COMPARISON OF OUTFALL IMPROVEMENTS VERSUS STORMWATER DETENTION FACILITIES

TECHNICAL MEMORANDUM

TAMPA INTERSTATE STUDY

WPI No. 7140004, State Project No. 99007-1402, FAP No. IR-9999(43)

The project consists of approximately 12 miles (19.31 km) of multi-lane improvements to I-275 from Dale Mabry Highway interchange north to Dr. Martin Luther King Jr. Boulevard and I-4 from I-275 (including interchange) to east of 50th Street (U.S. 41); a multi-lane controlled access facility (Crosstown Connector) on new alignment from I-4 south to the existing Tampa South Crosstown Expressway; and improvements to approximately 4.4 miles (7.08 km) of the Tampa South Crosstown Expressway from the Kennedy Boulevard overpass east to Maydell Drive, Hillsborough County.

Prepared For

FLORIDA DEPARTMENT OF TRANSPORTATION

Prepared By

GREINER, INC.

In Association With

KNIGHT APPRAISAL SERVICES, INC.
PIPER ARCHAEOLOGICAL SERVICES

APRIL 1994

TABLE OF CONTENTS

I. INTRODUCTION

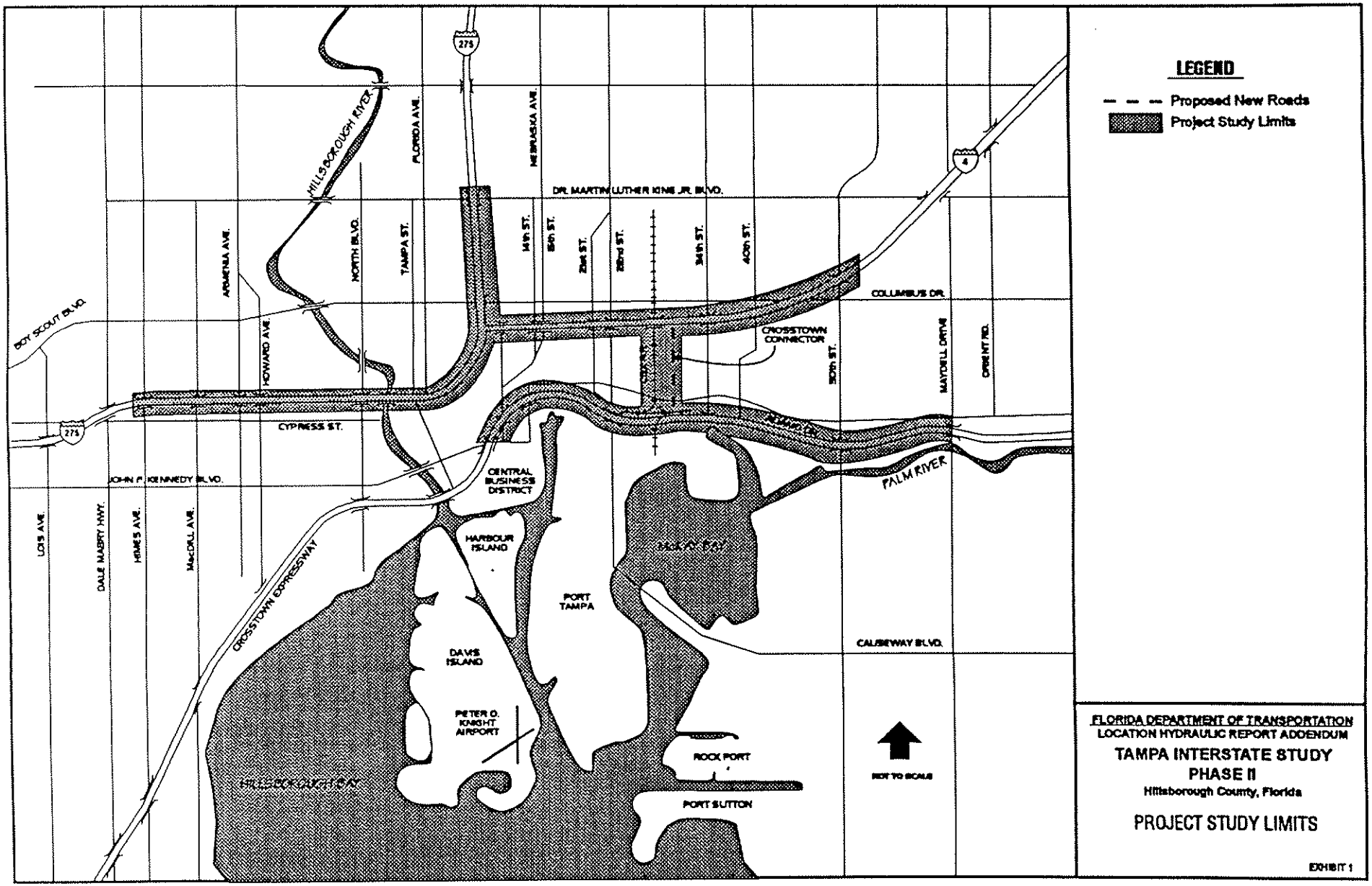
The proposed Tampa Interstate Study (TIS) Environmental Impact Statement (EIS) study limits consist of: approximately 12 miles (19.31 km) of multi-lane improvements to I-275 from Dale Mabry Highway Interchange north to Dr. Martin Luther King Jr. Boulevard and I-4 from I-275 to east of 50th Street (U.S. 41), a multi-lane controlled access facility (Crosstown Connector) from I-4 south to the existing Tampa South Crosstown Expressway, and improvements to approximately 4.4 miles (7.08 km) of the Tampa South Crosstown Expressway from the Kennedy Boulevard overpass east to Maydell Drive, Hillsborough County (see Exhibit 1).

