

TAB 9

# **8<sup>th</sup> AVENUE DRAINAGE IMPROVEMENTS**

### **8<sup>TH</sup> AVENUE DRAINAGE STUDY**

In October of 2007, the CRA approved entering into contract with CPH Engineering for the study of the drainage problems that the City encounters on 8<sup>th</sup> Avenue West, recognizing that substandard drainage, especially on such a major thoroughfare and evacuation route, is detrimental to the well-being of the community. The flooding experienced is also a deterrent to successful on-going revitalization.

The proposal from CPH included three tasks. Task 1 pertained to the flooding, Task 2 pertained to traffic calming and Task 3 pertained to beautification. The meeting minutes and contract scope are attached.

The CRA intended to gather appropriate documentation regarding the improvements necessary. This documentation would allow for the City to approach the FDOT for financial assistance in improving their right-of-way. The intention was to complete Task 1 and have the option of continuing with any additional tasks, dependent upon funding availability and FDOT participation.

CPH completed Task 1 of the study (attached), which included recommendations and associated cost estimates. It should be noted that the City has utilized the recommendations of the study to apply for stimulus funding for stormwater projects.

Some of the scope of work associated with Tasks 2 & 3 has since been incorporated into the findings of the County-wide mobility study, so are no longer appropriate.

#### **QUESTIONS:**

- **Should the City/CRA approach FDOT regarding the improvement of flooding conditions on and adjacent to 8<sup>th</sup> Avenue West (Business 41)?**
- **Should the CRA intend to participate in the funding of such endeavors?**
- **Should any additional action be taken at this time?**

**MINUTES &  
EXCERPT FROM SCOPE OF  
SERVICES FROM CONTRACT**

**CRA MEETING 10/10/07**

**D. Renewal of Employment Contract**

Discussion ensued regarding the terms under which the Executive Director's employment would be terminated in the event of a complete loss of funding of the CRA.

**MOTION:** Mr. Maloney moved, Mr. Frazier seconded, and a motion carried unanimously to authorize the chairman to execute the contract as written with a stipulation regarding a severance package in the event of loss of funding.

**NEW BUSINESS**

**A. Storefront Grant Applications**

**08-SF-01 Turner Chapel AMC**

**MOTION:** Mr. Maloney moved, Mr. Mollanazar seconded, and the motion carried unanimously to award Turner Chapel AMC amount not to exceed \$50,000.00 for approved improvements.

**08-SF-02 HealthQuest, Inc.**

**MOTION:** Mr. Langford moved, Mr. Frazier seconded, and the motion carried unanimously to award HealthQuest, Inc. an amount not to exceed \$41,555.23 for approved improvements.

**B. 8<sup>th</sup> Ave. Drainage Design**

**MOTION:** Mr. Maloney moved, Mr. Mollanazar seconded, and a motion carried unanimously to approve the agreement with CPH Engineers not to exceed \$64,500.00 for a drainage study of 8<sup>th</sup> Ave. W. that includes consultation with the FDOT as part of Task 1 to ensure compatibility with FDOT methodologies.

**C. Sales Contract 200 11<sup>th</sup> St. Dr. W.**

**MOTION:** Mr. Maloney moved, Mr. Frazier seconded, and the motion carried unanimously to authorize the chairman to execute a purchase contract in the amount of \$36,000.00 for 200 11<sup>th</sup> St. Dr. W.

**D. CRA Executive Director Update**

- Reported that the City has met with Publix regarding their interest in the construction of a new store at Sanctuary Cove.
- The closing on the Ford property located just north of the CBI property is scheduled for Friday.
- Bob Breeden has advised that the property purchased for the Riverside Drive development is now for sale for his original purchase price.
- Lesley has resigned and applications for a replacement are coming in to the office. Due to her resignation, I will not be attending the FRA

- b. Ecological
  - c. Environmental
  - d. Hydro geological
  - e. Structural
  - f. Value Engineering
  - g. Biological
- 3) Provide other professional services, as required, including but not limited to:
- a. Architectural
  - b. Landscape Architecture
  - c. Surveying and Mapping
  - d. Planning
  - e. Geographic Information Systems
  - f. Quality Control
  - g. Remedial Investigations
  - h. Regulatory Liaison
  - i. Contamination Assessments
  - j. Laboratory Services (via sub-consultants)
  - k. Ecological Assessments
  - l. Permitting
  - m. CADD Services
  - n. Environmental monitoring of permit requirements
- 4) Comply with all applicable Federal and State laws, City ordinances and regulations in the performance of these services.

**G. Ordering of Services**

Tasks or sub-tasks shall refer to the sequential ordering of Consultant's services under a Work Assignment and generally as detailed in this Exhibit "A" which should as applicable, be titled as follows:

**1) TASK I – 8<sup>TH</sup> AVENUE FLOODING INVESTIGATION STUDY**

- a. Per the meeting between CPH and the City on September 22, 2006, we understand, during heavy rainstorms, 8<sup>th</sup> Avenue experiences short term flooding at 7<sup>th</sup> Street West and between 11<sup>th</sup> Street and 14<sup>th</sup> Street. CPH proposes an investigation of the flooding be undertaken as listed below:
  - **Data Collection**  
We propose to obtain the original construction documents, including drainage basin maps, from FDOT for 8<sup>th</sup> Avenue between the Manatee River and 17<sup>th</sup>

Street, along with any subsequent modifications and maintenance/repair work reports. We will examine available topographic data and perform field reconnaissance to verify the extents of the drainage areas that outfall to the 8<sup>th</sup> Avenue storm piping system. We will utilize any available studies in an effort to reduce costs.

