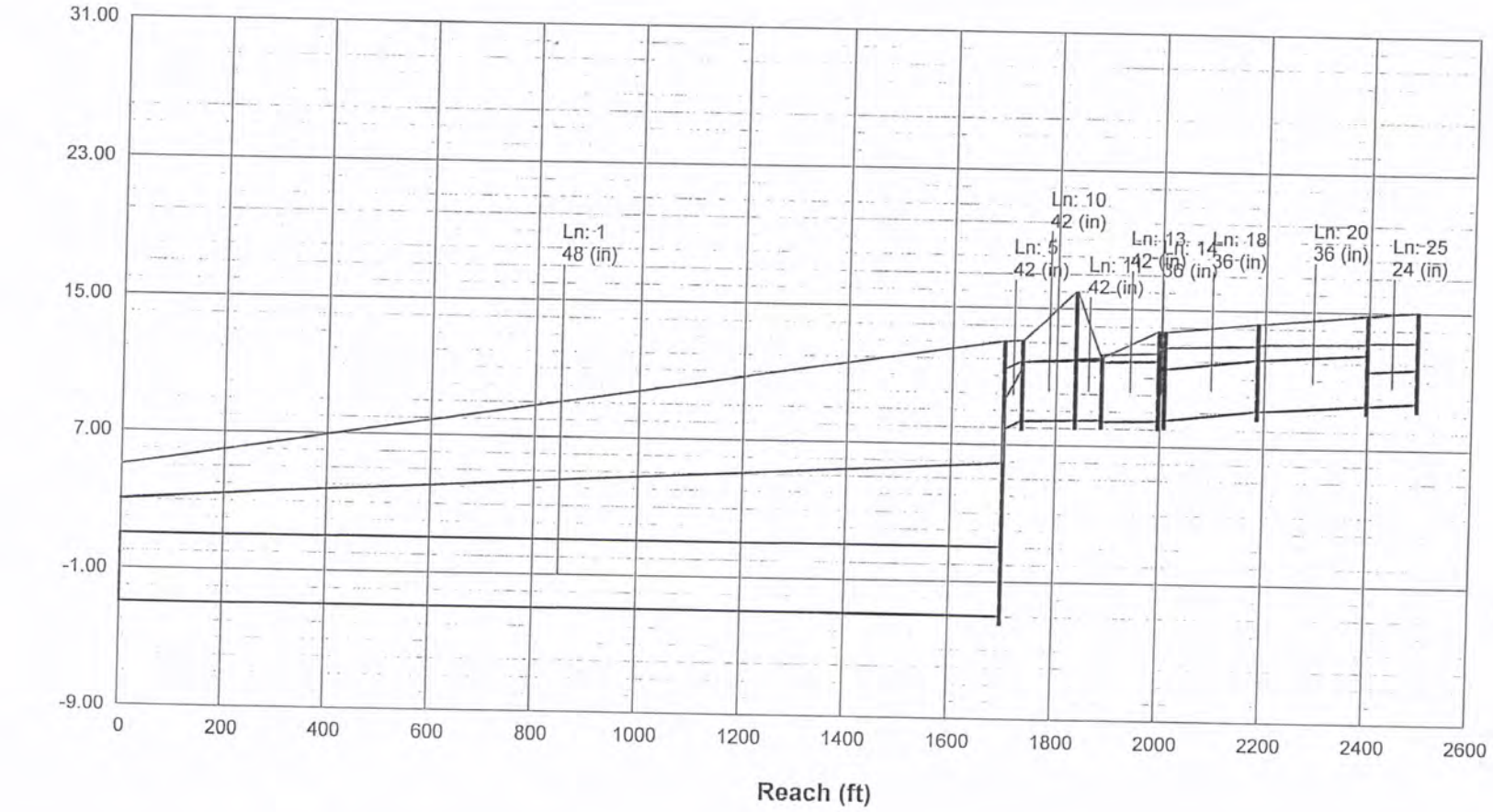
Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	Dns line No.
24		4.95	18 c	11.4	9.56	9.63	0.614	13.48*	13.51*	0.12	23
25		4.95	24 c	96.5	9.50	9.68	0.187	13.25*	13.29*	0.04	20

Project File: Improvements - 8th Ave. from 5th St. W. to 7th St. W. (3-Yr).stm Number of lines: 2 Run Date: 06-24-2008

NOTES: c = circular; e = elliptical; b = box; Return period = 3 Yrs.; * Indicates surcharge condition.