This report was completed to meet the FHWA requirement for evaluation of stormwater outfall improvements to receiving waters in lieu of providing stormwater peak attenuation for new impervious areas associated with the roadway improvements.

Within the TIS EIS study area, land uses consist of primarily urban areas with commercial, residential, and industrial land uses. Since the land uses are generally consistent throughout the study area, one representative drainage area (Ybor City Basin) was selected for the outfall improvement versus stormwater peak attenuation evaluation.

II. EXISTING CONDITION

The Ybor City Basin includes a portion of Interstate 4 (I-4) from 13th Street east to 19th Street. The existing interstate drainage system consists of a combination of open ditch and enclosed storm sewer systems which discharge to the City of Tampa drainage system. The flow north of I-4 within this basin drains through a cross drain located at 13th Street (7-foot by 5-foot CBC). This sub-basin outfalls to the Ybor Channel through a 5-foot by 6-foot double box culvert located at 15th Street. This cross drain has inadequate drainage capacity according to


LEGEND
Proposed New Roads
Project Study Limits
FLORIDA DEPARTMENT OF TRANSPORTATION
LOCATION HYDRAULIC REPORT ADDENDUM
TAMPA INTERSTATE STUDY
PHASE II
Hillsborough County, Florida
PROJECT STUDY LIMITS
EXHIBIT 1
NOT TO SCALE
HILLSBOROUGH RIVER
FLORIDA AVE.
NEBRASKA AVE.
DR. MARTIN LUTHER KING JR. BLVD.
ARMENIA AVE.
NORTH BLVD.
TAMPA ST.
14th ST.
15th ST.
22nd ST.
28nd ST.
34th ST.
40th ST.
COLUMBUS DR.
BOY SCOUT BLVD.
HOWARD AVE.
CROSSTOWN CONNECTOR
50th ST.
MAYDELL DRIVE
DIANE RD.
CYPRESS ST.
JOHN F. KENNEDY BLVD.
CENTRAL BUSINESS DISTRICT
HARBOUR ISLAND
HILLSBOROUGH BAY
PORT TAMPA
PALM RIVER
LOIS AVE.
DALE MABRY HWY.
HOMES AVE.
MacDILL AVE.
CROSSTOWN EXPRESSWAY
CAUSEWAY BLVD.
DAVIS ISLAND
PETER O. KNIGHT AIRPORT
ROCK PORT
PORT SUTTON

the City of Tampa Stormwater Management Division and contributes to flooding north of the interstate. It is also considered as part of the City of Tampa storm sewer system by FDOT.

