Sponsored by: Puto

CITY OF MARATHON, FLORIDA
RESOLUTION 2006-009

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF MARATHON, FLORIDA, AMENDING THE PLANNING DOCUMENT FOR STATE REVOLVING LOAN FUND (SRF) LOAN FOR MARATHON REGIONAL WASTEWATER PROJECT, SERVICES AREAS 6 & 7, (NOW TO BE KNOWN AS SERVICE AREA 6) AND SERVICE AREA 8 (NOW TO BE KNOWN AS SERVICE AREA 7)

WHEREAS, the City Council had previously approved the Planning Document (the "Planning Document") for the State Revolving Fund ("SRF") loan for the Marathon Regional Wastewater Project (the "Project");

WHEREAS, during the design of the Project, it has become necessary to make certain adjustments and modifications that will require amendments to the Planning Document;

WHEREAS, City staff and the consultants working on the Project now recommend that service areas 6 and 7 as described in the Planning Document be combined into a service area 6 that will be served by a vacuum collection system, and that service area 7 (formerly service area 8) now be served by a combination of technologies (as opposed to only cluster systems); and

WHEREAS, the City desires to amend the Planning Document to reflect the recommendations of City staff and the consultants working on the Project;

NOW THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF MARATHON, AS FOLLOWS:

Section 1. The above recitals are true and correct and are incorporated herein.

Section 2. The City Council hereby amends the Planning Document as follows:

a) Pages 1 thru7, 14 & 15 of Section 1 of the Planning Document are hereby replaced by the similarly numbered pages in Composite Exhibit A hereto;

b) Pages 1, 17, 18, 19, & 23 thru 32 of Section 2 of the Planning Document are hereby replaced by the similarly numbered pages in Composite Exhibit B hereto; and

c) Page 1 of Section 3 of the Planning Document is hereby replaced by the similarly numbered page in Composite Exhibit C hereto; and

d) The entire Section 4 of the Planning Document is hereby replaced by Composite Exhibit D .

Section 3. The City Manager is directed to send a revised copy of the Planning Document to the State Revolving Loan Program, together with a copy of this resolution.

Section 4. This resolution shall take effect immediately upon adoption.

PASSED AND APPROVED by the City Council of the city of Marathon, Florida, this 10th day of January, 2006.

THE CITY OF MARATHON, FLORIDA

John Bartus, Mayor

AYES: Bull, Mearns, Miller, Pinkus, Bartus
NOES: None
ABSENT: None
ABSTAIN: None

ATTEST:

Cindy L. Ecklund, City Clerk

(City Seal)

APPROVED AS TO FORM AND LEGALITY FOR THE USE AND RELIANCE OF THE CITY OF MARATHON, FLORIDA ONLY:

City Attorney

THE WEILER ENGINEERING CORPORATION

"Excellence in Engineering"

6630 Front Street, Stock Island
Key West, Florida 33040
(305) 481-0347 ph
(305) 295-0143 fax

January 6, 2006

Mike Puto
City Manager
City of Marathon
10045-55 Overseas Highway
Marathon, FL 33050

RE: City of Marathon SRF Planning Documents Update

Mr. Puto,

Enclosed you will find an update to the City of Marathon SRF planning documents.

The decision was made by the City of Marathon not to pursue sending any wastewater flow to the City of Key Colony Beach WWTP. This affected the collections and treatment alternatives for service areas 6 & 7. These two service areas have now been combined into a single service area and this new area was re-evaluated for both collection and treatment systems. The results indicate that a vacuum collection system is now feasible in this area. Although this is not the lowest cost alternative, this type of system is being recommended because it is easily provided with back-up power and lends itself well to hurricane recovery. Since this area now has a combined total flow of over .100 MGD an AWT plant is required for this area.

The enclosed updated information has combined Areas 6 & 7 into Area 6 and re-named Area 8 to Area 7. Any mention of eight service areas has been removed. The enclosed updated pages can be inserted into the original document and will provide the new data as well as cost estimates and conclusions.

Replace the Table of Contents
In Section 1 replace pages 1 thru 7, 14 & 15 with new pages.
In Section 2 replace pages 1, 17, 18, 19, & 23 thru 32 with new pages.
In Section 3 replace page 1 with the new page.
In Section 4 replace the entire section.

Feel free to contact me at any time with questions.

If the City wishes to adopt these changes, this information should be copied to:

Tim Banks
State Revolving Loan Program
Bureau of Water Facilities Funding
2600 Blair Stone Road MS 3505
Tallahassee, FL 32399-2400

Sincerely,

Edward R. Castle, P.E.

City of Marathon

Planning Documents for State Revolving Fund Loan

Marathon Regional Wastewater Project

Table of Contents

Revised: 1/2006

Tab 1 Section 1: Executive Summary

1.1 Background
1.2 Project Purpose and Scope
1.3 Potential Financing and Funding Sources
1.4 Project Description
1.4a Service Area Briefs
1.5 Preliminary Cost Estimates
1.6 Project Justification
1.7 Project Period

Table 1-1: Proposed Service Areas
Table 2-1: Service Area: Selected Collection, Treatment and Disposal Alternatives

Figure 1-1: City of Marathon Service Area Map
Figure 1-2: Service Area 1 Map
Figure 1-3: Service Area 2 Map
Figure 1-4: Service Area 3 Map
Figure 1-5: Service Area 4 Map
Figure 1-6: Service Area 5 Map
Figure 1-7: Service Area 6 Map
Figure 1-8: Service Area 7 Map

Attachment "A": Chapter 2 1998 Marathon Wastewater Facilities Plan

Tab 2 Section 2: Cost Comparison

2.1 Updated Collection System Alternative Analysis
2.2 Wastewater Treatment Analysis

2.3 Service Area Operation and Maintenance Cost Estimates

Table 2-1: Service Area 1 Vacuum Collection System Cost Analysis
Table 2-2: Service Area 1 Grinder Pump Collection System Cost Analysis
Table 2-3: Service Area 1 Gravity Collection System Cost Analysis
Table 2-4: Service Area 2 Vacuum Collection System Cost Analysis
Table 2-5: Service Area 2 Grinder Pump Collection System Cost Analysis
Table 2-6: Service Area 2 Gravity Collection System Cost Analysis
Table 2-7: Service Area 3 Vacuum Collection System Cost Analysis
Table 2-8: Service Area 3 Grinder Pump Collection System Cost Analysis
Table 2-9: Service Area 3 Gravity Collection System Cost Analysis
Table 2-10: Service Area 4 Vacuum Collection System Cost Analysis
Table 2-11: Service Area 4 Grinder Pump Collection System Cost Analysis
Table 2-12: Service Area 4 Gravity Collection System Cost Analysis
Table 2-13: Service Area 5 Vacuum Collection System Cost Analysis
Table 2-14: Service Area 5 Grinder Pump Collection System Cost Analysis
Table 2-15: Service Area 5 Gravity Collection System Cost Analysis
Table 2-16: Service Area 6 Vacuum Collection System Cost Analysis
Table 2-17: Service Area 6 Grinder Pump Collection System Cost Analysis
Table 2-18: Service Area 6 Gravity Collection System Cost Analysis
Table 2-19: Service Area 7 Vacuum Collection System Cost Analysis
Table 2-20: Service Area 7 Grinder Pump Collection System Cost Analysis
Table 2-21: Service Area 7 Gravity Collection System Cost Analysis

Attachment "C": Cost Estimates for Wastewater Treatment Alternatives from 1998 Marathon Wastewater Facilities Plan

Tab 3 Section 3: Environmental Effects

3.1 Project Area Characteristics
- 3.1a Project Area
- 3.1b Geology
- 3.1c Topography
- 3.1d Climate
- 3.1e Hydrology

3.2 Marine Biological Communities
3.3 Institutional Structure
3.4 Environmentally Sensitive Resources
3.5 Environmental Impacts of Construction
- 3.5a Land Disturbance
- 3.5b Noise
- 3.5c Air Quality
- 3.5d Surface Water
- 3.5e Traffic
- 3.5f Historical and Archaeological Resources

3.6 Long-Term Environmental Impacts of Operation
3.6a Noise
3.6b Odor
3.6c Traffic
3.6d Energy Consumption
3.7 Secondary Impacts
3.8 Spill Prevention and Response

Tab 4 Section 4: Selected Alternative

4.1 Selected Wastewater Treatment Alternative Construction Cost Estimate summary
4.2 Selected Collections Systems and Service Areas
4.2a Service Area 1
4.2b Service Area 2
4.2c Service Area 3
4.2d Service Area 4
4.2e Service Area 5
4.2f Service Area 6
4.2g Service Area 7
4.3 Operations and Maintenance Cost Comparison

Table 4-1: Marathon Sewer Construction Cost Estimate
Table 4-2: Sewage Treatment Plant Staffing Requirements
Table 4-3: Comparison of O & M Direct Costs

Tab 5 Section 5: Public Participation Process

Appendix "A": Public Participation

Tab 6 Section 6: Financial Feasibility

6.1 Capital Finance Plan

Tab 7 Section 7: Schedule

Appendix "B": Marathon Wastewater Project Schedule

Tab 8 Section 8: Adopting Resolution

8.1 Specific Authorization for Implementation

City of Marathon

Service Area 6

Monroe County, Florida

Vaca Cut to Coco Plum
(Including Coco Plum Dr.)