- **Flooding Analysis**

From the information gathered above, we will compile a preliminary drainage basin map and hydraulic grade line analysis using the Hydraflow stormwater model program. We will analyze the existing pipe system for the 3 and 10 year storm events with documented tailwater elevations for the Manatee River. We will utilize any available studies in an effort to reduce costs.

- **Field Verification**

If the results of the model indicate that no flooding should be occurring for the modeled storm event, we will then coordinate with FDOT personnel to jointly perform a detailed examination of the storm pipe system to verify: pipe diameters, absence of blockages or collapses, or other items that would negatively impact the flow capacity of the pipe system. Please note that MOT, life-safety, pipe-plugging, and dewatering will need to be provided by the City, or by a qualified FDOT contractor, to complete the observations.

If necessary, we will modify the flood analyses to reflect actual pipe conditions encountered in the field with the hope of obtaining model results that agree with current conditions on 8<sup>th</sup> Avenue.

- **Recommendations**

Based on the analyses performed and field reconnaissance, we will compile a preliminary report of our findings with a list of recommended improvements for consideration by the City for forwarding to FDOT District.

- b. CPH will initiate and coordinate meetings with City of Palmetto staff and regulatory agencies, as applicable.
- c. The Design Memorandum/Report will be used to support future permitting, design, and construction services tasks for

the project. These services are not included as part of this work assignment.

- d. As applicable to project requirements, CPH will conduct an analysis and provide the City with a summary report.
- e. Deliverables: CPH will submit to the City, six (6) copies of the Design Memorandum/Report together with the necessary maps and other information.

## **2) TASK II – 8<sup>TH</sup> AVENUE TRAFFIC CALMING AND “COMPLETE STREET” STUDY**

CPH understands that pedestrian safety on 8<sup>th</sup> Avenue, especially between 10<sup>th</sup> and 17<sup>th</sup> Streets needs to be improved to provide safer intersection and mid-block crossings. We recommend the following tasks be undertaken:

- **Data Collection**  
Research roadway widths, traffic counts, vehicular speed, pedestrian and bicyclist counts, and crash data to verify the feasibility of lane reduction, traffic calming, and pedestrian walkability enhancements. CPH will analyze the creation of a “Complete Street”, one that contributes to the walkability, bikability, and vehicular travel through an urban thoroughfare. We will utilize the 8<sup>th</sup> Avenue Traffic Study and the 8<sup>th</sup> Avenue Corridor Study that were conducted by the City in an effort to reduce costs.
- **Conceptual Design/Planning**  
Conceptual designs will be developed from traffic counts, traffic patterns, pedestrian and bicyclist behavior, vehicular and pedestrian crash data, and motorist travel speeds. Treatments may include, but are not limited to:
  - Extension of existing traffic islands and raised medians;
  - Construction of additional traffic islands and raised medians;
  - Chicanes;
  - Pavement Treatments (cobble, bricks, etc.);
  - “Road Diets”;
  - Lanes that curves or shifts;
  - Street Trees/Landscaped Medians;
  - Innovative Pedestrian Crosswalks;
  - Appropriate Signage; and
  - Speed Reduction



Other concepts will be based on the Institute of Transportation Engineers (ITE) recommended practices.

Based on field reconnaissance and conceptual design, we will compile a preliminary report of our recommendations for consideration by the City of Palmetto. The report will include conceptual design and City feedback with exhibits and recommendations. These items will provide the framework for future coordination with FDOT and grant applications.

CPH proposes to compile three exhibits for discussion purposes with the City and FDOT. The first exhibit will be an overview of the limits of the traffic calming study and proposed location of lane narrowing, intersection and mid-block pedestrian crossings, and other traffic calming elements. Additionally, the limits of construction for the possible drainage improvements to address the flooding in Task 1 will be shown. The second exhibit will consist of a typical cross section showing the new median, narrower travel lanes, and any other proposed traffic calming improvements. The third exhibit will consist of manufacturer details for pedestrian crossing alert devices, i.e., flashing signs, RPMs (Reflective Pavement Markings), etc. All three of these exhibits will be reviewed with City representatives for approval, prior to meeting with FDOT.

- **Coordination with FDOT**

After obtaining approval from City representatives, we propose to meet with FDOT officials to discuss the details and results of the flooding investigation and traffic calming study. The goal of the FDOT coordination will be to elicit support and funding from FDOT for fixing the drainage, if necessary, and assisting with construction of the traffic calming improvements. As part of this coordination, we recommend broaching the City's interest in applying for an FDOT Highway Beautification Grant and adding landscaping to the medians created as part of the traffic calming improvements.

3) **TASK III – 8<sup>TH</sup> AVENUE BEAUTIFICATION**

Once Task I is complete and Task II is nearing completion, we recommend that application for a FDOT Highway Beautification Grant begin in accordance with the items listed below:

- **Pre-Application Meeting with FDOT Landscape Manager**

Chapter 14-96 of the FAC, which governs the FDOT Highway Beautification Grant program, requires that all interested applications conduct a pre-application meeting with the respective FDOT Landscape Manager prior to July 1<sup>st</sup> of each year.