III. DOWNSTREAM IMPROVEMENT ALTERNATIVE

The proposed downstream improvement alternative would consist of collecting runoff from the proposed interstate drainage system and directing it to a stormwater outfall to the Ybor Channel and ultimately to Hillsborough Bay. Preliminary downstream improvement alternative calculations are shown in Appendix A.

The following improvements would be required to the downstream outfall system if detention facilities were not constructed for stormwater peak discharge attenuation:

1) Construction of approximately 3,700 linear feet of 36-inch storm sewer pipe and appurtenances from the interstate (I-4) to the Ybor Channel. This storm sewer system which serve the interstate system only and would be a separate system from the existing City of Tampa outfall system.

2) Jacking and boring of the 36-inch storm-sewer pipe under an existing railroad line located north of S.R. 60.

3) Open cut a storm/sewer installation across S.R. 60, a major four-lane roadway.

4) Acquisition of drainage easement from the City of Tampa for storm-sewer installation and maintenance.

Estimated outfall improvement costs are $900,660 as shown in Appendix B.

It should be noted that directly discharging surface runoff from the interstate system to the receiving water without water quality considerations is not recommended due to potential water quality impacts associated with the first flush volume on Hillsborough Bay.

IV. STORMWATER ATTENUATION ALTERNATIVE

The proposed stormwater attenuation alternative would consist of collecting runoff from the proposed interstate drainage system and directing it to a system of detention ponds located on the south side of the interstate I-4 at 15th Street. The proposed detention ponds would be sized to provide peak discharge attenuation for the 25-year, 24-hour design storm event discharging at a rate no greater than the existing conditions for the same storm event. Preliminary detention pond sizing calculations are shown in Appendix C.

The proposed detention ponds will provide approximately 7.8 acre-feet of storage capacity. The detention ponds would discharge to the existing City of Tampa storm-sewer system (49 cfs for 25-year 24-hour storm event). The detention ponds will be also designed to treat the first flush runoff volumes.

Preliminary detention facility costs were estimated to be approximately $862,500. This cost includes an allowance that the excavated material from the detention facilities can be utilized as embankment for the proposed interstate roadway.

V. SUMMARY

The proposed TIS roadway improvements will generate increased stormwater runoff. There are two options available to ensure that no adverse impacts to adjacent property owners are incurred as a result of this project: 1) Improvement of the stormwater outfall system, and 2) creation of stormwater detention facilities to attenuate the increase in the peak discharge rate.

Cost comparisons of these two alternatives indicate that the stormwater detention facility alternative is the most economically viable (estimated cost $862,500 versus $900,660 for outfall improvement) both in right-of-way and construction costs.

APPENDICES

APPENDIX A

DOWNSTREAM IMPROVEMENT ALTERNATIVE CALCULATIONS

Advanced Interconnected Channel & Pond Routing (adICPR Ver 1.40)

TIS 15TH ST PONDS
4-6-94

BASIN NAME	1	2
NODE NAME	1	1
UNIT HYDROGRAPH	UH256	UH256
PEAKING FACTOR	256.	256.
RAINFALL FILE	FLMOD	FLMOD
RAIN AMOUNT (in)	8.00	8.00
STORM DURATION (hrs)	24.00	24.00
AREA (ac)	26.10	26.10
CURVE NUMBER	93.00	73.00
DCIA (%)	.00	.00
TC (mins)	30.00	35.00
LAG TIME (hrs)	.00	.00
BASIN STATUS	ONSITE	INACTIVE

BASIN	QMX (cfs)	TMX (hrs)	VOL (in)	NOTES
1	73.87	12.27	7.16	12TH TO 19TH ST BASINPOST
2	47.96	12.37	4.81	12TH TO 19TH ST BASIN PRECONDITION

Note: Assume outfall to discharge difference in Pre vs Post development flow for 25-year storm event (74cfs - 48cfs) = 26 cfs (use 30 cfs)

Greiner, Inc.