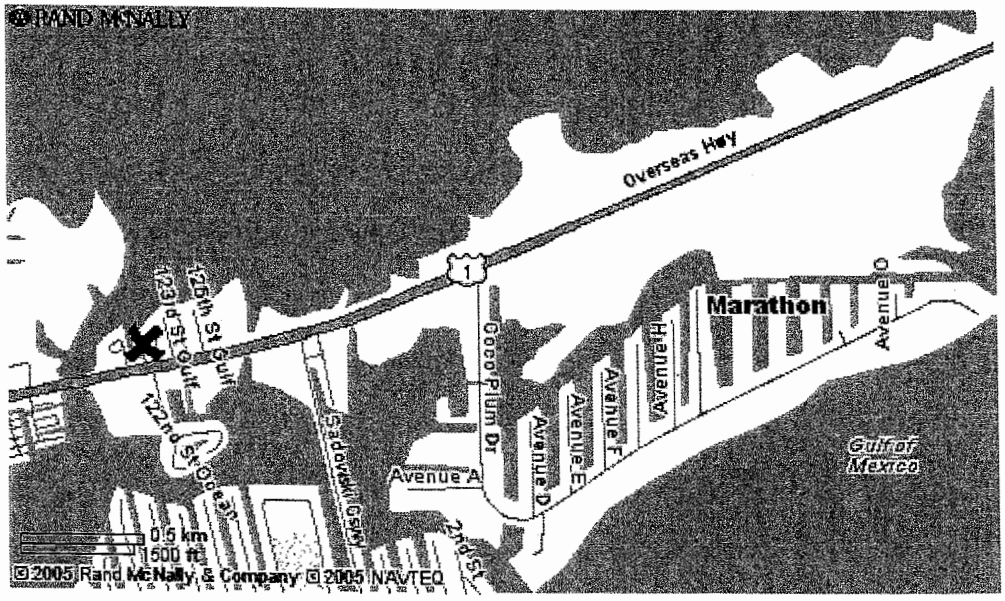

Figure 1 – 7

City of Marathon

Service Area 7

Monroe County, Florida

Grassy Key

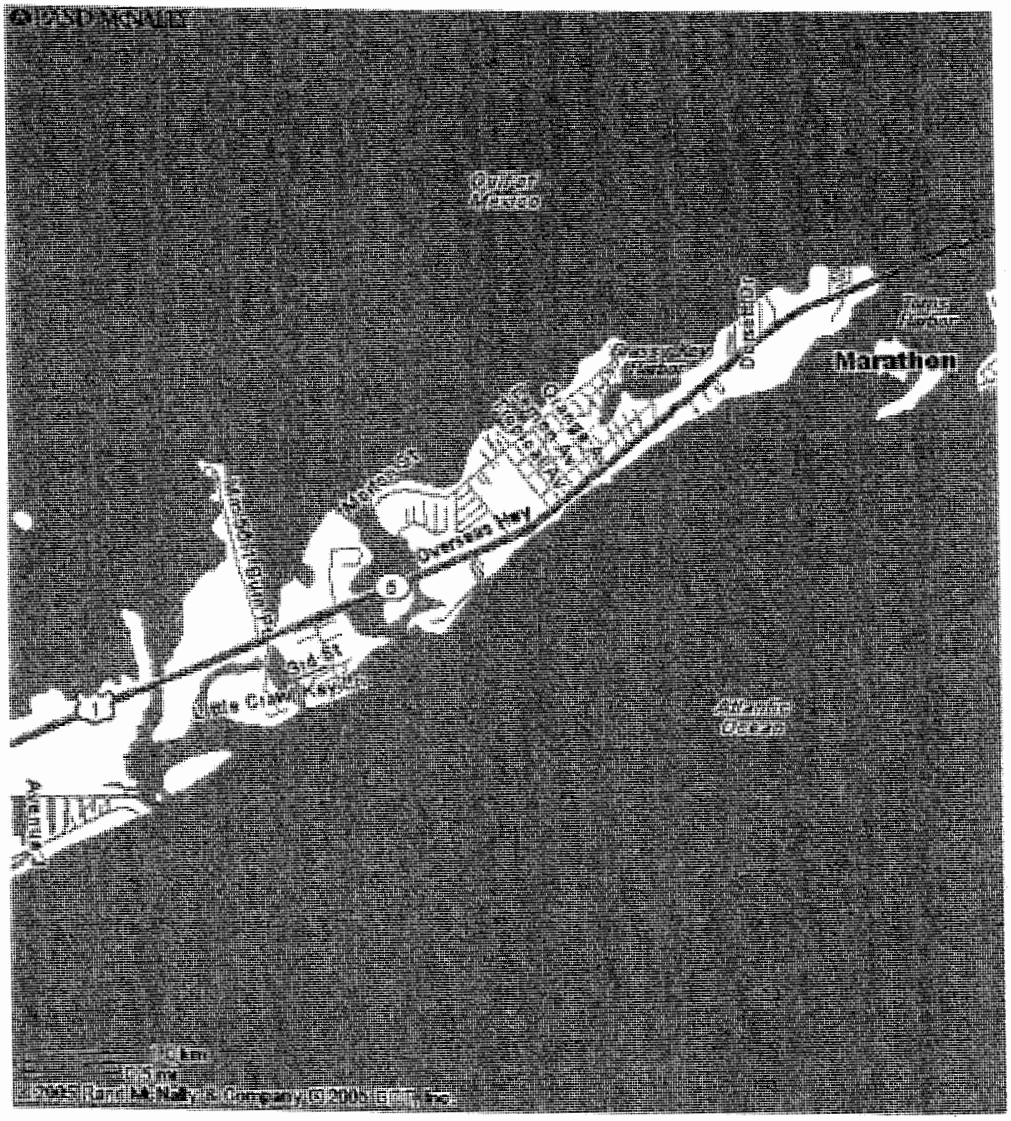

Figure 1 - 8

Table 4 - 1 Marathon Sewer Costs - All Service Areas

Service Area	Piping Total non US1 LF	Piping total US1 Corridor LF	Flow Total 2015 EST. MGD	EDU Total EA	Plant Costs New & Upgrades	On-site Treatment Systems - EA	Piping Costs Total	Lateral Costs Total	Vacuum Pits EA	Vacuum Station Cost	Restoration Costs non US1	Restoration Costs US1 Corridor	Pumping Facilities	General Conditions & Contingency	Totals
1	2,600	0	0.023	138	$30,360	$0	$195,000	$48,714	$0	$0	$26,000	$0	$120,000	$58,810	$478,884
2	0	0	0.001	1	$0	$16,000	$0	$0	$0	$0	$0	$0	$0	$2,240	$18,240
3	25,985	6,150	0.247	1480	$2,960,000	$0	$2,410,125	$1,036,000	$1,295,000	$1,000,000	$259,850	$738,000	$0	$1,357,857	$11,056,832
4	73,310	7,280	0.399	2389	$4,778,000	$0	$6,044,250	$2,150,100	$2,687,625	$1,000,000	$733,100	$873,600	$0	$2,557,335	$20,824,010
5	77,610	7,250	0.490	2934	$5,868,000	$0	$6,364,500	$2,534,976	$3,168,720	$1,000,000	$776,100	$870,000	$0	$2,881,521	$23,463,817
6	33,850	5,425	0.155	928	$1,856,000	$0	$2,945,625	$431,420	$1,182,500	$750,000	$296,575	$651,000	$0	$1,135,837	$9,248,957
7 BAT	3,900	800	0.080	477	$954,000	$0	$352,500	$166,950	$0	$0	$39,000	$96,000	$300,000	$267,183	$2,175,633
7 On-Site	0	0	0.053	319	$0	$2,552,000	$0	$319,000	$0	$0	$0	$0	$0	$401,940	$3,272,940
Totals	217,255	26,905	1.448	8,666	$16,446,360	$2,568,000	$18,312,000	$6,687,160	$8,333,845	$3,750,000	$2,130,625	$3,228,600	$420,000	$8,662,723	$70,539,313

Two WWTPs (expanded Little Venice and Crawl Key)

DIRECT COSTS SUMMARY Markup= 25.0%

Design Flow, MGD = 1.459 Hours/wk= 224

Treatment Plant Operations		**Margin $**	**Total $**
Labor	$389,202.67	$97,300.67	$486,503.33
Benefits	$143,805.46	$35,951.36	$179,756.82
Overtime	$38,729.60	$9,682.40	$48,412.00
Office Supplies	$3,000.00	$750.00	$3,750.00
Operating Supplies	$6,000.00	$1,500.00	$7,500.00
Postage & Freight	$0.00	$0.00	$0.00
Telephone	$4,800.00	$1,200.00	$6,000.00
In-house Lab	$68,352.00	$0.00	$68,352.00
Outside Services	$31,200.00	$0.00	$31,200.00
Water	$4,800.00	$1,200.00	$6,000.00
Electricity	$104,970.67	$26,242.67	$131,213.34
Chemicals	$459,678.89	$114,919.72	$574,598.61
Vehicle Expense	$22,592.17	$5,648.04	$28,240.21
Repair Parts	$35,000.00	$8,750.00	$43,750.00
Solids Operations			
Labor	$66,320.34	$16,580.08	$82,900.42
Benefits	$28,079.85	$7,019.96	$35,099.81
Overtime	$0.00	$0.00	$0.00
Contract Hauling	$334,951.20	$0.00	$334,951.20
Outside Services	$1,620.00	$0.00	$1,620.00
Chemicals	$5,861.65	$1,465.41	$7,327.06
Vehicle Expense	$15,845.77	$3,961.44	$19,807.21
Repair Parts	$20,000.00	$5,000.00	$25,000.00
Collection System Operations			
Labor	$127,750.00	$31,937.50	$159,687.50
Overtime	$19,162.50	$4,790.63	$23,953.13
Benefits	$42,762.84	$10,690.71	$53,453.55
Electricity	$189,624.44	$47,406.11	$237,030.54
Chemicals	$0.00	$0.00	$0.00
Vehicle Expense	$16,863.00	$4,215.75	$21,078.75
Repair Parts	$25,000.00	$6,250.00	$31,250.00

	Direct Cost	Margin	Contract
Total	$2,180,973.03	$436,212.46	**$2,617,185.48**

Service Area 1, Knight's Key

DIRECT COSTS SUMMARY Markup= 25.0%

Design Flow, MGD = 0.023 Hours/wk= 7

Treatment Plant Operations		**Margin $**	**Total $**
Labor	$9,330.53	$2,332.63	$11,663.17
Benefits	$3,627.95	$906.99	$4,534.93
Overtime	$1,210.30	$302.58	$1,512.88
Office Supplies	$500.00	$125.00	$625.00
Operating Supplies	$500.00	$125.00	$625.00
Postage & Freight	$0.00	$0.00	$0.00
Telephone	$1,200.00	$300.00	$1,500.00
In-house Lab	$4,296.00	$0.00	$4,296.00
Outside Services	$1,440.00	$0.00	$1,440.00
Water	$360.00	$90.00	$450.00
Electricity	$1,636.64	$409.16	$2,045.80
Chemicals	$7,246.48	$1,811.62	$9,058.10
Vehicle Expense	$1,768.01	$442.00	$2,210.01
Repair Parts	$5,000.00	$1,250.00	$6,250.00
Solids Operations			
Labor	$1,045.49	$261.37	$1,306.86
Benefits	$442.66	$110.66	$553.32
Overtime	$0.00	$0.00	$0.00
Contract Hauling	$5,280.25	$0.00	$5,280.25
Outside Services	$270.00	$0.00	$270.00
Chemicals	$92.40	$23.10	$115.51
Vehicle Expense	$249.80	$62.45	$312.25
Repair Parts	$1,500.00	$375.00	$1,875.00
Collection System Operations			
Labor	$5,703.13	$1,425.78	$7,128.91
Overtime	$855.47	$213.87	$1,069.34
Benefits	$1,909.06	$477.26	$2,386.32
Electricity	$1,128.72	$282.18	$1,410.90
Chemicals	$0.00	$0.00	$0.00
Vehicle Expense	$752.81	$188.20	$941.02
Repair Parts	$2,000.00	$500.00	$2,500.00

	Direct Cost	Margin	Contract
Total	$57,345.67	$11,514.86	**$68,860.53**

Service Area 3, 11th St. to 33rd St.