Storm Sewer Profile

Proj. file: Improvements - 8th Ave. from 5th St. W. to 7th St. W. (3-Yr).stm



AREA 3 - Cost Estimate for Improvements

Cut (ft)	0 - 4	4 - 6	6 - 8	8 - 10	10 - 12	12 - 14	14 - 16	16 - 18	> 18	Total
Size (in)	Lft $/Lft Cost	Lft $/Lft Cost	Lft $/Lft Cost	Lft $/Lft Cost	Lft $/Lft Cost	Lft $/Lft Cost	Lft $/Lft Cost	Lft $/Lft Cost	Lft $/Lft Cost	Quantity Cost
24	46.80 $0	356.5 57.20 $20,392	67.60 $0	78.00 $0	84.50 $0	91.00 $0	97.50 $0	104.00 $0	110.50 $0	$20,392
36	57.20 $0	401.0 67.60 $27,108	78.00 $0	88.40 $0	98.80 $0	109.20 $0	119.60 $0	126.10 $0	136.50 $0	$27,108
42	164.0 59.80 $9,807	133.0 70.20 $9,337	80.60 $0	91.00 $0	101.40 $0	111.80 $0	123.50 $0	130.00 $0	143.00 $0	$19,144
48	130.5 62.40 $8,143	261.5 72.80 $19,037	261.5 83.20 $21,757	261.5 97.50 $25,496	261.5 110.50 $28,896	261.5 119.60 $31,275	262.0 130.00 $34,060	143.00 $0	156.00 $0	$168,665
Subtot	$17,950	$75,873	$21,757	$25,496	$28,896	$31,275	$34,060	$0	$0	**$235,308**

	Quantity	Cost	
Inlets	3	$5,000	**$15,000**
Manholes	8	$5,000	**$40,000**

Total	**$290,308**

3215

cph

Engineers
Architects
Surveyors
Planners
Landscape Architects
Environmental Scientists
Construction Management
Design / Build