JOB TIS - Seg 3 | SHEET 1 OF ___ | PROJ. NO. C1104.50
DESCRIPTION Alt 3A8 (Sheet 1) | COMPUTED BY KEJ | DATE 9/30/88
CHECKED BY ___ | DATE ___

15th Street Outfall

- Boundary 12th St to 19th St.

Existing Condition

Drainage Area = (1380×390) (16th to 19th) + 13.7 Ac (12th to 16th) = 26.1 Ac

Existing Impervious (Seg 3) = 69,000 ft² + 69,000 ft² + 33,200 ft² + 33,200 ft² + 4000 + 2400 + 1500 + 1800 + 1200 + 4200 + 3600 + 2400 + 2400 + 2400 + 2400 + 6600 + 1800 + 1800 + 2100

= 5.7 Ac (16th to 19th) + 7.3 Ac (12th to 16th) = 13.0 Ac

Soil Type = Tavares A

CN

Existing Impervious = 13 Ac @ CN = 98

Pervious = 13.1 Ac @ CN = 49 (open - fair)

$$\overline{CN} = \frac{13\ Ac(98) + 13.1\ Ac(49)}{26.1} = 73$$

Time of Concentration = 35 min

Form No. GI

Greiner, Inc.

JOB TIS - SEG 3 SHEET 2 OF ___ PROJ. NO. C1164.50
DESCRIPTION Alt 3A8 (Sheet 1) COMPUTED BY REJ DATE 9/30/08
CHECKED BY ___ DATE ___

Proposed Condition

Drainage Area: 12.4 Ac (16th to 19th) + 13.7 Ac (12th to 16th) = 26.1

Proposed Impervious = 10.9 Ac (16th to 19th) + 12.8 (12th to 16th) = 23.7

Proposed Pervious = (1200 x 45) (embank) + (500 x 20) embank = 1.5 Ac + 0.9 Ac = 2.4 Ac

CN

Proposed Impervious = 23.7 Ac @ CN = 98

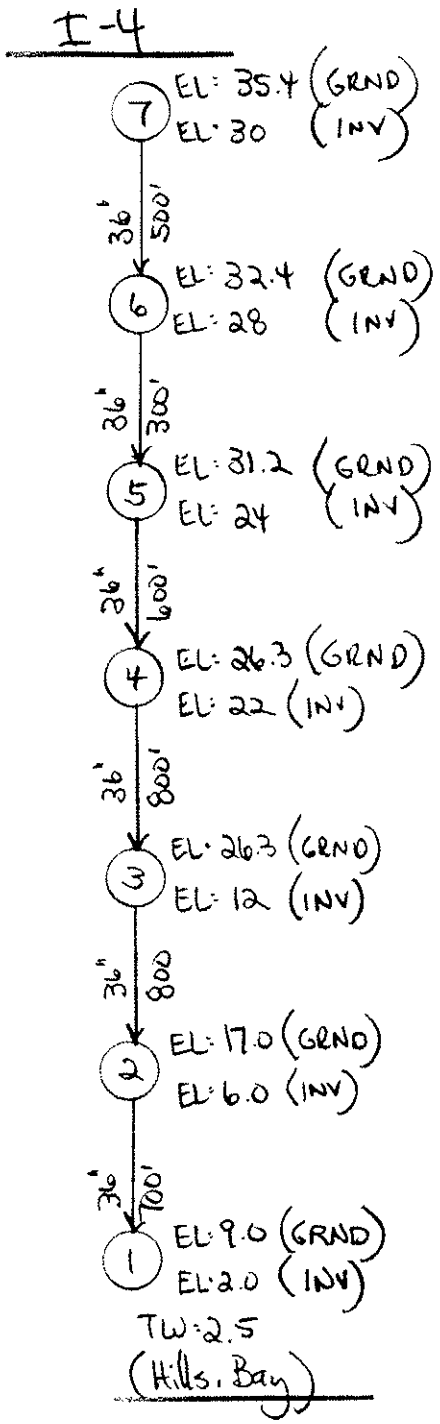
Pervious = 2.4 Ac @ CN = 49

$$\overline{CN} = \frac{23.7\,Ac(98) + 2.4\,Ac(49)}{26.1} = 93$$

Time of Concentration = 30 min

Greiner, Inc.