DIRECT COSTS SUMMARY Markup= 25.0%

Design Flow, MGD = 0.250 Hours/wk= 32

Treatment Plant Operations		**Margin $**	**Total $**
Labor	$68,804.67	$17,201.17	$86,005.83
Benefits	$24,594.21	$6,148.55	$30,742.76
Overtime	$5,532.80	$1,383.20	$6,916.00
Office Supplies	$500.00	$125.00	$625.00
Operating Supplies	$1,500.00	$375.00	$1,875.00
Postage & Freight	$0.00	$0.00	$0.00
Telephone	$1,200.00	$300.00	$1,500.00
In-house Lab	$5,616.00	$0.00	$5,616.00
Outside Services	$1,440.00	$0.00	$1,440.00
Water	$600.00	$150.00	$750.00
Electricity	$21,671.36	$5,417.84	$27,089.21
Chemicals	$78,766.09	$19,691.52	$98,457.61
Vehicle Expense	$4,770.31	$1,192.58	$5,962.89
Repair Parts	$10,000.00	$2,500.00	$12,500.00
Solids Operations			
Labor	$11,364.01	$2,841.00	$14,205.01
Benefits	$4,811.49	$1,202.87	$6,014.36
Overtime	$0.00	$0.00	$0.00
Contract Hauling	$57,393.97	$0.00	$57,393.97
Outside Services	$270.00	$0.00	$270.00
Chemicals	$1,004.39	$251.10	$1,255.49
Vehicle Expense	$2,715.18	$678.79	$3,393.97
Repair Parts	$5,000.00	$1,250.00	$6,250.00
Collection System Operations			
Labor	$11,406.25	$2,851.56	$14,257.81
Overtime	$1,710.94	$427.73	$2,138.67
Benefits	$3,818.11	$954.53	$4,772.64
Electricity	$27,089.21	$6,772.30	$33,861.51
Chemicals	$0.00	$0.00	$0.00
Vehicle Expense	$1,505.63	$376.41	$1,882.03
Repair Parts	$5,000.00	$1,250.00	$6,250.00

	Direct Cost	Margin	Contract
Total	$353,084.60	$72,091.16	**$425,175.76**

Service Area 4, Sombrero Blvd area

DIRECT COSTS SUMMARY Markup= 25.0%

Design Flow, MGD = 0.399 Hours/wk= 42

Treatment Plant Operations		**Margin $**	**Total $**
Labor	$80,678.00	$20,169.50	$100,847.50
Benefits	$29,326.36	$7,331.59	$36,657.95
Overtime	$7,261.80	$1,815.45	$9,077.25
Office Supplies	$500.00	$125.00	$625.00
Operating Supplies	$1,500.00	$375.00	$1,875.00
Postage & Freight	$0.00	$0.00	$0.00
Telephone	$1,200.00	$300.00	$1,500.00
In-house Lab	$14,922.00	$0.00	$14,922.00
Outside Services	$1,890.00	$0.00	$1,890.00
Water	$1,200.00	$300.00	$1,500.00
Electricity	$27,089.21	$6,772.30	$33,861.51
Chemicals	$125,710.68	$31,427.67	$157,138.34
Vehicle Expense	$5,136.03	$1,284.01	$6,420.04
Repair Parts	$12,000.00	$3,000.00	$15,000.00
Solids Operations			
Labor	$18,136.95	$4,534.24	$22,671.19
Benefits	$7,679.14	$1,919.78	$9,598.92
Overtime	$0.00	$0.00	$0.00
Contract Hauling	$91,600.77	$0.00	$91,600.77
Outside Services	$540.00	$0.00	$540.00
Chemicals	$1,603.01	$400.75	$2,003.77
Vehicle Expense	$4,333.42	$1,083.36	$5,416.78
Repair Parts	$5,000.00	$1,250.00	$6,250.00
Collection System Operations			
Labor	$11,406.25	$2,851.56	$14,257.81
Overtime	$1,710.94	$427.73	$2,138.67
Benefits	$3,818.11	$954.53	$4,772.64
Electricity	$32,507.05	$8,126.76	$40,633.81
Chemicals	$0.00	$0.00	$0.00
Vehicle Expense	$1,505.63	$376.41	$1,882.03
Repair Parts	$5,000.00	$1,250.00	$6,250.00

	Direct Cost	Margin	Contract
Total	$488,255.34	$94,825.64	**$583,080.98**

Service Area 5, Expanded Little Venice

DIRECT COSTS SUMMARY Markup= 25.0%

Design Flow, MGD = 0.499 Hours/wk= 32

Treatment Plant Operations		**Margin $**	**Total $**
Labor	$68,804.67	$17,201.17	$86,005.83
Benefits	$24,594.21	$6,148.55	$30,742.76
Overtime	$5,532.80	$1,383.20	$6,916.00
Office Supplies	$500.00	$125.00	$625.00
Operating Supplies	$1,500.00	$375.00	$1,875.00
Postage & Freight	$0.00	$0.00	$0.00
Telephone	$1,200.00	$300.00	$1,500.00
In-house Lab	$9,216.00	$0.00	$9,216.00
Outside Services	$930.00	$0.00	$930.00
Water	$1,200.00	$300.00	$1,500.00
Electricity	$32,507.05	$8,126.76	$40,633.81
Chemicals	$157,217.11	$39,304.28	$196,521.39
Vehicle Expense	$4,770.31	$1,192.58	$5,962.89
Repair Parts	$15,000.00	$3,750.00	$18,750.00
Solids Operations			
Labor	$22,682.56	$5,670.64	$28,353.19
Benefits	$9,603.73	$2,400.93	$12,004.66
Overtime	$0.00	$0.00	$0.00
Contract Hauling	$114,558.36	$0.00	$114,558.36
Outside Services	$540.00	$0.00	$540.00
Chemicals	$2,004.77	$501.19	$2,505.96
Vehicle Expense	$5,419.49	$1,354.87	$6,774.36
Repair Parts	$5,000.00	$1,250.00	$6,250.00
Collection System Operations			
Labor	$22,812.50	$5,703.13	$28,515.63
Overtime	$3,421.88	$855.47	$4,277.34
Benefits	$7,636.22	$1,909.06	$9,545.28
Electricity	$54,178.41	$13,544.60	$67,723.01
Chemicals	$0.00	$0.00	$0.00
Vehicle Expense	$3,011.25	$752.81	$3,764.06
Repair Parts	$7,500.00	$1,875.00	$9,375.00

	Direct Cost	Margin	Contract
Total	$573,841.31	$112,149.24	**$685,990.55**

Service Area 6, Vaca Cut to Cocoplum

DIRECT COSTS SUMMARY Markup= 25.0%

Design Flow, MGD = 0.155 Hours/wk= 32

Treatment Plant Operations		**Margin $**	**Total $**
Labor	$42,653.87	$10,663.47	$53,317.33
Benefits	$16,584.90	$4,146.23	$20,731.13
Overtime	$5,532.80	$1,383.20	$6,916.00
Office Supplies	$500.00	$125.00	$625.00
Operating Supplies	$500.00	$125.00	$625.00
Postage & Freight	$0.00	$0.00	$0.00
Telephone	$1,200.00	$300.00	$1,500.00
In-house Lab	$5,616.00	$0.00	$5,616.00
Outside Services	$1,560.00	$0.00	$1,560.00
Water	$360.00	$90.00	$450.00
Electricity	$8,126.76	$2,031.69	$10,158.45
Chemicals	$48,834.97	$12,208.74	$61,043.72
Vehicle Expense	$4,271.64	$1,067.91	$5,339.55
Repair Parts	$2,500.00	$625.00	$3,125.00
Solids Operations			
Labor	$7,045.68	$1,761.42	$8,807.10
Benefits	$2,983.12	$745.78	$3,728.90
Overtime	$0.00	$0.00	$0.00
Contract Hauling	$35,584.26	$0.00	$35,584.26
Outside Services	$270.00	$0.00	$270.00
Chemicals	$622.72	$155.68	$778.41
Vehicle Expense	$1,683.41	$420.85	$2,104.26
Repair Parts	$1,000.00	$250.00	$1,250.00
Collection System Operations			
Labor	$20,759.38	$5,189.84	$25,949.22
Overtime	$3,113.91	$778.48	$3,892.38
Benefits	$6,948.96	$1,737.24	$8,686.20
Electricity	$16,253.52	$4,063.38	$20,316.90
Chemicals	$0.00	$0.00	$0.00
Vehicle Expense	$2,740.24	$685.06	$3,425.30
Repair Parts	$1,500.00	$375.00	$1,875.00

	Direct Cost	Margin	Contract
Total	$237,246.15	$48,553.97	**$285,800.12**

Service Area 7, Grassy Key (package plants & on-site)

DIRECT COSTS SUMMARY Markup= 25.0%

Design Flow, MGD = 0.133 Hours/wk= 17

Treatment Plant Operations		**Margin $**	**Total $**
Labor	$51,222.37	$12,805.59	$64,027.97
Benefits	$17,586.74	$4,396.69	$21,983.43
Overtime	$2,972.46	$743.11	$3,715.57
Office Supplies	$500.00	$125.00	$625.00
Operating Supplies	$1,000.00	$250.00	$1,250.00
Postage & Freight	$0.00	$0.00	$0.00
Telephone	$1,200.00	$300.00	$1,500.00
In-house Lab	$18,288.00	$0.00	$18,288.00
Outside Services	$720.00	$0.00	$720.00
Water	$600.00	$150.00	$750.00
Electricity	$6,320.81	$1,580.20	$7,901.02
Chemicals	$41,903.56	$10,475.89	$52,379.45
Vehicle Expense	$5,520.99	$1,380.25	$6,901.24
Repair Parts	$4,000.00	$1,000.00	$5,000.00
Solids Operations			
Labor	$6,045.65	$1,511.41	$7,557.06
Benefits	$2,559.71	$639.93	$3,199.64
Overtime	$0.00	$0.00	$0.00
Contract Hauling	$30,533.59	$0.00	$30,533.59
Outside Services	$810.00	$0.00	$810.00
Chemicals	$534.34	$133.58	$667.92
Vehicle Expense	$1,444.47	$361.12	$1,805.59
Repair Parts	$1,000.00	$250.00	$1,250.00
Collection System Operations			
Labor	$30,042.19	$7,510.55	$37,552.73
Overtime	$4,506.33	$1,126.58	$5,632.91
Benefits	$10,056.28	$2,514.07	$12,570.34
Electricity	$10,835.68	$2,708.92	$13,544.60
Chemicals	$0.00	$0.00	$0.00
Vehicle Expense	$3,965.57	$991.39	$4,956.96
Repair Parts	$2,000.00	$500.00	$2,500.00

	Direct Cost	Margin	Contract
Total	$254,168.75	$50,954.29	**$305,123.04**

Marathon Central WWTP

DIRECT COSTS SUMMARY Markup= 25.0%

Design Flow, MGD = 1.459 Hours/wk= 112

Treatment Plant Operations		**Margin $**	**Total $**
Labor	$256,221.33	$64,055.33	$320,276.67
Benefits	$90,805.41	$22,701.35	$113,506.76
Overtime	$19,364.80	$4,841.20	$24,206.00
Office Supplies	$2,500.00	$625.00	$3,125.00
Operating Supplies	$5,000.00	$1,250.00	$6,250.00
Postage & Freight	$0.00	$0.00	$0.00
Telephone	$3,600.00	$900.00	$4,500.00
In-house Lab	$34,176.00	$0.00	$34,176.00
Outside Services	$15,600.00	$0.00	$15,600.00
Water	$3,600.00	$900.00	$4,500.00
Electricity	$94,812.22	$23,703.05	$118,515.27
Chemicals	$459,678.89	$114,919.72	$574,598.61
Vehicle Expense	$19,918.95	$4,979.74	$24,898.68
Repair Parts	$25,000.00	$6,250.00	$31,250.00
Solids Operations			
Labor	$66,320.34	$16,580.08	$82,900.42
Benefits	$28,079.85	$7,019.96	$35,099.81
Overtime	$0.00	$0.00	$0.00
Contract Hauling	$334,951.20	$0.00	$334,951.20
Outside Services	$1,080.00	$0.00	$1,080.00
Chemicals	$5,861.65	$1,465.41	$7,327.06
Vehicle Expense	$15,845.77	$3,961.44	$19,807.21
Repair Parts	$20,000.00	$5,000.00	$25,000.00
Collection System Operations			
Labor	$127,750.00	$31,937.50	$159,687.50
Overtime	$19,162.50	$4,790.63	$23,953.13
Benefits	$42,762.84	$10,690.71	$53,453.55
Electricity	$189,624.44	$47,406.11	$237,030.54
Chemicals	$0.00	$0.00	$0.00
Vehicle Expense	$16,863.00	$4,215.75	$21,078.75
Repair Parts	$25,000.00	$6,250.00	$31,250.00

	Direct Cost	Margin	Contract
Total	$1,898,579.17	$378,192.99	**$2,276,772.16**

Project: Marathon Wastewater Project Collection Alternative Analysis
Service Area 6 : Vaccum Collection System - Construction Costs