- **Highway Beautification Grant Application Preparation**

CPH will assist in the preparation of the Highway Beautification Grant Application and will provide project summary, project schedule, and limited exhibits.

- **Conceptual Design/Cost Estimating**

CPH will provide the City with cost estimate(s), in phases, for design and construction and based on recommended treatments.

- **Project Phasing**

Depending on the cost of the drainage repairs and traffic calming improvements, and financial participation by FDOT, we preliminarily recommend phasing the implementation of the landscape improvements as outlined below:

- Phase 1: 10<sup>th</sup> to 17<sup>th</sup> Street (portion of 8<sup>th</sup> Avenue with no signalized intersections currently experiencing flooding)
- Phase 2: 7<sup>th</sup> to 10<sup>th</sup> Street
- Phase 3: 4<sup>th</sup> to 7<sup>th</sup> Street

Compilation of design plans is not included.

CPH proposes to conduct the subject work scope on an hourly basis NTE in accordance with the rates included in our master contract.

# **DRAINAGE STUDY REPORT**

**Drainage Study**  
**8<sup>th</sup> Avenue West between 4<sup>th</sup> Street West and 17<sup>th</sup> Street West**

**I. Introduction**

The City of Palmetto has been experiencing flooding conditions during minor rainfall events along Business Route US 41 (8<sup>th</sup> Avenue West) between 4<sup>th</sup> Street West and 17<sup>th</sup> 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 (8<sup>th</sup> Avenue West) between 4<sup>th</sup> Street West and 17<sup>th</sup> 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 10<sup>th</sup> Avenue West and 10<sup>th</sup> Street West Stormwater Drainage Improvements. This new stormwater system has improved drainage for small portions of the northern basins along 8<sup>th</sup> 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 8<sup>th</sup> Avenue West and 4<sup>th</sup> 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 4<sup>th</sup> 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 8<sup>th</sup> Avenue West between 12<sup>th</sup> Street West and 14<sup>th</sup> Street West, at the intersection of 8<sup>th</sup> Avenue West and 8<sup>th</sup> Street West, and at the intersection of 4<sup>th</sup> Avenue West and 7<sup>th</sup> 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 – 8<sup>th</sup> Avenue West from 13<sup>th</sup> Street West to 14<sup>th</sup> Street West (Oakridge Subdivision)**

The updated Oak Ridge Subdivision accepts water from 8<sup>th</sup> 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 8<sup>th</sup> 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 – 8<sup>th</sup> Avenue West from 8<sup>th</sup> Street West to 9<sup>th</sup> Street Drive West**

The newer system servicing 10<sup>th</sup> 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 11<sup>th</sup> Street West and from 9<sup>th</sup> Street West to 8<sup>th</sup> Street West along 8<sup>th</sup> Avenue West. The inlets and connecting pipes along 8<sup>th</sup> Avenue West were not upgraded with the new system, but have lower tailwater conditions to overcome to function more efficiently. The older system servicing 8<sup>th</sup> Avenue West between 8<sup>th</sup> Street West and 9<sup>th</sup> 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 8<sup>th</sup> 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 – 8<sup>th</sup> Avenue West from 5<sup>th</sup> Street West to 7<sup>th</sup> Street West**

The older system servicing 8<sup>th</sup> Avenue West between 5<sup>th</sup> Street West and 7<sup>th</sup> 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 8<sup>th</sup> 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 – 8<sup>th</sup> Avenue West from 4<sup>th</sup> Street West to 5<sup>th</sup> Street West**

The older system servicing 8<sup>th</sup> Avenue West between 4<sup>th</sup> Street West and 5<sup>th</sup> 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 8<sup>th</sup> 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 4<sup>th</sup> Street West, 7<sup>th</sup> Street West, and the area between 12<sup>th</sup> Street West and 14<sup>th</sup> 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 8<sup>th</sup> 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 8<sup>th</sup> 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 8<sup>th</sup> Avenue within the study corridor. A breakdown of estimated cost by *Area* is provided below:

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

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: DRAWN BY: CHECKED BY: APPROVED BY: SCALE:		DATE: JUNE 2008 JOB NO. P5901 FILE: DRAINAGE STUDY CERTIFICATE OF AUTHORIZATION No. 3215 © 2008	 <p>           Engineers            Architects            Surveyors            Planners            Landscape Architects            Environmental Scientists            Construction Management            Design/Build         </p>	FIGURE <b>B2</b>
PROPOSED 8TH AVE IMPROVEMENTS 13TH STREET WEST TO 14TH STREET WEST CITY OF PALMETTO PALMETTO/MANATEE, FLORIDA				