JOB TIS 15th St. Outfall — SHEET ___ OF ___ PROJ. NO. ___
DESCRIPTION ___ — COMPUTED BY WJJ DATE ___
CHECKED BY ___ DATE ___



15th St Outfall Schematic

HYDRAULIC NETWORK ANALYSIS AND DESIGN HN86105 VER 2.0

* * * R E S U L T S * * * 15th Street Outfall

REACH #	FR NODE	TO NODE	REACH TYPE	FLOW (CFS)	U/S GRND (FT)	U/S HGL (FT)
1	2	1	3	30.000	9.000	8.882
2	3	2	3	30.000	17.000	14.882
3	4	3	3	30.000	26.300	24.882
4	5	4	3	30.000	31.200	28.845
5	6	5	3	30.000	32.400	30.882
6	7	6	3	30.000	35.400	32.882

Note: No surcharging therefore 36" RCP ok

HYDRAULIC NETWORK ANALYSIS AND DESIGN HN86105 VER 2.0

15th St. Outfall

= NODE DATA =

NODE	X	Y	QTOT	GRND	TW
1	0.00	0.00	30.00	9.00	2.50
2	0.00	0.00	30.00	9.00	-999.00
3	0.00	0.00	30.00	17.00	-999.00
4	0.00	0.00	30.00	26.30	-999.00
5	0.00	0.00	30.00	31.20	-999.00
6	0.00	0.00	30.00	32.40	-999.00
7	0.00	0.00	30.00	35.40	-999.00

= REACH DATA =

REACH # 1 FR NODE 2 TO NODE 1

-> Circular Culvert <-

Span (inches)	-->	36
Rise (inches)	-->	36
Length (feet)	-->	700
Manning's n	-->	.012
HW Invert (fmsl)	-->	6
TW Invert (fmsl)	-->	2
Energy Loss Coef	-->	1
Entrnc Loss Coef	-->	.5
# of Culverts/Channels	-->	1

REACH # 2 FR NODE 3 TO NODE 2

-> Circular Culvert <-

Span (inches)	-->	36
Rise (inches)	-->	36
Length (feet)	-->	800
Manning's n	-->	.012
HW Invert (fmsl)	-->	12
TW Invert (fmsl)	-->	6
Energy Loss Coef	-->	1
Entrnc Loss Coef	-->	.5
# of Culverts/Channels	-->	1

REACH # 3 FR NODE 4 TO NODE 3

-> Circular Culvert <-

Span (inches)	-->	36
Rise (inches)	-->	36
Length (feet)	-->	800
Manning's n	-->	.012
HW Invert (fmsl)	-->	22
TW Invert (fmsl)	-->	12
Energy Loss Coef	-->	1
Entrnc Loss Coef	-->	.5
# of Culverts/Channels	-->	1

REACH # 4 FR NODE 5 TO NODE 4

-> Circular Culvert <-

Span (inches)	-->	36
Rise (inches)	-->	36

Length (feet) --> 600
Manning's n --> .012
HW Invert (fmsl) --> 26
TW Invert (fmsl) --> 24
Energy Loss Coef --> 1
Entrnc Loss Coef --> .5
# of Culverts/Channels --> 1

REACH # 5 FR NODE 6 TO NODE 5

-> Circular Culvert <-

Span (inches) --> 36
Rise (inches) --> 36
Length (feet) --> 300
Manning's n --> .012
HW Invert (fmsl) --> 28
TW Invert (fmsl) --> 26
Energy Loss Coef --> 1
Entrnc Loss Coef --> .5
# of Culverts/Channels --> 1