#	Description	Quantity	Unit	Unit Cost	Subtotal	Contin-gency 10%	Total
1	Vaccum Main						
	4"	15,500	LF	$65.00	$1,007,500.00	$100,750.00	$1,108,250.00
	6"	9,950	LF	$75.00	$746,250.00	$74,625.00	$820,875.00
	8"	4,400	LF	$80.00	$352,000.00	$35,200.00	$387,200.00
	10"	4,000	LF	$90.00	$360,000.00	$36,000.00	$396,000.00
2	Force Main						
	8"	0	LF	$85.00	$0.00	$0.00	$0.00
	12"	0	LF	$100.00	$0.00	$0.00	$0.00
	14"	0	LF	$110.00	$0.00	$0.00	$0.00
	16"	0	LF	$120.00	$0.00	$0.00	$0.00
3	Valves						
	4" plug valve	14	EA	$680.00	$9,520.00	$952.00	$10,472.00
	6" plug valve	6	EA	$800.00	$4,800.00	$480.00	$5,280.00
	8" plug valve	4	EA	$1,200.00	$4,800.00	$480.00	$5,280.00
	10" plug valve	4	EA	$2,000.00	$8,000.00	$800.00	$8,800.00
	12" plug valve	0	EA	$2,500.00	$0.00	$0.00	$0.00
	14" plug valve	0	EA	$3,500.00	$0.00	$0.00	$0.00
4	3" service w/crossover connection	215	EA	$500.00	$107,500.00	$10,750.00	$118,250.00
5	Buffer Tanks						
	Single	12	EA	$12,000.00	$144,000.00	$14,400.00	$158,400.00
	Dual	3	EA	$15,000.00	$45,000.00	$4,500.00	$49,500.00
	Quad	0	EA	$25,000.00	$0.00	$0.00	$0.00
6	Gravity Services						
	6" service w cleanout	566	EA	$500.00	$283,000.00	$28,300.00	$311,300.00
	6" dual service w cleanout	168	EA	$650.00	$109,200.00	$10,920.00	$120,120.00
7	Jack & Bore US1 (120')						
	6"	2	EA	$75,000.00	$150,000.00	$15,000.00	$165,000.00
	10"	0	EA	$90,000.00	$0.00	$0.00	$0.00
8	Bridge Crossing						
	16"	100	LF	$225.00	$22,500.00	$2,250.00	$24,750.00
9	Driveway Restoration	2,250	LF	$10.00	$22,500.00	$2,250.00	$24,750.00
10	US1/DOT Trench Restoration	5,425	LF	$120.00	$651,000.00	$65,100.00	$716,100.00
11	Non-DOT Trench Restoration	310	LF	$15.00	$4,650.00	$465.00	$5,115.00
12	Right-of-way Restoration	26,910	LF	$10.00	$269,100.00	$26,910.00	$296,010.00
13	Vacuum Pits	215	EA	$5,000.00	$1,075,000.00	$107,500.00	$1,182,500.00
14	Vacuum Station Complete	1	EA	$750,000.00	$750,000.00	$75,000.00	$825,000.00
15	Vacuum Station Land Acquisition	0	EA	$300,000.00	$0.00	$0.00	$0.00
16	12' Dia. Master liftstation	0	EA	$600,000.00	$0.00	$0.00	$0.00
17	Startup, spares & tools	1	LOT	$175,000.00	$175,000.00	$17,500.00	$192,500.00
	Total Construction Cost				$6,301,320.00	$630,132.00	$6,931,452.00

Table 2 - 16
Section 2
17 (Revised 1/2006)

Table 4-3 Comparison of O&M Direct Costs

	Weiler Plan	Central WWTP	Two WWTPs
Treatment Plant Operations			
Labor	$346,486.61	$256,221.33	$389,202.67
Benefits	$126,032.09	$90,805.41	$143,805.56
Overtime	$31,194.83	$19,364.80	$38,729.60
Office Supplies	$3,500.00	$2,500.00	$3,000.00
Operating Supplies	$7,000.00	$5,000.00	$6,000.00
Postage & Freight	$0.00	$0.00	$0.00
Telephone	$7,200.00	$3,600.00	$4,800.00
In-house Lab	$57,954.00	$34,176.00	$68,352.00
Outside Services	$9,540.00	$15,600.00	$31,200.00
Water	$5,520.00	$3,600.00	$4,800.00
Electricity	$98,977.18	$94,812.22	$104,970.67
Chemicals	$459,678.89	$459,678.89	$459,678.89
Vehicle Expense	$24,235.16	$19,918.85	$22,592.17
Repair Parts	$53,500.00	$25,000.00	$40,000.00
Solids Operations			
Labor	$66,319.74	$66,320.34	$66,320.34
Benefits	$28,079.86	$28,079.85	$28,079.85
Overtime	$0.00	$0.00	$0.00
Contract Hauling	$334,951.20	$334,951.20	$334,951.20
Outside Services	$2,700.00	$1,080.00	$1,620.00
Chemicals	$5,861.63	$5,861.65	$5,861.65
Vehicle Expense	$15,845.77	$15,845.77	$15,845.77
Repair Parts	$20,500.00	$20,000.00	$20,000.00
Collection System Operations			
Labor	$102,139.70	$127,750.00	$127,750.00
Overtime	$15,319.47	$19,162.50	$19,162.50
Benefits	$34,186.75	$42,762.84	$42,762.84
Electricity	$147,410.43	$189,624.44	$189,624.44
Chemicals	$0.00	$0.00	$0.00
Vehicle Expense	$13,481.13	$16,863.00	$16,863.00
Repair Parts	$28,000.00	$25,000.00	$25,000.00
Total O&M Cost	**$2,045,614.44**	**$1,923,579.09**	**$2,210,973.15**
O&M Cost Differential from WEC		-$122,035.35	$165,358.71
Approximate Cost per month per EDU	$19.51	$18.35	$21.09
Billing/month/EDU	$2.00	$2.00	$2.00
Admin fees per month per EDU	$4.88	$4.59	$5.27
Capital R&R per month per EDU 2.5%	$16.69	$43.16	$36.01
Total Monthly Bill	**$43.08**	**$68.10**	**$64.37**

Section 1
Executive Summary

1.1 Background

The Florida Keys are comprised of a chain of more than 800 individual islands located at the southern tip of Florida, extending from Soldier Key at the northeastern point, to the Dry Tortugas at the southwestern point. The more developed islands are connected by U.S. Highway 1, a 110-mile stretch of roadway from Key Largo to Key West. A significant portion of the waters adjacent to the islands has been designated as Outstanding Florida Waters, and includes the 2,800-nautical square mile Florida Keys National Marine Sanctuary (FKNMS) the second largest in the United States. The ecosystem and coral reefs within the Keys are complex and dynamic systems and one of earth's most precious resources. Nevertheless, wastewater practices in the islands have placed the marine ecosystem under stress. Ongoing research has determined that continued discharge of nutrients into the nearshore waters (as a result of septic tanks and illegal cesspits) is a major direct cause of the degradation of the Keys' nearshore and coastal waters. The unique geological and hydrological characteristics of the Keys, as well as the protected status of the waters surrounding the islands, mandate the need to construct facilities to treat and dispose of wastewater to help restore the health and economic vitality of the Keys' marine community.

1.2 Project Purpose and Scope

This Marathon Wastewater Project originated from a recognition of the need to eliminate septic tanks and illegal cesspits that exist within the City of Marathon in order to restore the health and economic vitality of its nearshore waters. The purpose of this facilities plan is to define the most cost-effective, environmentally sound, and simplest implemented program for the management of existing and future wastewater pollutants that act, or will act, to deteriorate the Keys' water quality in the Marathon area. This plan is consistent with the Comprehensive Sanitary Wastewater Master Plan for Monroe County, in accordance with the United States Environmental Protection Agency (EPA) and the Florida Department of Environmental Protection (FDEP) guidelines under PL 92-500 and the Monroe County Year 2010 Comprehensive Plan. This plan has been adopted by the City of Marathon.

1.3 Potential Financing and Funding Sources

Funding for this project is being sought through FDEP State Revolving Loan Fund (SRF) program as well as through grant appropriations from state and federal agencies.

1.4 Project Description

This proposed project provides an affordable long term solution to meeting the 2010 wastewater treatment goals. To determine the best approach various technologies and various configurations of service areas were examined. The City of Marathon service area is defined as the east end of the Seven Mile Bridge extending eastward to Tom's Harbor Bridge and includes the following: Knight's Key, Vaca Key, Boot Key, the Sombrero area, Fat Deer Key, Coco Plum, Long Point Key, Little Crawl Key, Crawl Key, Valhalla Island, and Grassy Key. The entire service area is shown in figure 1-1, individual service area maps follow in figures 1-2 through 1-9.

Initially, the 1998 Marathon Facilities Plan collection system alternatives were re-evaluated using current unit prices. It was determined that vacuum systems are the most cost-effective method of wastewater collection for larger service areas, but that a combination of conventional gravity systems and macerator or STEP systems was more appropriate for smaller service areas. It was also determined that in areas of low density or remote location, on-site and cluster systems were the correct choice.

Unlike the findings in the Marathon Facilities Plan, it was not decided that a single type of collection system was best, but rather, use of the most practical and cost effective system for each of the various neighborhoods in the City was most economical. This originally resulted in eight service areas, however, by combining two areas it became practical to install another vacuum collection system. These systems are easily powered in emergency situations and handle hurricane recovery with ease. The final review resulted in seven service areas (see table 1-1). The four largest service areas can most effectively be served by vacuum sewer systems. Two of the smaller service areas are best served by small gravity systems and macerator or STEP pumping systems. The last service area, Grassy Key, is to be served by on-site and cluster systems in the residential area while the eastern end of the island where the trailer parks are located will be served with small gravity systems and macerator or STEP systems. The Boot Key service area consists of a single facility and will be served by an on-site system. See table 1-2 for a summary of selected alternatives.

Finally, the construction costs and O&M costs for various combinations of wastewater treatment plants was examined. It was found that the capital costs for construction of wastewater treatment plants (WWTPs) to serve the City of Marathon could be reduced by using a combination of: 1) pre-engineered systems; 2) upgraded existing WWTPs; 3) use of relocated BAT WWTPs and 4) on-site and cluster type treatment systems. This also allowed the elimination of deep injection wells and long runs of force mains.

The following service area briefs give a description of each service area and the selected alternatives for each.

1.4a Service Area Briefs

Service Area 1, Knight's Key, is currently in process of re-development by a private developer. The year 2015 estimated wastewater flows are .023 MGD. The City of Marathon intends to partner with the developer to provide a new best achievable treatment (BAT) plant to handle the flows from the entire island. The city would then design and construct a collection system to convey the existing properties' sewage to the new BAT wastewater treatment plant located in the new development. Effluent disposal will be through Class V shallow injection wells.

Service Area 2, Boot Key, currently has one small facility surrounding the radio tower complex. The year 2015 estimated wastewater flows are .0006 MGD. The rest of the island is not able to be developed. The best way to provide service here is a small BAT on-site unit located such that gravity flow will provide the only needed conveyance. Effluent disposal will be through Class V shallow injection wells, subsurface drip irrigation, or a conventional drain field.

Service Area 3, Vaca Key (west), includes both ocean side and bayside from 11th Street up to 33rd Street. The year 2015 estimated wastewater flows are .247 MGD. The density in this area allows a vacuum collection system to be cost effective. Treatment will be provided by a new .250 MGD nutrient removal wastewater treatment plant constructed in this area. Pine Island will be served with an on-site system. Effluent disposal will be through Class V shallow injection wells.