# Storm Sewer Summary Report

Page 1

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

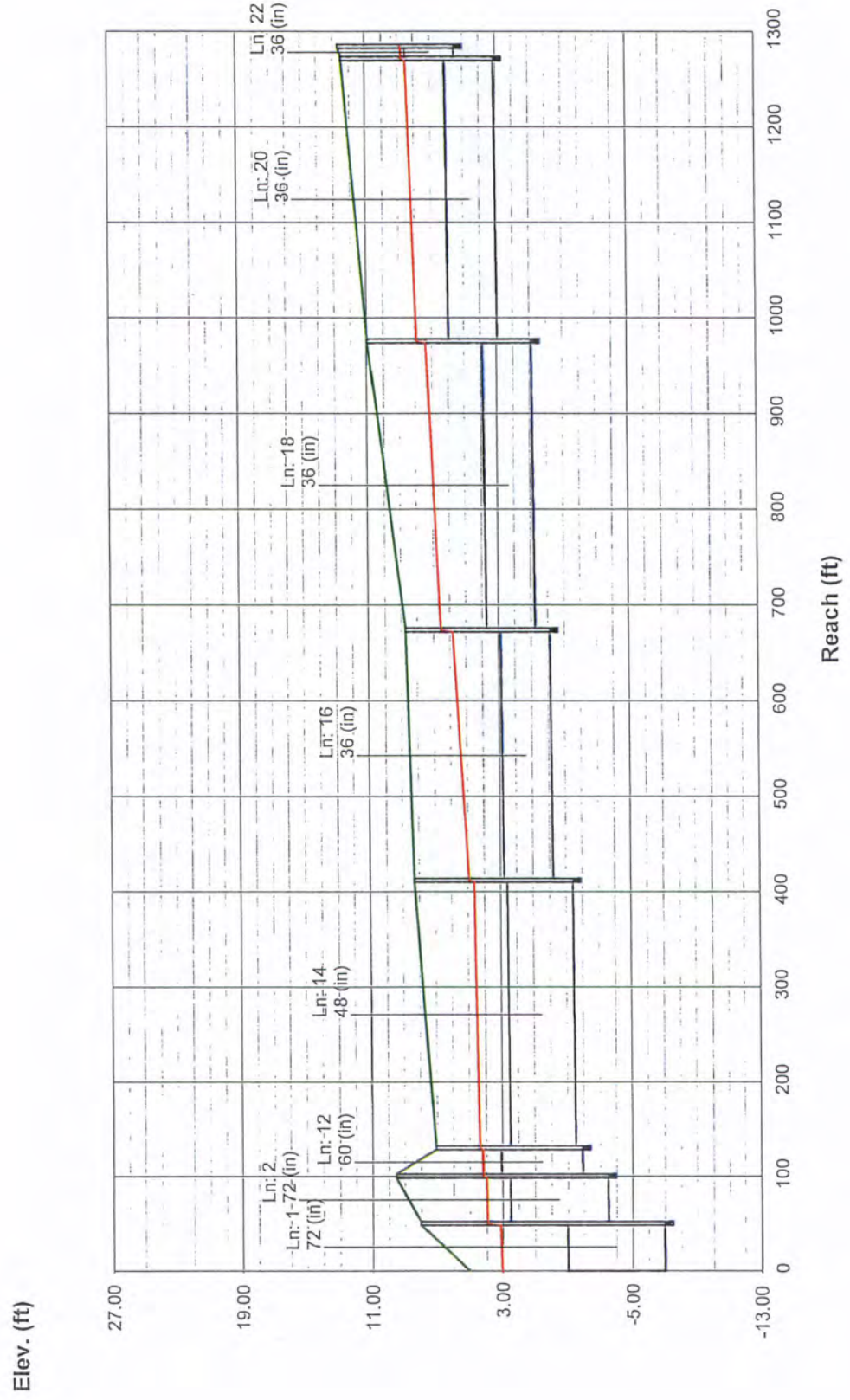
Project File: Improvements - 8th Ave. from 13th St. W. to 14th St. W. (3-Yr) Number of lines: 22