REACH # 6 FR NODE 7 TO NODE 6

-> Circular Culvert <-

Span (inches) --> 36
Rise (inches) --> 36
Length (feet) --> 500
Manning's n --> .012
HW Invert (fmsl) --> 30
TW Invert (fmsl) --> 28
Energy Loss Coef --> 1
Entrnc Loss Coef --> .5
# of Culverts/Channels --> 1

HYDRAULIC NETWORK ANALYSIS AND DESIGN HN86105 VER 2.0

REACH NUMBER	1	2	3	4	5	6
FROM NODE	2	3	4	5	6	7
TO NODE	1	2	3	4	5	6
CULVERT TYPE	CIRCULAR	CIRCULAR	CIRCULAR	CIRCULAR	CIRCULAR	CIRCULAR
SPAN (inches)	36.000	36.000	36.000	36.000	36.000	36.000
RISE (inches)	36.000	36.000	36.000	36.000	36.000	36.000
HW INVERT (ft)	6.000	12.000	22.000	26.000	28.000	30.000
TW INVERT (ft)	2.000	6.000	12.000	24.000	26.000	28.000
FLOW REGIME	SUPER	SUPER	SUPER	-----	SUPER	SUPER
FLOW RATE (cfs)	30.000	30.000	30.000	0.000	30.000	30.000
D/S VEL (fps)	-99999.000	-99999.000	-99999.000	0.000	-99999.000	-99999.000
U/S VEL (fps)	6.891	6.891	6.891	0.000	6.891	6.891
AVERAGE VEL (fps)	6.891	6.891	6.891	0.000	6.891	6.891
TRAVEL TIME (mins)	1.693	1.935	1.935	0.000	0.726	1.209
NORM DEPTH (ft)	1.587	1.464	1.266	1.883	1.515	1.774
CRIT DEPTH (ft)	1.775	1.775	1.775	1.775	1.775	1.775
CRIT SLOPE (ft/ft)	0.0040	0.0040	0.0040	0.0040	0.0040	0.0040
BED SLOPE (ft/ft)	0.0057	0.0075	0.0125	0.0033	0.0067	0.0040
VEL HEAD (ft)	0.738	0.738	0.738	0.000	0.738	0.738
ENTRANCE LOSS (ft)	0.369	0.369	0.369	0.000	0.369	0.369
FRICTION LOSS (ft)	0.000	0.000	0.000	0.000	0.000	0.000
TOT HEAD LOSS (ft)	1.107	1.107	1.107	0.000	1.107	1.107
CONTROL ELEV (ft)	7.775	13.775	23.775	24.000	29.775	31.775
HYD GRADE LINE (ft	8.882	14.882	24.882	0.000	30.882	32.882

REACH NUMBER
FROM NODE
TO NODE

CULVERT TYPE
SPAN (inches)
RISE (inches)
HW INVERT (ft)
TW INVERT (ft)

FLOW REGIME
FLOW RATE (cfs)
D/S VEL (fps)
U/S VEL (fps)
AVERAGE VEL (fps)
TRAVEL TIME (mins)

NORM DEPTH (ft)
CRIT DEPTH (ft)
CRIT SLOPE (ft/ft)
BED SLOPE (ft/ft)

VEL HEAD (ft)
ENTRANCE LOSS (ft)
FRICTION LOSS (ft)
TOT HEAD LOSS (ft)
CONTROL ELEV (ft)

APPENDIX B

COST COMPARISON

GREINER, INC.