Service Area 4, Vaca Key (central), includes both ocean side and bayside from 33rd Street through 60th Street as well as all of the Sombrero area. The year 2015 estimated wastewater flows are .399 MGD. The density in this area allows a vacuum collection system to be cost effective. A new .400 MGD nutrient removal wastewater treatment plant will be constructed in this area to provide needed treatment. The effluent disposal will be primarily re-use on the Sombrero Country Club, alternate Class V shallow injection wells will also be provided.

Service Area 5, Vaca Key (east), includes both ocean side and bayside from 60th Street through Vaca Cut and includes the Little Venice Area. The year 2015 estimated wastewater flows are .490 MGD. The density in this area allows an expansion of the existing vacuum collection system to be cost effective. The existing Little Venice advanced wastewater treatment plant will be expanded to .499 MGD to provide treatment.. Effluent disposal will be a combination of re-use on the City of Marathon parks and events fields and through Class V shallow injection wells.

Service Area Briefs (continued)

Combined Service Area 6, Fat Deer Key (west), includes both ocean side and bayside from Vaca Cut to Coco Plum and down Coco Plum Drive to it's end. The year 2015 estimated wastewater flows are .155 MGD. This area was re-addressed in December of 2005 once it was determined that some of the flow from these areas would not be pumped to the City of Key Colony Beach WWTP. The original conclusion of grinder pump collection system for this area is still marginally the most economical, as shown in Section 2, however, with the increase in flow and service area size, a vacuum collection system became much more attractive for this area. Value engineering during this review has also reduced the construction cost estimate. The inability to provide back-up power and 24 hour retention volumes for hundreds of pump stations has made the vacuum collection system the recommendation in this area. The treatment will be provided by upgrading an existing package plant both in capacity and in treatment to meet advanced wastewater treatment standards. Effluent disposal will be through Class V shallow injection wells.

Service Area 7, Grassy Key, includes both ocean side and bayside from the east end of Fat Deer Key through to the east end of Grassy Key. The year 2015 estimated wastewater flows for this area are .063 MGD. The large geographic size and distance between properties in this area requires that a combination of systems be used in this area to be economically feasible. The two areas at the east end of the island where the trailer parks are located have the greatest density. These areas will be served by re-location of at least two (2) BAT WWTPs from existing facilities that will be served by new proposed facilities. The collection system here will consist of existing gravity systems as well as liftstations to redirect the flow to the new plants. The other less dense areas are proposed to be served through a combination of on-site and cluster systems thus eliminating the need for costly vacuum systems and forcemains.

Table 1-1 : City of Marathon Proposed Sewer Service Areas

Service Area #	Description	Boundaries
1	Knight's Key	Entire Island
2	Boot Key	Entire Island
3	Vaca Key - West	11th Street to 33rd Street
4	Vaca Key - Central	33rd Street to 60th Street including the entire Sombrero area
5	Vaca Key - East	60th Street to Vaca Cut including Little Venice
6	Fat Deer Key (West) - Coco Plum	Vaca Cut to Coco Plum – south to the end of Coco Plum drive
7	Grassy Key	Fat Deer Key east through Grassy Key

Table 1- 2: Service Area: Selected Collection Treatment and Disposal Alternatives

Service Area #	Year 2015[1] Estimated Wastewater Flows MGD	Collection System Alternative	Treatment System Alternative	Effluent Disposal Alternative
1	.023	Low pressure Forcemain	Work with Developer to build new BAT WWTP	Injection wells
2	.0006	N/A	On-site BAT system	Injection wells
3	.247	Vacuum	Advanced WWTP	Injection wells
4	.399	Vacuum	Advanced WWTP/Re-use	Sombrero CC
5	.490	Vacuum	Expansion of Little Venice Advanced WWTP/Re-use	City of Marathon Parks
6	.155	Vacuum	Upgrade an existing WWTP (Bonefish Towers)	Injection wells
7	.133	Numerous	Re-locate BAT WWTP's from other service areas, cluster & on-site systems	Injection wells

[1] 2015 estimated wastewater flows from 1998 Marathon Facilities Plan

1.5 Preliminary Cost Estimates

Capital costs and operation and maintenance (O&M) costs were determined for each alternative system evaluated in this report. Actual costs for any given system will depend on actual labor and materials costs, market conditions, project scope, implementation schedule, and other factors.

O&M costs were based on unit costs for power, chemicals, and labor, as appropriate for the Florida Keys. These are also order-of-magnitude estimates and are believed to be accurate within the same range as the capital cost estimates.

Although estimates have a fairly wide range of uncertainty, they were developed with similar methodologies and assumptions. Therefore, for purposes of comparing alternatives, the costs of alternative systems are considered significantly different if they differ by more than 10 percent. If costs or present values are within 10 percent they are considered the same.

The proposed plan minimizes construction costs by using multiple treatment plants and on-site systems and at the same time keeps O&M costs low by proper sizing of the facilities to minimize staffing requirements. With a construction cost estimated at just $69,857,882, or approximately $8,000 per EDU, this approach will provide a long-term, low cost solution to meeting the 2010 goals. It is also believed that this approach will result in the lowest monthly bills to the rate payers in the City of Marathon service area.

1.6 Project Justification

The need for further reduction of human produced pathogen and nutrient loadings in the nearshore waters of the Florida Keys is well documented. Numerous studies have been funded and completed starting back in 1962 and running right through 1995. A minimum of 39 separate studies are well documented in the Marathon Wastewater Facilities Plan produced by CH2M HILL in April of 1998. The general consensus of these studies is that Anthropogenic nutrient loading is an increasing problem that is affecting the health and viability of nearshore marine communities in the Florida Keys. This project strives to upgrade the existing wastewater treatment in the City of Marathon service area with long term solutions that will in turn improve coastal marine water quality in the area.

Rather than revisiting all of these studies, this document recognizes the fact that the 1998 Marathon Wastewater Facilities Plan was thorough, complete, and is as relevant today as in 1998 and herby adopts chapter 2 as justification for this project. This chapter has been reproduced in attachment A.

1.7 Project Period

This project is currently in the planning and design phase. Procurement will begin this summer with construction expected to begin in the spring of 2006. This phased implementation project is estimated to run through the end of 2010.

2.1 City of Marathon Updated Collection System Alternative Analysis

The construction of a system for collection of wastewater is a significant portion of the cost of a complete wastewater treatment system. The 1998 Marathon Facilities Plan was reviewed and updated with 2005 pricing in appropriate areas. It appears that recent sewer projects in the Keys, funded mostly with grant money, have caused the prices for underground piping installation to skyrocket. A good example of this is seen in the recent bid for the proposed Marathon Central Sewer Plan in which installation of 14 inch diameter forcemain was priced at $218.00 per lineal foot while the 1998 Facilities Plan budgeted just $30.00 per lineal foot. Weiler felt this drastic change in pricing structure justified a complete update of the collection system alternatives analysis.

New analytical spreadsheets shown in the following pages were designed and realistic 2005 prices, as received in the recent Key Largo Park re-bid, were input. All new quantities and layouts were used in this review. These spreadsheets were used to evaluate the different collection system alternatives for each service area at today's prices.

Evaluation of the alternatives at 2005 prices revealed no startling differences from the original conclusions drawn in the 1998 Marathon Wastewater Facilities Plan. Vacuum systems appear to be the most economical way to collect wastewater in high density areas. Vacuum systems have several factors in their favor:

- Vacuum piping is installed in shallow trenches
- Vacuum sewers do not require a power source at the connection point
- Operation and maintenance costs appear less for vacuum valves than macerator pumps
- Vacuum valves are made of composite materials, are non-corrosive, and have few moving parts

Weiler recommends a vacuum collection system be installed in service areas 3, 4, 6, and the vacuum system in service area 5 be expanded.

Lower density areas and smaller areas appear to be better served with macerator pump systems or conventional gravity. This is due to the high cost of individual vacuum stations at approximately $1,000,000 each. Macerator pump and gravity systems work well and will be much more cost effective in areas where there are not enough connections to support the cost of a vacuum station.

Weiler recommends gravity and macerator pump collection systems in service area 1.

The following tables show the updated pricing for each collection system alternative for each individual service area as previously discussed.

2.2 City of Marathon Updated Wastewater Treatment Alternative Analysis

The construction costs for various combinations of wastewater treatment plants has been examined extensively. It was found that we can reduce the capital costs for construction of wastewater treatment plants to serve the City of Marathon by using a combination of: 1) pre-engineered systems; 2) upgraded existing WWTPs; 3) use of relocated BAT WWTPs and 4) on-site and cluster type treatment systems. This also allowed us to eliminate the deep injection wells and long runs of force mains. A thorough discussion of the results is shown in Section 4 "Selected Alternatives".

A multitude of information was available in the Monroe County Sanitary Wastewater Plan and the 1998 Marathon Wastewater Facilities Plan. This information was studied and reveals that treatment costs are similar regardless of the type of process chosen. The use of pre-engineered systems appears to be the most affordable alternative. The cost estimate information from the 1998 Marathon Facilities Plan is included in attachment C.

2.3 City of Marathon Wastewater Operation and Maintenance Cost Estimates

The cost of operating and maintaining wastewater collection and treatment facilities must be recovered in the monthly users fees and should be considered when planning the wastewater facilities. WEC's staff have many years of experience with estimating O&M costs and have prepared estimates for WEC's proposed approach as well as for two other options discussed in the recent Marathon regional proposals.

The cost model developed by WEC addresses all components of the O&M costs associated with wastewater collection, treatment and disposal, including sludge removal. Several key components of the model include:

- **Labor costs**: The required WWTP operations staffing is set by the FDEP. Solids processing man-hours are based on the quantity of sludge produced. Collection system man-hours are based on the size of the service area. All these hours are inputs in the spreadsheet. Wages for each position are in a data field. The model computes the costs of health insurance, workers compensation, payroll taxes, vacation time, holidays, etc. and determines a true hourly cost for each position. Overtime is estimated as a percentage of regular hours for certain positions. The model then calculates the direct cost for labor, benefits and overtime as shown on the summary sheets.
- **Laboratory costs**: The number of permit-required samples and the number of process control samples for each plant is determined by the treatment capacity. Costs for each analysis, both in-house for process control and Outside Services for FDOH-certified testing, are then used to calculate the annual cost of testing.

- **Electrical costs**: The horsepower and estimated run times for the major electrical equipment are inputs. The model calculates annual cost of electricity based on these inputs and the cost per kilowatt-hour.
- **Treatment Plant Chemicals**: Treatment plant chemicals are calculated based on the treatment plant flow, the characteristics of the raw wastewater and biological removal efficiencies. The unit costs for the chemicals include freight to Marathon.
- **Contract Hauling and Chemicals for Solids Operations**: We have assumed that a mobile centrifuge or belt press will be used to travel from treatment plant to treatment plant to dewater the biosolids to 18% solids. The total tonnage of biosolids is calculated based on the wastewater strength and quantity, and predicted growth rates. The current hauling rates for land application of Class B residuals are used to calculate the contract hauling cost. Chemical costs are due to polymer consumption during the dewatering process and are based on the dry weight of sludge produced at the facility.
- **Vehicle Expense**: Vehicle expense for the maintenance staff, collection system staff and the solids staff are calculated using the required man-hours. An hourly vehicle cost is estimated by amortizing the cost new over 10 years and adding anticipated fuel consumption, repairs, insurance, etc. This hourly expense is then used to calculate the vehicle expense. Under the Treatment Plant Operations, two vehicle allowances are also included for administrative and supervisory staff. In the WEC plan, these two vehicle allowances are spread among the four largest facilities.
- **Miscellaneous Other Expenses**: Other categories of expenses are generally based on the size of the treatment system and the level of staffing. These include office and operating supplies, telephones, water, and repair parts.