Run Date: 06-24-2008

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

# Storm Sewer Profile

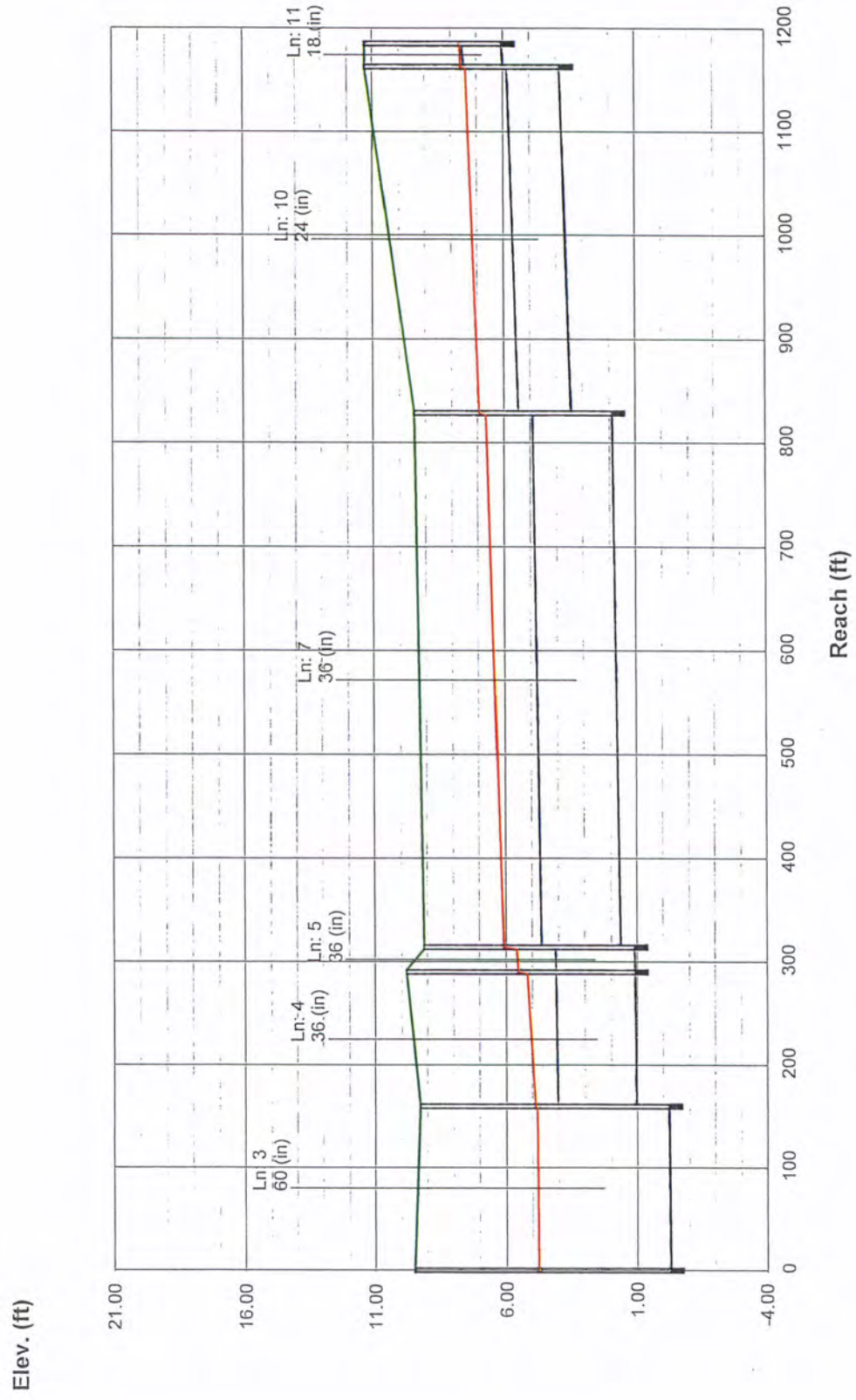
Proj. file: Improvements - 8th Ave. from 13th St. W. to 14th St. W. (3-Yr).stm





# Storm Sewer Profile

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



**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
Manholes	3	\$5,000
		\$55,000
		\$15,000

<b>Total</b>	<b>\$287,799</b>
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DESIGNED BY: MTS  
 DRAWN BY: DMI  
 CHECKED BY: SLL  
 APPROVED BY: JCP  
 SCALE: N.T.S.