PROJECT : TAMPA INTERSTATE STUDY - Outfall Improvement
PROJECT NO. : C2380.21
ESTIMATOR : DKC

DATE : 4-Apr-94
FILE : TISOUTFL.XLS

PAY ITEM NO.	DESCRIPTION	QUANTITY	UNITS	UNIT PRICE	COST
	OUTFALL IMPROVEMENT				
	Mobilization	1	ls	5.0%	$22,575
	Manholes	12	ea	$1,500.00	$18,000
	Pipe - 36" RCP	3,700	lf	$45.00	$166,500
	Pavement Replacement	6,000	sy	$18.00	$108,000
	Utility Relocation	20	ea	$7,500.00	$150,000
	Jack & Bore Under Railroad	50	lf	$180.00	$9,000
	Maintenance of Traffic	1	ls	12.0%	$54,180
	Easements	55,500	sf	$5.00	$277,500
				SUBTOTAL	**$783,180**
				Contingency @ 15.0%	$117,477
				PROJECT TOTAL	**$900,657**
	POND ALTERNATIVE				
	Mobilization	1	ls	5.0%	$3,513
	Excavation (1)	0	cy	$0.00	$0
	Manholes	4	ea	$1,500.00	$6,000
	Pipe - 36" RCP	350	lf	$40.00	$14,000
	Littoral Zone	1	ac	$15,000.00	$9,000
	Sod	9,500	sy	$1.50	$14,250
	Land Cost	135,240	sf	$5.00	$676,200
	House Demolition	3	ea	$5,000.00	$15,000
	Maintenance of Traffic	1	ls	$12,000.00	$12,000
				SUBTOTAL	**$749,963**
				Contingency @ 15.0%	$112,494
				PROJECT TOTAL	**$862,457**

(1) Excavated material will be utilized in roadway embankment.

APPENDIX C

STORMWATER ALTERNATION ALTERNATIVE CALCULATIONS

Advanced Interconnected Channel & Pond Routing (adICPR Ver 1.40)

TIS 15TH ST PONDS
4-6-94

BASIN NAME	1	2
NODE NAME	1	1
UNIT HYDROGRAPH	UH256	UH256
PEAKING FACTOR	256.	256.
RAINFALL FILE	FLMOD	FLMOD
RAIN AMOUNT (in)	8.00	8.00
STORM DURATION (hrs)	24.00	24.00
AREA (ac)	26.10	26.10
CURVE NUMBER	93.00	73.00
DCIA (%)	.00	.00
TC (mins)	30.00	35.00
LAG TIME (hrs)	.00	.00
BASIN STATUS	ONSITE	INACTIVE

BASIN	QMX (cfs)	TMX (hrs)	VOL (in)	NOTES
1	73.87	12.27	7.16	12TH TO 19TH ST BASINPOST
2	47.96	12.37	4.81	12TH TO 19TH ST BASIN PRECONDITION

Note: Allowable discharge from Pond = Pre developed conditions - 48 cfs

Greiner, Inc.

JOB TIS - Seq 3 | SHEET 1 OF | PROJ. NO. C1104.50
DESCRIPTION Alt 3A8 (Sheet 1) | COMPUTED BY KEJ | DATE 9/30/04
CHECKED BY | DATE

15th Street Outfall

- Boundary 12th St to 19th St.

Existing Condition

Drainage Area = (1380 × 390) + 13.7 Ac = 26.1 Ac
(16th to 19th) (12th to 16th)

Existing Impervious (Seq 3) = 69,000 ft² + 69,000 ft² + 33,200 ft² + 33,200 ft² +
4000 + 2400 + 1500 + 1800 + 1200 + 4200 + 3600 + 2400
+ 2400 + 2400 + 2400 + 6600 + 1800 + 1800 + 2100
= 5.7 Ac + 7.3 Ac = 13.0 Ac
(16th to 19th) (12th to 16th)

Soil Type = Tavares A

CN

Existing Impervious = 13 Ac @ CN = 98
Pervious = 13.1 Ac @ CN = 49 (open - fair)

$$\overline{CN} = \frac{13\ Ac(98) + 13.1\ Ac(49)}{26.1} = 73$$

Time of Concentration = 35 min

Form No. GI

Greiner, Inc.