We used the model to estimate annual costs for six of the seven service areas anticipated in our plan. The Boot Key service area was excluded as being irrelevant since it will be served by a single on-site system. A summary page of the cost estimate models for each of the six remaining service areas is attached, along with estimates for a central treatment plant and two regional treatment plants.

Operation and maintenance cost estimates from the 1998 Marathon Wastewater Facilities Plan are shown in appendix C along with the construction cost estimates.

Section 3
Environmental Effects

3.1 Project Area Characteristics

3.1a Project Area

The Marathon Wastewater Project service area is defined as the east end of the Seven Mile Bridge extending eastward to Tom's Harbor Bridge and includes the following: Knight's Key, Boot Key, Vaca Key, the entire Sombrero area, Fat Deer Key, Coco Plum, Long Point Key, Little Crawl Key, Crawl Key, Valhalla Island, and Grassy Key. The entire service area is shown in figure 1-1, individual service area maps are shown in figures 1-2 through 1-8.

3.1b Geology

The Floridian Plateau, which is characterized by chemically or biologically produced sediments, underlies the Everglades, Florida Bay, and the Florida Keys, as well as a large portion of the west Florida continental shelf. The islands of the Florida Keys represent elevated remnants of a Pleistocene coral reef tract that extends from Soldier Key through Key West. The Florida Keys can be divided into two physiographic provinces distinguished by the shape, orientation, and lithology of the banks and islands in each. The northernmost province of the Florida Keys (Key Biscayne through Marathon) is characterized by long, narrow islands oriented northeast to southwest. These narrow islands and the man-made land bridges between them restrict water exchange between the Atlantic, Florida Bay, and the various sounds in this area. It is here that the Florida Reef Tract is best developed. These islands are formed of an aerially weathered and re-crystallized limestone known as Key Largo Limestone. The southwestern province of the Florida Keys (Bahia Honda through Key West) is characterized by roughly triangular islands oriented in a northwest to southeast direction, or at right angles to the Florida Reef Tract. These islands are built on an extension of the older Miami Oolite Formation and their northwest-southeast orientation results from the directional movement of tidal currents over differing sea-level stands in the Gulf of Mexico and the Straits of Florida.

3.1c Topography

Generally, the islands of the Florida Keys lie only 0.6 to 1.0 m (2 to 3 feet) above mean high tide. Maximum elevations, seen in the Key Largo area, reach only 5.5 m (18 feet) above sea level.

3.1d Climate

The Marathon area has a mild semitropical maritime climate with a small daily range in temperature. Water temperatures and salinities vary seasonally and are affected by individual storms and seasonal events. The winds that affect the Florida Keys are generally southeast to easterly and they bring in moist tropical air over the area. Major storms, including hurricanes, historically have affected the area on an average of once every seven years. During winter, cold fronts occasionally push rapidly through the area, and may cause rapid drops in temperature and high winds from the northwest. These winter conditions generally last 4 to 5 days. There is a relatively long, and sometimes severe, dry season (November through April) and a wet season. Approximately 50 to 80 percent of the annual rainfall is received during the May through October wet season. These wet/dry seasonal precipitation levels, coupled with the winter increase in population seen throughout the Florida Keys, have numerous ramifications in terms of freshwater resource allocation and potential nearshore pollution problems within the Marathon area.

3.1e Hydrology

In the Florida Keys, physical oceanographic processes (including tides, currents, and surface waves) force local and regional circulation and, as a result, drive water-mass transport and exchange, embayment flushing, and bottom sediment transport. Working separately or in combination, these processes affect the local water quality by transporting potential pollutants (polluted waters or sediments) into or out of the region, or by maintaining them in place. The Florida Current sweeps through the Straits of Florida and dominates the offshore transport of the entire region. Surface measurements at 5 km offshore of Marathon and Miami recorded mean flows to the east and north at 20 cm/s. A deep countercurrent (below 400 m) has been observed in the northern Keys and off the eastern Florida mainland, however, this does not affect the shallow coastal waters. Cyclonic eddies that spin off the western edge of the Florida Current have been observed east of Miami and are probably common throughout the northern Keys. These eddies are 20 to 30 km long (north-south) and 10 km across (east-west) and they move northward through the coastal waters with translation speeds of 25 cm/s.

Two principal aquifers underlie Monroe County. These are the Biscayne Aquifer, commonly referred to as the Surficial Aquifer System, and the Floridan Aquifer, which is a confined or artesian aquifer system.

The Biscayne Aquifer is an unconfined aquifer system under water-table conditions. Aquifers under water-table conditions are free to rise and fall in the direct relation to regional and local recharge mechanisms, such as precipitation, diurnal and seasonal tidal fluctuations, or discharges into canal systems, the latter of which constitute groundwater loss. The Biscayne Aquifer System is regarded as the primary sole source aquifer of potable water throughout most of southeastern Florida, but in the Florida Keys it is

designated as a non-potable water source because of its excessive chloride content. It is one of the most productive and permeable aquifer systems in the world.

The elevation, or mean distance to the surface, of the Biscayne Aquifer closely mimics surface elevation contours of the Florida Keys and averages approximately 1 m (3 feet) below surface grade. These elevations vary seasonally in response to periods of increased and/or decreased rainfall amounts, and vary on a daily/seasonal basis due to tidal fluctuations. On some of the larger Keys, with areas of high topographical relief (i.e., Big Pine Key, Key West, Sugarloaf Key, and Cudjoe Key), there are thin lenses of non-potable freshwater that typically average 6 m (20 feet) in thickness. The dimensions of these lenses vary seasonally, but are not sufficient to meet the local population's demand for drinking water. Consequently, the residents of the Florida Keys, despite an abundant supply of non-potable water, must receive all of their potable water from Dade County via the Florida Keys Aqueduct Authority.

Beneath the Florida Keys, the Biscayne Aquifer runs through the Miami Limestone, Key Largo Limestone, and Tamiami Formations. The Tamiami Formation underlies the Key Largo Limestone in the northern Keys. This formation grades downward in a poorly hardened limestone and calcareous sand of low permeability into a more highly permeable sandy fossiliferous limestone intermixed with clastic sediments. The Hawthorne Group forms the boundary between the upper Biscayne and deeper Floridan Aquifer systems.

The Floridan Aquifer runs between 244 and 670 m (800 and 2,200 feet) below ground in the Marathon area. It is also considered a non-potable water source in the Florida Keys. The 670 m lower boundary of the Floridan Aquifer is described as the Boulder Zone and is generally considered the lower boundary of Floridan Plateau sediments.

3.2 Marine Biological Communities

Broadly speaking , the FKNMS contains three unique and critically important marine biological communities:

1. The mangrove forest lining its shores;
2. The extensive seagrass meadows, estimated to be some of the largest in the world, which lie on both sides of the island chain and extend offshore to the reef tract itself; and
3. The Florida Reef Tract, which contains the only shallow-water coral reef ecosystem within the continental United states.

All these communities are tremendously complex within themselves, and each is made up of a vast number of interacting organisms. As is the case with the redwood forests of California, a few key plant and animal species define each community. These species, the mangroves, seagrasses, and hard corals, actually build and define the habitat, providing the structure that supports each community's countless individual inhabitants. Most of the fish and invertebrate species that contribute so heavily to Florida's sports and

commercial fishing economy, as well as the majority of other mobile reef species, utilize all these different habitats at varying stages of their development.

The marine biological communities off Marathon form an integrated part of the FKNMS ecosystem. These marine biological resources are unique within the United States, and it is the objective of the National Marine Sanctuary Program to preserve and enhance them for future generations.

3.3 Institutional Structure

The entire project area lies within the City of Marathon. Institutional services within the bulk of the Marathon population center are provided by the City, Monroe county, or various state agencies such as the Florida Department of Environmental Protection, Florida Department of Health and Rehabilitative Services, Florida Highway Patrol, and the Florida Fish and Wildlife Commission. The Little Venice wastewater district currently provides centralized wastewater collection and disposal to its residents. Wastewater treatment and disposal in the rest of the City is currently handled by onsite disposal systems and a large number of privately operated package wastewater treatment plants.

3.4 Environmentally Sensitive Resources

Characteristics of the project area, such as geology, topography, climate, and hydrology are discussed above. Environmentally sensitive resources within the project area include upland hardwood hammock communities, mangrove shoreline and wetland communities, marine grass communities in the nearshore ocean waters and throughout Florida Bay, and live coral reef systems. The coral reef systems extend almost continuously for the full length of the project area and, with the exception of near-shore patch reefs, are located 5 to 6 miles offshore on the ocean side. Both the marine grass communities and the reef systems require very high water quality, particularly with regard to suspended sediments and nutrients. Nutrient enrichment of these waters, some of which is attributable to present wastewater management practices in the planning area and throughout the Keys, has contributed to the decline of these marine systems.

3.5 Environmental Impacts of Construction

Construction of wastewater collection system will require installation of approximately 40 miles of pipeline in the service area. Pipe diameters vary from 1.5 to 10 inches in diameter and the vacuum and pressure sewers will be installed with 3 to 4 feet of cover. Additionally, approximately 3 vacuum collection stations must be constructed. The impacts of construction of the wastewater treatment facilities will be minimized by utilizing existing treatment plant sites, where available, and through use of pre-engineered systems that require minimum field construction. This construction activity will result in land disturbance, traffic interruptions, noise, and some short term pollution of water and air.

3.5a Land Disturbance

Land disturbance resulting from constructing the vacuum and pressure sewers, vacuum stations, and wastewater treatment facilities should not result in any adverse hydrogeologic or groundwater quality impacts. Some of the excavation will occur through thin surface soils or fill, but most will be into the Key Largo Limestone. Trenches will be backfilled with the material removed, and the hydrology of the upper part of the Key Largo Limestone will not be significantly affected. Turbidity in shallow groundwater caused by the excavation and backfilling should not migrate far from the backfilled trench and should not have any adverse impacts on surface waters.

3.5b Noise

Noise will be generated by excavation equipment, other heavy machinery, pumps, and truck traffic during construction activities. These short-term nuisance impacts are unavoidable. Construction activities associated with the collection system and wastewater treatment facilities should not penetrate any upland hardwood or mangrove communities and wildlife in these areas should not be significantly impacted by noise. Noise impacts on residents in the construction areas can be minimized by controlling work hours and utilizing noise reduction measures.

3.5c Air Quality

Potential sources of air pollution during construction activities include fugitive dust emissions and engine exhaust emissions. Some emission of fugitive dust is unavoidable, particularly during prolonged dry periods or in windy conditions. Fugitive dust emissions can be controlled to some extent by altering excavation techniques and wetting down or otherwise stabilizing areas with high potential for dust generation. These control methods should be considered for construction in close proximity to residences or businesses. Engine exhaust emissions are unavoidable and should not be significant in comparison to exhaust emissions generated by traffic on US Highway 1 and other roads in the construction area.

3.5d Surface Water

The greatest potential impact to surface waters resulting from construction activities is the potential transport of sediment, turbidity, and other pollutants to nearshore marine waters by stormwater runoff from disturbed areas. This impact can not be entirely eliminated, but can be controlled by employing proper construction and sediment control practices. Construction practices that will minimize sediment loading to surface waters

include quick restoration of trenches and adjacent areas and recirculation of dewatering discharges into other trench sections. Sediment control practices, such as utilization of silt fences and turbidity booms, should also be used extensively to minimize sediment loading to surface waters. Other potential adverse impacts to surface waters, such as fuel or chemical spills, can be minimized by using proper fuel and chemical handling and storage methods.