DATE: JUNE 2008  
 JOB NO. P5901  
 FILER: DRAINAGE STUDY  
 CERTIFICATE OF AUTHORIZATION NO. 3215  
 © 2008

FIGURE **E2**

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

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

**gph**

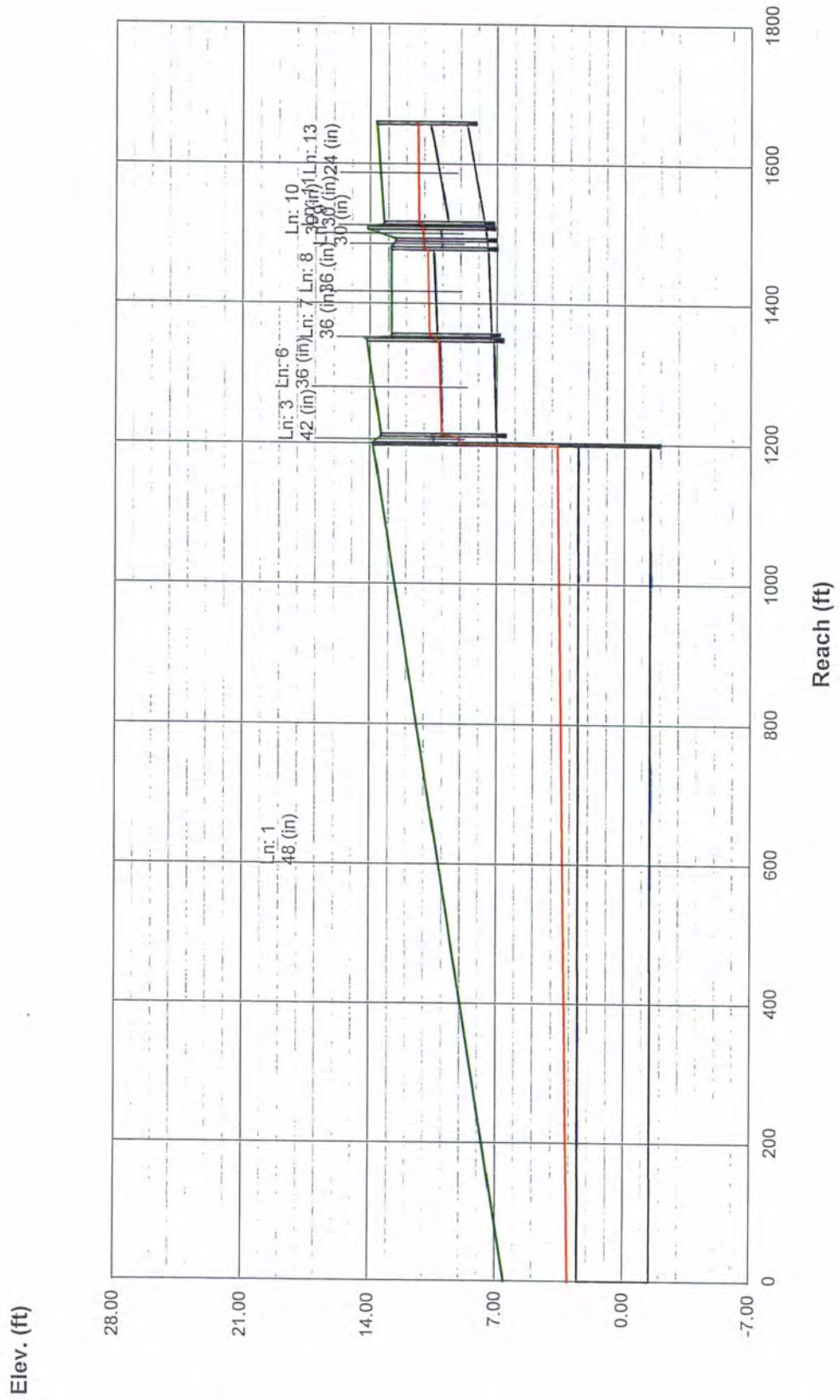


## Page 1

Underflow: Same as above, 2000

# Storm Sewer Profile

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





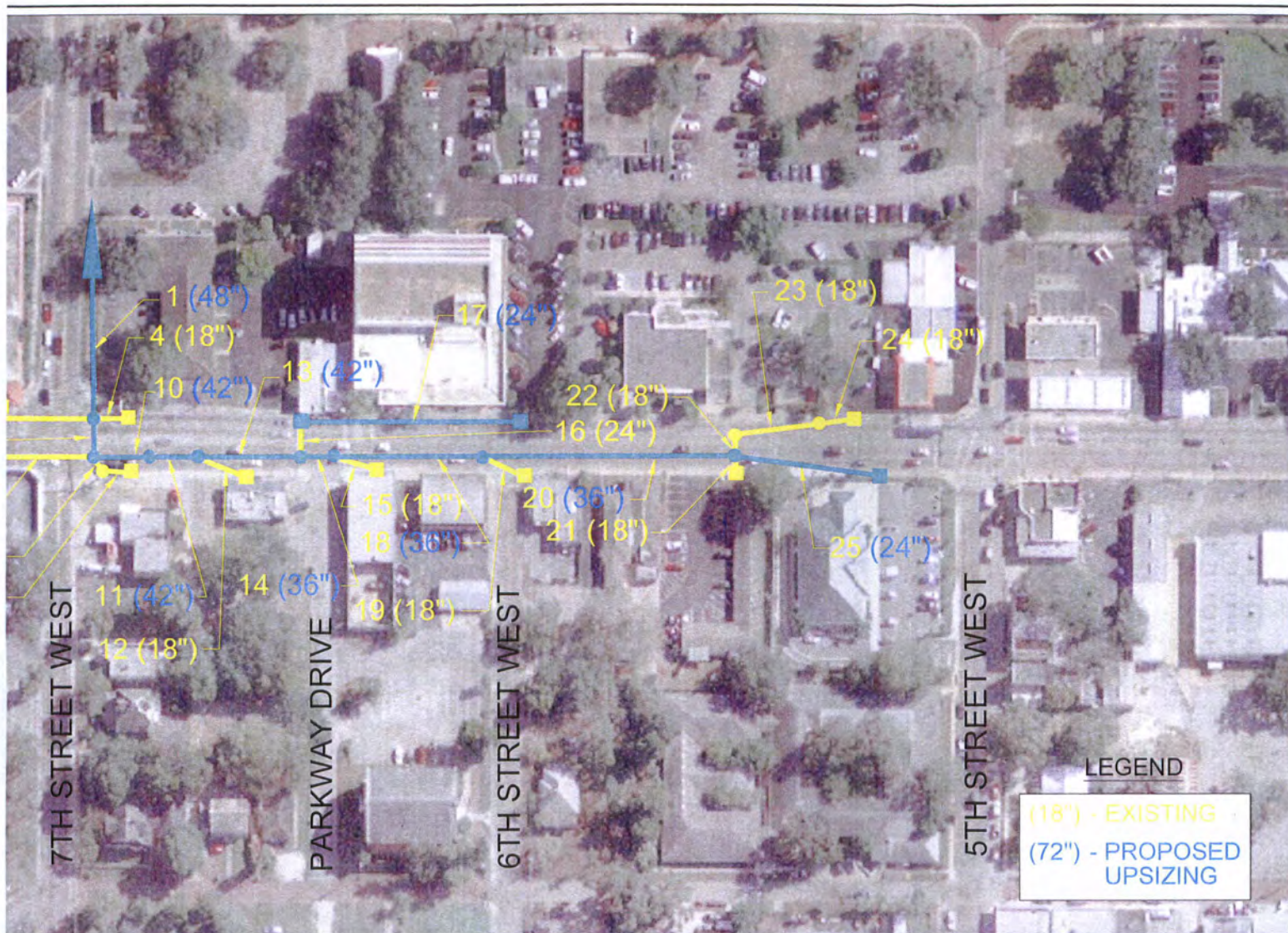
**AREA 2 - Cost Estimate for Improvements**