PROPOSED 8TH AVE IMPROVEMENTS
4TH STREET WEST TO 5TH STREET WEST
CITY OF PALMETTO
PALMETTO/MANATEE, FLORIDA

FIGURE
E2

Storm Sewer Summary Report

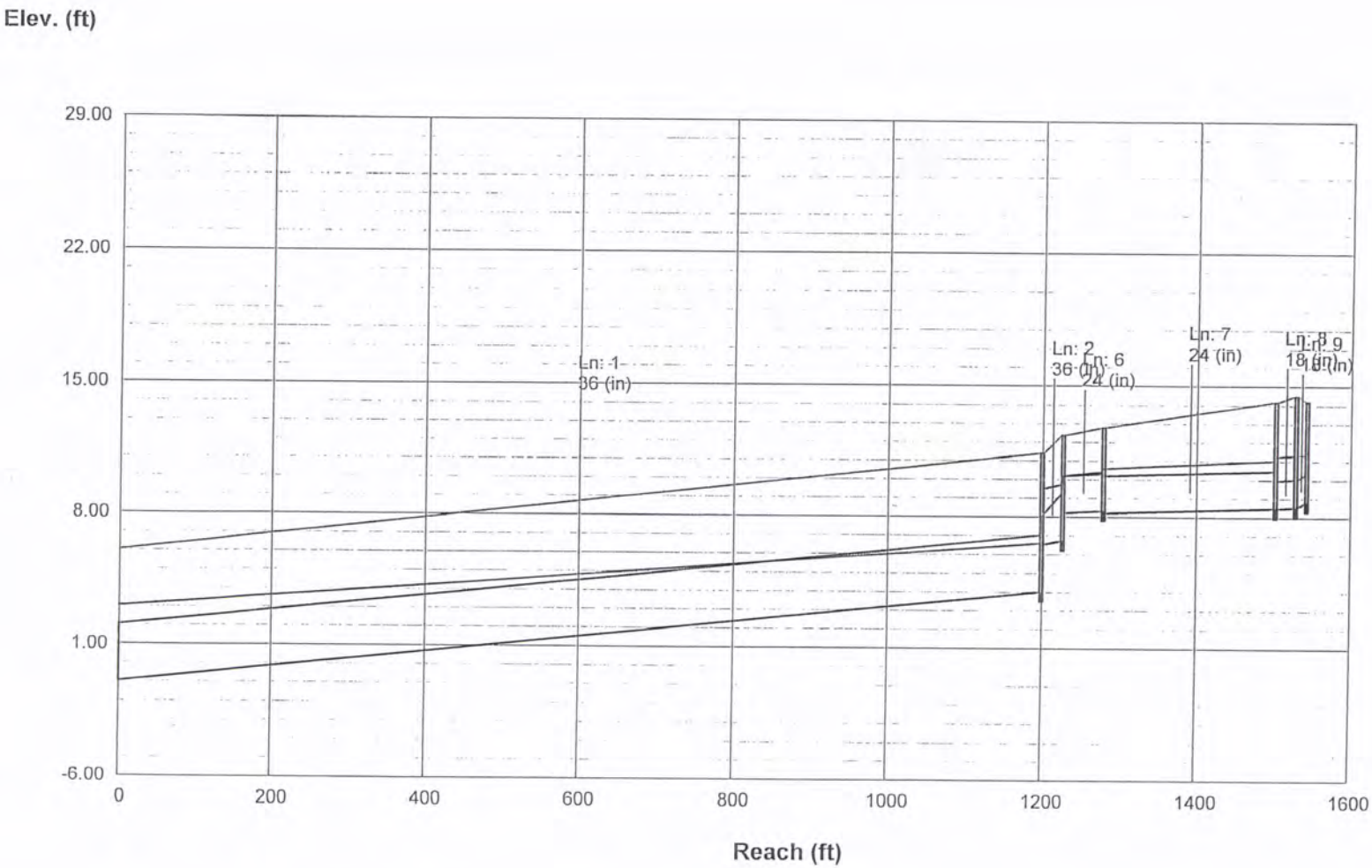
Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	Dns line No.
1	Inserted Line	34.66	36 c	1200.0	-1.00	4.00	0.417	3.00	6.59	n/a	End
2	Inserted Line	29.71	36 c	27.0	6.50	6.70	0.741	8.04	9.23	n/a	1
3	Inserted Line	14.85	24 c	41.3	8.20	8.30	0.242	10.20*	10.38*	0.52	2
4	Inserted Line	4.95	18 c	70.8	8.30	8.50	0.282	10.90*	11.06*	0.12	3
5		4.95	18 c	92.8	8.30	8.58	0.302	10.90*	11.11*	0.12	3
6		14.85	24 c	52.3	8.20	8.30	0.191	10.20*	10.43*	0.17	2
7		9.90	24 c	223.6	8.20	8.46	0.116	10.60*	11.03*	0.23	6
8		4.95	18 c	26.0	8.46	8.51	0.192	11.26*	11.32*	0.02	7
9		4.95	18 c	14.3	8.51	8.78	1.895	11.34*	11.37*	0.12	8

Project File: Improvements - 8th Ave. from 4th St. W. to 5th St. W. (3-Yr).stm Number of lines: 9 Run Date: 07-08-2008

NOTES: c = circular; e = elliptical; b = box; Return period = 3 Yrs.; * Indicates surcharge condition.

Storm Sewer Profile

Proj. file: Improvements - 8th Ave. from 4th St. W. to 5th St. W. (3-Yr).stm



AREA 4 - Cost Estimate for Improvements

Cut (ft)	0 - 4	4 - 6	6 - 8	8 - 10	10 - 12	12 - 14	14 - 16	16 - 18	> 18	Total
Size (in)	Lft $/Lft Cost	Lft $/Lft Cost	Lft $/Lft Cost	Lft $/Lft Cost	Lft $/Lft Cost	Lft $/Lft Cost	Lft $/Lft Cost	Lft $/Lft Cost	Lft $/Lft Cost	Quantity Cost
24	46.80 $0	316.5 57.20 $18,104	67.60 $0	78.00 $0	84.50 $0	91.00 $0	97.50 $0	104.00 $0	110.50 $0	$18,104
36	562.5 57.20 $32,175	402.0 67.60 $27,175	262.5 78.00 $20,475	88.40 $0	98.80 $0	109.20 $0	119.60 $0	126.10 $0	136.50 $0	$79,825
Subtot	$32,175	$45,279	$20,475	$0	$0	$0	$0	$0	$0	**$97,929**

	Quantity	Cost	
Inlets	4	$5,000	**$20,000**
Manholes	1	$5,000	**$5,000**

Total	**$122,929**