3.5e Traffic

Traffic impacts caused by construction of the collection system are unavoidable. Nearly all of the sewer lines will be constructed within road right-of-ways. Unsafe traffic conditions and inconveniences to residents and businesses can be minimized by timely completion of construction segments and implementation of a traffic control plan approved by the Florida Department of Transportation and Monroe County.

Construction of the vacuum stations and wastewater treatment facilities will result in very minor traffic impacts in comparison with pipeline construction. The vacuum station facilities are relatively small, being approximately the same size as a small single family home. The wastewater treatment facilities will be slightly larger but still relatively small. Construction will be contained on-site for these facilities and result in minimal impacts on traffic in these areas.

3.5f Historical and Archaeological Resources

Construction and operation of wastewater collection and treatment systems should not have any significant impacts on historic or archaeological resources. All construction of the collection system vacuum and pressure sewers will occur within developed, public right-of-way (road and highway shoulders). Nearly all of these construction areas have been previously disturbed or filled and have very low potential for containing significant archaeological sites. The vacuum stations, collections system, and wastewater treatment facilities are intended to be constructed within developed areas. No historic structures will be impacted by these construction activities.

3.6 Long-Term Environmental Impacts of Operation

Long-term operation of the wastewater facilities will result in some continuing long-term impacts. These include noise, potential odor emissions, traffic impacts, and energy consumption.

3.6a Noise

Noise impacts are easily minimized with very minimal expenditures. Mechanical equipment at the WWTP sites, such as blowers and pump motors, can be enclosed within sound-deadening enclosures or buildings if necessary. All pumps at the vacuum stations

are contained within insulated buildings and should not generate significant noise levels outside the buildings.

3.6b Odor

Odor emissions from the WWTP sites and vacuum stations will be controlled by proven odor control technology. Cost estimates for the WWTPs include budgets for odor control measures. With this high level of odor control at the WWTPs, emission of odors should be minimal and should not be a significant long-term nuisance. Cost estimates for the vacuum stations contain adequate budgets for odor control equipment to provide effective odor control.

3.6c Traffic

This project will not have any long-term traffic impacts. The small size of the wastewater treatment facilities and vacuum stations will minimize the amount of traffic generated at each facility. Only one operator and the occasional maintenance person will be regularly visiting the sites.

3.6d Energy Consumption

Energy consumption is used as a design parameter. Operation and maintenance costs have been carefully evaluated and any possible reduction in energy consumption which would reduce the monthly operating costs is considered critical for long term value to the rate payers, as well as reducing energy needs now and into the future.

3.7 Secondary Impacts

A beneficial secondary impact of this project will be a gradual improvement in confined and nearshore water quality within the service area. Once the wastewater systems are on-line and all existing septic tanks and cesspits are emptied, cleaned and abandoned, wastewater nutrient loading to the canals and nearshore waters should be eliminated. Improvement in water quality should be noticeable first in confined canals, particularly previously-identified "hot spots".

Further away from these confined waters, water quality improvement may be less dramatic and take longer to occur, but will occur over time as a result of the decrease in nutrient loading.

One potential secondary impact that Marathon residents have expressed concern about in public meetings is that the development of publicly owned wastewater facilities will cause an increase in the rate of growth. The rate of growth in Marathon and all of Monroe County is very strictly controlled by the Monroe County Rate of Growth Ordinance (ROGO), and the development of publicly owned wastewater facilities will

not cause an increase in this controlled growth rate. The original ROGO development allocation of 255 units per year throughout Monroe County was based on hurricane evacuation time requirements and not wastewater facility availability.

3.8 Spill Prevention and Response

The potential for sewage spills at the WWTPs or throughout the collection system will be minimized by providing Class 1 reliability for the WWTPs and for the vacuum stations. Class 1 reliability standards provide for multiple treatment units or basins far all essential treatment processes, the ability to bypass individual units or tanks, redundant pumping capabilities that will maintain design pumping capacity with the largest pump out of service, and standby power capability for all treatment processes and vacuum stations.

Some hazardous materials , such as diesel fuel for standby generators and chemicals used in the treatment process, will be handled and utilized by the wastewater utility. The potential for fuel spills will be minimized by using appropriate, approved, double-walled above-ground fuel storage tanks with leak detection and exterior fuel piping. A hazardous materials handling and storage protocol will be developed by the wastewater utility. This protocol will address such items as secondary containment for hazardous material storage areas, hazardous material handling practices, and employee training programs.

Providing Class 1 reliability throughout the wastewater collection and treatment system and utilizing a hazardous materials handling and storage protocol will minimize the risk of releasing sewage or hazardous waste into the environment. As an additional precaution, a spill response contingency plan will be prepared and implemented by the wastewater utility. This plan should address the following areas:

1. Collection system and WWTP operational procedures necessary to isolate forcemain breaks or other potential spill causes.
2. Identification and duties of a local emergency response team to respond to spill situations.
3. Equipment and materials to be maintained ready for isolating and cleaning up spill situations.
4. Coordination of spill response plan with state (FDEP) and federal (USCG & EPA) emergency response programs and guidelines.
5. Rapid notification system to activate wastewater utility and state/federal emergency response teams.

Section 4
Selected Alternative

4.1 City of Marathon Selected Wastewater Treatment System Construction Estimate Summary

The Weiler Engineering Corporation (WEC) has applied its depth of experience in wastewater planning, design, construction and operation in the Florida Keys to developing our approach for the City of Marathon. The following is a discussion of how the construction cost estimates were prepared for the City.

The first step in the construction estimate process was to determine the system project approach which is discussed in the executive summary. Once the service areas were established each are was looked at individually for the specific needs of that area. Some areas had existing facilities available and other areas had such a low density that only on-site systems would be cost effective in these areas. Weiler further looked into possible partnerships with both the public and private sectors as well as any planned construction projects in these areas.

The second step included acquiring aerial maps of each service area. These maps were red lined and the number of lineal feet of pipe needed in each service area was determined. Current local prices were used to determine the actual pipe costs, installation costs, and restoration costs. The US1 corridor restoration prices were calculated separately due to the increased costs in this area.

Next, Weiler determined the appropriate collection system for each area. The cost modeling was done with the appropriate equipment for each service area. Collections system costs include piping, trenching, restoration, pumps, vacuum stations, vacuum pits, manholes and laterals to name a few. Geographical differences and density issues were also taken into account while cost modeling.

The wastewater treatment systems were evaluated on an area by area basis as well. In some areas existing facilities are well suited to expansion, while in other areas new facilities must be constructed. Weiler surveyed the aerial maps and visited each of the service areas several times to determine the most cost effective and practical solution to plant locations. The plant location was then used to refine piping needs and other factors such as effluent disposal, reuse of effluent, re-piping needs, and community needs and acceptance.

Finally, the low density areas were evaluated for on-site best available treatment units. Weiler feels this is the most cost effective alternative in some areas. A combination of different systems was used for budgeting in these areas because each small area subdivision has it's own unique needs and challenges. Project construction costs are shown in table 4-1. The 1998 Marathon Facilities Plan alternative wastewater treatment strategies was also analyzed and is included in appendix C.

4.2 Selected Collection Systems and Service Areas

Initially, we updated the 1998 Marathon Facilities Plan collection system alternatives evaluations using realistic unit prices. We found that vacuum systems are the most cost-effective method of wastewater collection for larger service areas, but that a combination of conventional gravity systems and macerator or STEP systems was more appropriate for smaller service areas. We also found that in areas of low density or remote location, on-site and cluster systems were the correct choice.

Unlike the findings in the Marathon Facilities Plan, it was not decided that a single type of collection system was best, but rather, use of the most practical and cost effective system for each of the various neighborhoods in the City was most economical. This originally resulted in eight service areas, however, by combining two areas it became practical to install another vacuum collection system. These systems are easily powered in emergency situations and handle hurricane recovery with ease. The final review resulted in seven service areas. The four largest service areas can most effectively be served by vacuum sewer systems. Two of the smaller service areas are best served by small gravity systems and macerator or STEP pumping systems. The last service area, Grassy Key, is to be served by on-site and cluster systems in the residential area while the eastern end of the island where the trailer parks are located will be served with small gravity systems and macerator or STEP systems. The Boot Key service area consists of a single facility and will be served by an on-site system.

4.2a Service Area 1

Boundaries

Service Area 1 includes all of Knight's Key. This area includes all residential and commercial property on the Island.

Description

Service Area 1 consists of residential units, condominiums, and a commercial area that is currently an RV resort, but is soon to be redeveloped into resort-style condominiums by Earthmark Companies, LLC.

Wastewater Flows

Current wastewater flows are about 19,000 gallons per day. The size of the area limits development. The year 2015 flows are estimated at 23,000 gallons per day after the redevelopment. Currently Hawks Nest Condos has the only FDEP-permitted sewage treatment system in this service area at this time.

Proposed Treatment Alternative

The new development will be required by FDEP to build a wastewater treatment plant sized to accept the flow from their development. Weiler suggests that the City work with the Developer to have their new best achievable treatment (BAT) wastewater treatment plant (WWTP) sized to accept all of the flow from this area. This will be the most economical alternative for all concerned.

Proposed Collection System Alternative

A combination of small gravity systems, macerator pumps, and small forcemains is recommended to convey wastewater from the areas of the island that are not involved in the redevelopment to the newly constructed BAT WWTP. Existing DOH plants and any other pump stations can simply be upgraded to pump to the new WWTP.

Proposed Disposal Alternative

Class V shallow injection wells will be required for the Developer's new BAT WWTP.

Plant Location

The location would likely be decided by the Developer if the City works with them to size the plant appropriately for the whole island.

Options

The low flows in this area make the above scenario the best alternative. The best alternative to the above would be requiring any commercial properties to install/upgrade their own systems and installation of on-site or cluster systems for the remaining residential units.

4.2b Service Area 2

Boundaries

Service Area 2 includes all of Boot Key. This area includes all property on the Island.

Description

Service Area 2 consists of one developed area located around the base of the radio tower. The facilities consist of a radio station and a boat basin and trap yard.

Wastewater Flows

Current wastewater flows are about 200 gallons per day. The restrictions in this area severely limit development. The year 2015 flows are estimated at only 600 gallons per day.

Proposed Treatment Alternative

One small BAT on-site system will easily handle this entire area.

Proposed Collection System Alternative

No collection system is needed in this area.

Proposed Disposal Alternative

A Class V shallow injection well is suggested for this application.

Plant Location

On-site system located as near to the source of the wastewater flow as possible.

Options

The City could fund the wastewater system for this area or simply require the commercial enterprises to install their own system(s).

4.2c Service Area 3

Boundaries

Service Area 3 includes the area beginning just east of Knight's Key and extending up to approximately 33rd Street including both ocean and bay sides of the Overseas Highway but excluding Boot Key.

Description

Service Area 3 consists of a multitude of developments including: restaurants, resorts, marinas, commercial properties, condominiums, motels, residential areas, the hospital, and continuing development. This area currently has about 11 FDEP permitted wastewater treatment facilities within its boundaries and numerous DOH facilities that will be taken off-line after connection to the new system.

Wastewater Flows

Current wastewater flows are about .231 million gallons per day (MGD). The year 2015 flows are estimated at .247 MGD.

Proposed Treatment Alternatives

One sub-regional biological nutrient removal WWTP with a capacity of .250 MGD is recommended for this area. This plant will require a licensed operator 6 hours per day 5 days a week with a 1 hour visit on Saturday and Sunday.