Cut (ft) Size	0 - 4	4 - 6	6 - 8	8 - 10	10 - 12	12 - 14	14 - 16	16 - 18	> 18	Total
(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
Manholes	5	\$5,000

Total	\$198,082
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 <p> <i>Engineers</i>  <i>Architects</i>  <i>Surveyors</i>  <i>Planners</i>  <i>Landscape Architects</i>  <i>Environmental Scientists</i>  <i>Construction Management</i>  <i>Design / Build</i> </p>	<p>PROPOSED 8TH AVE IMPROVEMENTS</p> <p>5TH STREET WEST TO 7TH STREET WEST</p> <p>CITY OF PALMETTO</p> <p>PALMETTO/MANATEE, FLORIDA</p>		<p>FIGURE</p> <p><b>D2</b></p>
	<p>3215</p>		



# Storm Sewer Summary Report

Page 1

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).str 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

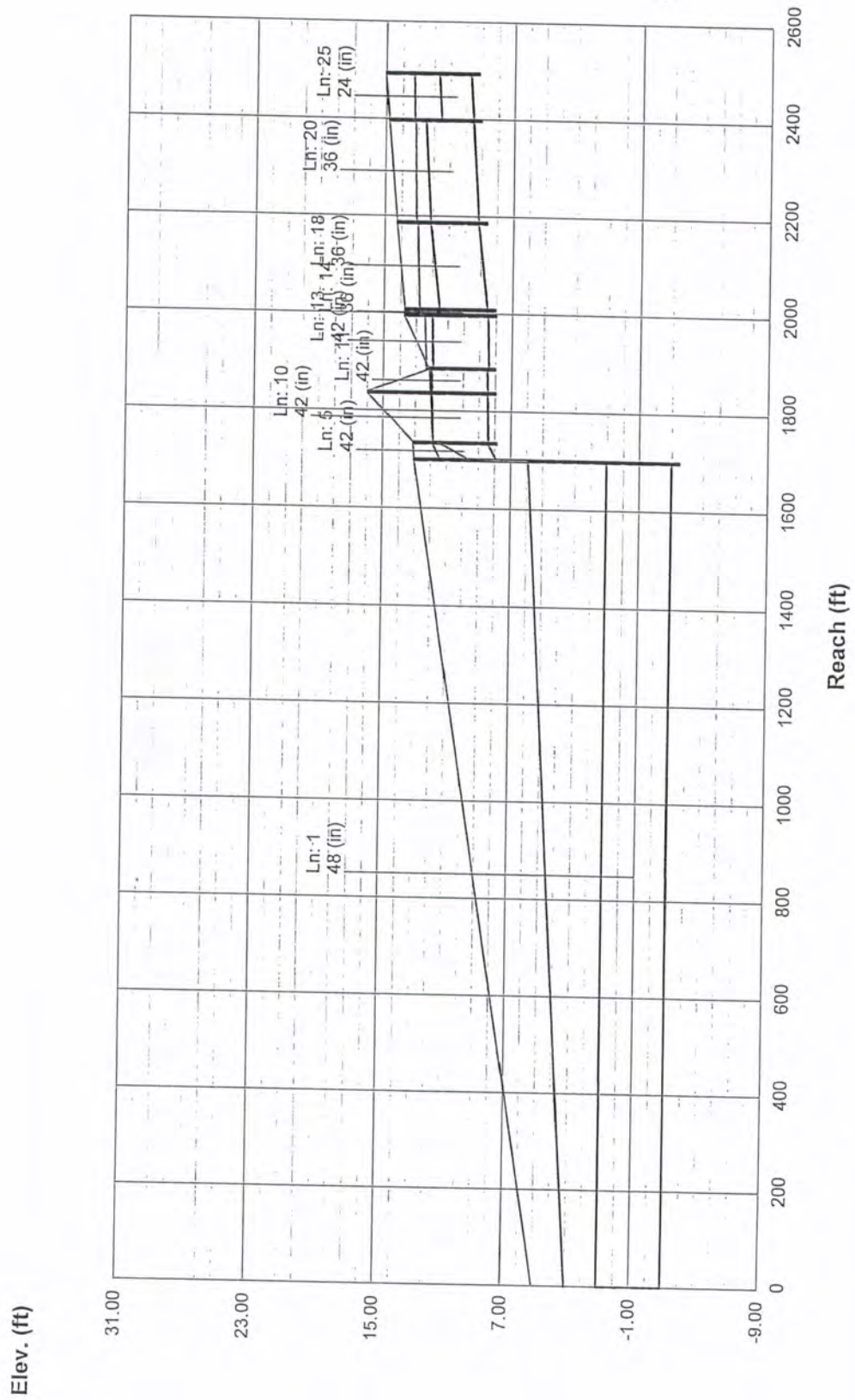
Page 1

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).str					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) Size	0 - 4	4 - 6	6 - 8	8 - 10	10 - 12	12 - 14	14 - 16	16 - 18	> 18	Total
(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
Manholes	8	\$5,000
		\$15,000
		\$40,000