JOB TTS - SEG 3 SHEET 2 OF ___ PROJ. NO. C1104.50
DESCRIPTION Alt 3A8 (Sheet 1) COMPUTED BY RES DATE 9/30/08
CHECKED BY ___ DATE ___

Proposed Condition

Drainage Area: 12.4 Ac (16th to 19th) + 13.7 Ac (12th to 16th) = 26.1

Proposed Impervious = 10.9 Ac (16th to 19th) + 12.8 (12th to 16th) = 23.7

Proposed Pervious = (1200 x 45 (embank)) + (500 x 20 embank) = 1.5 Ac + 0.9 Ac = 2.4 Ac

CN

Proposed Impervious = 23.7 Ac @ CN = 98

Pervious = 2.4 Ac @ CN = 49

$$\overline{CN} = \frac{23.7\,Ac(98) + 2.4\,Ac(49)}{26.1} = 93$$

Time of Concentration = 30 min

Advanced Interconnected Channel & Pond Routing (adICPR Ver 1.40)
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TIS 15TH ST PONDS
4-6-94

NODAL MIN/MAX/TIME CONDITIONS REPORT

NODE ID	PARAMETER	MINIMUMS VALUE	MINIMUMS TIME (hr)	MAXIMUMS VALUE	MAXIMUMS TIME (hr)
1	STAGE (ft):	30.00	1.50	32.49	13.00
TIS Pond	VOLUME (af):	.00	1.25	6.53	13.00
	RUNOFF (cfs):	.00	1.25	73.79	12.25
	OFFSITE (cfs):	.00	24.00	.00	24.00
	OTHER (cfs):	.00	24.00	.00	24.00
	OUTFLOW (cfs):	.00	11.25	40.64	13.00
				(less than pre: 48cfs)	
99	STAGE (ft):	29.00	24.00	29.00	24.00
outfall	VOLUME (af):	.00	11.25	12.12	24.00
	RUNOFF (cfs):	.00	24.00	.00	24.00
	OFFSITE (cfs):	.00	24.00	.00	24.00
	OTHER (cfs):	.00	11.25	40.64	13.00
	OUTFLOW (cfs):	.00	24.00	.00	24.00

Advanced Interconnected Channel & Pond Routing (adICPR Ver 1.40)

TIS 15TH ST PONDS
4-6-94

CONTROL PARAMETERS

START TIME: .00
END TIME: 24.00

TO TIME (hours)	SIMULATION INC (secs)	PRINT INC (mins)
100.00	150.00	15.00

RUNOFF HYDROGRAPH FILE: DEFAULT
OFFSITE HYDROGRAPH FILE: DEFAULT
BOUNDARY DATABASE FILE: NONE

NOTE:

Advanced Interconnected Channel & Pond Routing (adICPR Ver 1.40)

TIS 15TH ST PONDS
4-6-94

NODE NAME	NODE TYPE	INI STAGE (ft)	X-COOR (ft)	Y-COOR (ft)	LENGTH (ft)	STAGE (ft)	AR/TM/STR (ac/hr/af)
1	AREA	30.000	.000	.000	.000	30.000	2.440
						33.000	2.810
						34.000	2.940
99	TIME	29.000	.000	.000	.000	29.000	.000
						29.000	36.000

Advanced Interconnected Channel & Pond Routing (adICPR Ver 1.40)
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TIS 15TH ST PONDS
4-6-94

REACH SUMMARY

INDEX	RCHNAME	FRMNODE	TONODE	REACH TYPE
1	1	1	99	RECTANGULAR WEIR/GATE/ORIFICE, VILLEMONTE EQ

```
        Advanced Interconnected Channel & Pond Routing (adICPR Ver 1.40)
                 Copyright 1989, Streamline Technologies, Inc.

        TIS 15TH ST PONDS
        4-6-94

>>REACH NAME       : 1
  FROM NODE        : 1
  TO NODE          : 99
  REACH TYPE       : RECTANGULAR WEIR/GATE/ORIFICE, VILLEMONTE EQ.
  FLOW DIRECTION   : POSITIVE AND NEGATIVE FLOWS ALLOWED
    CREST EL. (ft):  31.000  CREST LN. (ft):   8.000    OPENING (ft): 999.000
        WEIR COEF.:   2.800       GATE COEF.:    .600 NUMBER OF ELEM.:   1.000
              NOTE: OUTFALL FROM 15TH ST PONDS
```