<b>Total</b>	<b>\$290,308</b>
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PROPOSED 8TH AVE IMPROVEMENTS  
4TH STREET WEST TO 5TH STREET WEST  
CITY OF PALMETTO  
PALMETTO/MANATEE, FLORIDA

FIGURE

**E2**



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



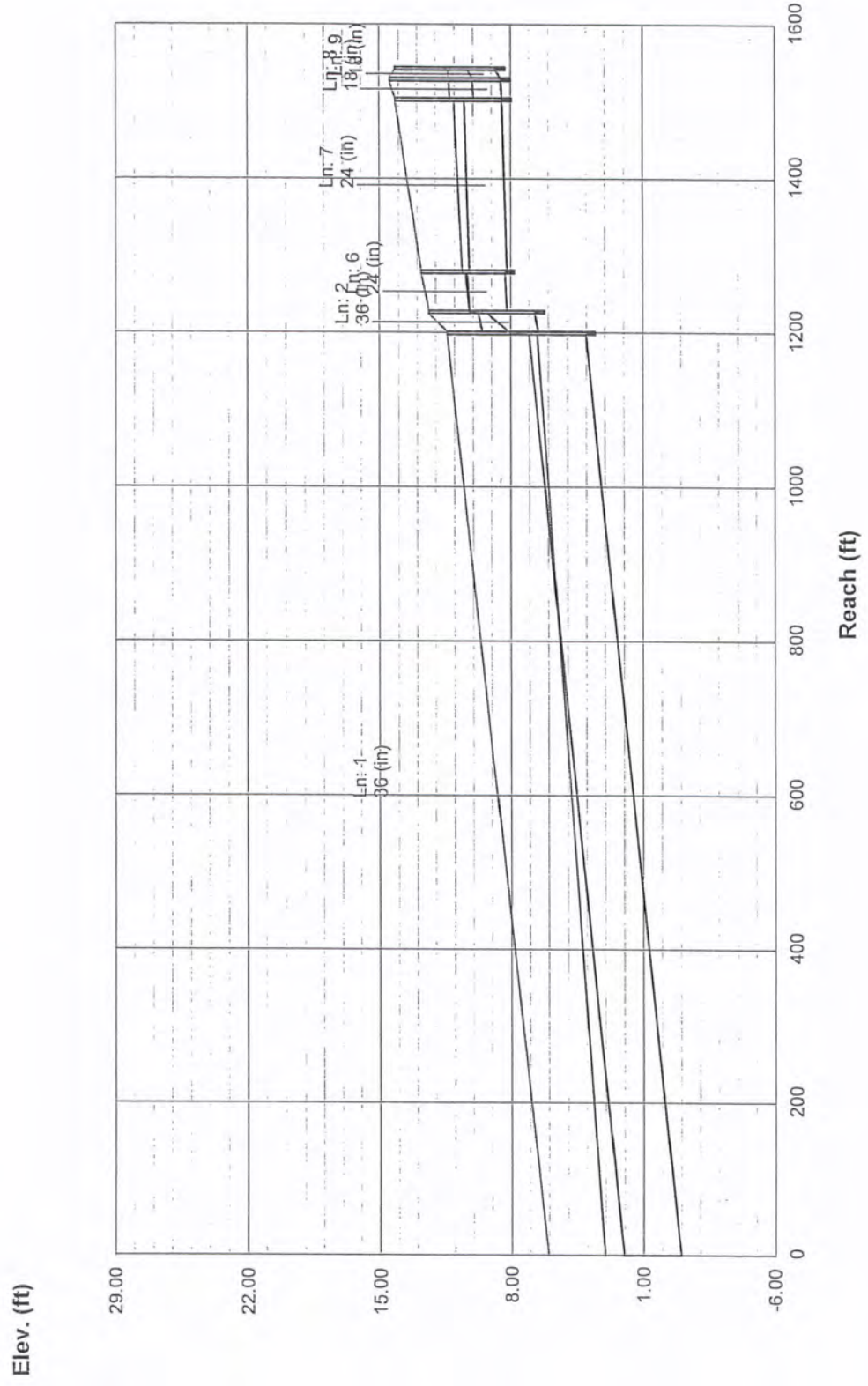
# Storm Sewer Summary Report

Page 1

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).str						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	Lft	Lft	Lft	Lft	Lft	Lft	Lft	Quantity
24	\$/Lft	\$/Lft	\$/Lft	\$/Lft	\$/Lft	\$/Lft	\$/Lft	\$/Lft	\$/Lft	Cost
	Cost	Cost	Cost	Cost	Cost	Cost	Cost	Cost	Cost	
	46.80	316.5	67.60	78.00	84.50	91.00	97.50	104.00	110.50	\$18,104
	\$0	\$18,104	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
36	562.5	402.0	262.5	88.40	98.80	109.20	119.60	126.10	136.50	\$79,825
	57.20	67.60	78.00	\$0	\$0	\$0	\$0	\$0	\$0	
	\$32,175	\$27,175	\$20,475	\$0	\$0	\$0	\$0	\$0	\$0	
Subtot	\$32,175	\$45,279	\$20,475	\$0	\$0	\$0	\$0	\$0	\$0	\$97,929

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

<b>Total</b>	<b>\$122,929</b>
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