Proposed Collection System Alternative

This high density area justifies a vacuum collection system. Weiler believes one vacuum station will be sufficient to serve this area. This station would supply vacuum for the entire area and deliver the wastewater to the treatment plant.

Proposed Disposal Alternative

Class V shallow injection wells would be needed for effluent disposal in this area. These wells are much less expensive than the previously proposed deep injection wells. The existing 11 treatment facilities in this area currently use shallow injection wells. When they are abandoned their effluent will be treated to a higher level and then disposed of in the new shallow wells.

Plant Location

The preferred location for the WWTP would be either the vacant property behind the old Silverado Lounge, near the intersection of 15th Street and Ocean Terrace, or to have the WWTP built as part of the Faro Blanco redevelopment. A third option would be the lot where the empty building that was the "Soon to be Famous" Gator's Restaurant.

Options

A central location for the sub-regional plant is very important in order to keep costs to a minimum. A central location will ensure that one vacuum station can be used and would eliminate the need for any re-pumping stations.

4.2d Service Area 4

Boundaries

Service Area 4 will serve the area from approximately 33rd Street up to 60th Street and includes both ocean and bay sides of the Overseas Highway as well as all of the entire Sombrero area including the golf course. It would also include the Kmart Plaza, the HUD Eastwind Apartments, and Winn Dixie wastewater plants.

Description

Service Area 4 consists of a many developments including: marinas, motels, condominiums, restaurants, shopping centers, low income housing, residential units, and continuing development. This area currently has about 30 FDEP permitted wastewater treatment facilities in it's boundaries as well as numerous DOH wastewater systems. These facilities will be taken off-line after connection to the new system.

Wastewater Flows

Current wastewater flows are about .373 MGD. The year 2015 flows are estimated at .399 MGD.

Proposed Treatment Alternative

One sub-regional biological nutrient removal WWTP with a capacity of .399 MGD is recommended for this area. We also recommend that this facility be classified for public access water reclamation. This plant will require a licensed operator 6 hours per day 7 days a week.

Proposed Collection System Alternative

This high density area justifies a vacuum collection system. Various sizes of vacuum mains would be needed in this area.

Proposed Disposal Alternative

The proposed main disposal method for this area is reuse. Reclaimed water will be sent to the Sombrero Country Club for irrigation and storage. Reclaimed water could also be used for irrigation at the City's Sombrero Beach property Class V shallow injection wells will be required by FDEP for effluent disposal when reclaimed water in not in use. The existing treatment facilities in this area currently use shallow injection wells. When they are abandoned their effluent will be treated to a higher level and then disposed of via reuse. Besides being ecologically sound, use of reclaimed water offers the advantages of low-cost irrigation water. The revenues generated by the sale of the reclaimed water can be useful in keeping rates low by apply the revenue toward the WWTP O&M costs.

Plant Location

The preferred location for the wastewater treatment plant is the site where the existing Eastwinds Apartments and the Winn Dixie Plaza WWTPs are located. Besides having the advantage of being at some distance from public roads, there is also an existing 4-inch PVC line running from the Eastwinds Apartments WWTP to Sombrero Country Club. This line can be upsized using trenchless technology and can then serve as the reclaimed water force main. Possible alternative locations for a sub-regional plant are the Marathon Manor area, and the Sombrero Country Club.

WEC anticipates that owners of existing WWTPs would be interested in conveying their WWTP sites to the City. These properties were required by FDEP to install treatment plants because of the large quantities of wastewater generated on site. These same large flows equate to a high number of EDUs and subsequently a large system development charge. Being able to sell the WWTP site to the City to help offset the large capital outlay for the system development charge should prove to be an attractive alternative.

Options

This is the ideal place for reuse facilities. This size plant is an excellent fit with the irrigation needs of the Sombrero Country Club and Sombrero Beach. The suggested location beside Winn Dixie already house two wastewater treatment plants. This would minimize NIMBY complaints and the need for environmental assessments and would also keep the plant close to the golf course for economical delivery of reclaimed water.

4.2e Service Area 5

Boundaries

Service Area 5 includes the area beginning at 60th Street and extending to Vaca Cut both ocean and bay sides included.

Description

Service Area 5 consists of a multitude of developments including: resorts, an airport, marinas, commercial properties, condominiums, motels, residential areas, restaurants, the City of Marathon offices, and continuing development. This area currently has about 14 FDEP permitted wastewater treatment facilities in it's boundaries and numerous DOH facilities that will be taken off-line after connection to the new system.

Wastewater Flows

Current wastewater flows are about .446 MGD. The year 2015 flows are estimated at .490 MGD.

Proposed Treatment Alternative

Weiler recommends that the Little Venice advanced wastewater treatment facility be expanded to .499 MGD to handle this entire area. The current staffing requirements are sufficient for the expansion therefore no additional staffing will be required.

Proposed Collection System Alternative

The Little Venice primary and extended service areas already have vacuum systems in place and they can be expanded to service the entire service area 5.

Proposed Disposal Alternative

Class V shallow injection wells are in currently in place. More wells may be needed to accommodate the expansion. The existing 14 treatment facilities will be abandoned and their effluent will be treated to a higher level and then disposed of in shallow wells.

Plant Location

Expansion of the existing facility eliminates the need for more land and additional environmental impact studies.

Options

Expansion of the existing facilities is definitely the most cost effective alternative for this area. No other options have been identified at this time.

4.2f Service Area 6

Boundaries

Service Area 6 includes the area east of Vaca Cut to Coco Plum Drive and extending down to the end of Coco Plum Drive and includes ocean and bay sides of the Overseas Highway as well as Coco Plum Marina.

Description

Service Area 6 consists of a multitude of developments including: resorts, marinas, commercial properties, motels, residential areas, restaurants, and continuing development. This area currently has 9 FDEP permitted wastewater treatment facilities within it's boundaries and numerous DOH facilities that will be taken off-line after connection to the new system.

Wastewater Flows

Current wastewater flows are about .139 MGD. The year 2015 flows are estimated at .155 MGD.

Proposed Treatment Alternative

Weiler recommends expanding and upgrading an existing package plant in this area. The Bonefish Towers plant appears to be the best candidate. Marie's Yacht Harbor also appears to have the room for expansion. Using one of these sites would be preferable to an undeveloped site since it is already the site of an existing WWTP. A .175 MGD nutrient removal WWTP would handle all the flow from this area.

Proposed Collection System Alternative

The updated Area 6 is large enough to support a central vacuum station and this is the recommended alternative. Vacuum collection systems are easily powered during emergencies and this was a major factor in it's selection in this area.

Proposed Disposal Alternative

The existing WWTP has Class V shallow injection wells. Additional wells may be needed in the upgrade. Re-use will be explored for the City of Marathon park areas as well as resorts in this area.

Plant Location

As mentioned Bonefish Towers looks promising as does Marie's Yacht Harbor.

Options

Other package plants are located in this area as well. Also, undeveloped parcels exist in this area but would require extensive environmental impact studies.

4.2h Service Area 7

Boundaries

Service Area 7 includes the entire Grassy Key area including the Crawl Keys, Valhalla Island, and Long Point Key.

Description

Service Area 7 consists of numerous developments including: trailer parks, resorts, commercial properties, condominiums, residential areas, restaurants, and minimal continued development. This area currently has 2 FDEP permitted wastewater treatment facilities within its boundaries and numerous DOH facilities that will be taken off-line after connection to the new system.

Wastewater Flows

Current wastewater flows are about .110 MGD. The year 2015 flows are estimated at .133 MGD.

Proposed Treatment Alternative

Weiler recommends a combination of several BAT WWTPs, on-site systems, and cluster systems for this area. The high density areas can be served by BAT WWTPs while the lower density areas are to be served with cluster systems and remote areas with on-site systems. We anticipate being able to relocate recently-installed BAT treatment systems from Service Areas 3 and 6 rather than purchasing new systems.

Proposed Collection System Alternative

On-site and cluster systems would require gravity and/or macerator pump systems while the trailer parks and other high density areas would be served by small gravity systems with conventional pump stations. In some cases, the existing pump stations at the trailer parks would be upgraded.

Proposed Disposal Alternative

Class V shallow injection wells will be used for effluent disposal from the proposed BAT WWTPs in this area. On-site and cluster systems may have drain fields, sub-surface drip irrigation or injection wells.

Plant Location

BAT WWTP's that are no longer needed in other service areas can be relocated to the high density areas. No sites have been picked at this time.

Options

Due to the low density of the housing through most of this area, a central wastewater treatment system would not be cost-effective. It is anticipated that the pockets of higher density, such as the trailer parks, can be served by existing BAT plants relocated from areas in Marathon that will be served by a sub-regional WWTP.

4.3 City of Marathon Wastewater Operation and Maintenance Cost Comparison Summary

The cost estimates prepared for each of the seven service areas have been totaled to generate the cost summary on the comparison table 4-3. The first numerical column, identified as "Weiler Plan", provides these totaled O&M costs. WEC's construction cost estimate for this plan is $70,539,313.

The second column, identified as "Central WWTP", provides the O&M cost estimate for a single central WWTP located on Crawl Key as described in the Gilbert-Southern proposal for the Marathon regional facility. The bid amount for this system was $181,000,000.

The third column, identified as "Two WWTPs", provides the cost estimate for two treatment plant as discussed by Gilbert-Southern and CPH at the FKAA workshop. The two plants are one at Crawl Key and an expanded Little Venice plant. This strategy kept each plant under the 1.0 MGD size where deep injection wells are required. Gilbert-Southern estimated that between removal of the deep injection wells, reduction in size of force mains and other value engineering items, the project construction cost could be reduced by $20,000,000 to approximately $160,000,000.

The importance of considering staffing and testing requirements when planning wastewater treatment facilities is made evident by comparing the O&M costs. WEC's plan has 9 FDEP permitted plants and a number of on-site and cluster systems permitted under DOH, yet we have managed to keep the O&M costs lower than for just two larger FDEP permitted plants. As can be seen from table 4-2 the staffing requirements, size does matter. Our approach takes advantage of the lower staffing and testing requirement for smaller plants to keep the O&M costs low.

The bottom of the attached comparison of O&M prices includes an estimate of what a homeowner could expect as a monthly bill. The components include the O&M cost, a charge for billing services, administrative costs at 25% of the O&M cost and a capital repairs and replacement component. This last component is intended to build a reservoir of funds to repair and replace the collection systems and treatment plants as they age. We have used a figure of 2.5% so that the entire system can be replaced over a period of 40 years. It is easy to see that higher capital construction costs can impact the R&R component of the monthly sewer bill.

The WEC plan is well thought out and can be implemented in phases with small enough construction projects that many companies can qualify and be able to bond the job. This increases competition and produces lower unit costs. We have accomplished this without significantly impacting the O&M costs, resulting in the lowest monthly sewer bill for the residents.

Treatment Process	Class A	Class B	Class C	Class D
Processes that exceed secondary treatment standards including the Bardenpho process but does not include polishing ponds or lagoons	3.0 MGD and above Staffing by Class C or higher operator 24 hours/day for 7 days/week. The lead/chief operator must be Class A	0.5 MGD up to 3.0 MGD Staffing by Class C or higher operator 16 hours/day for 7 days/week. The lead/chief operator must be Class B or higher	0.1 MGD up to 0.5 MGD Staffing by Class C or higher operator 6 hours/day for 5 days/week and one visit on each weekend day. 0.05 MGD up to 0.1 MGD Staffing by Class C or higher operator 3 hours/day for 5 days/week and one visit on each weekend day Less than 0.05 MGD Staffing by Class C or higher operator ½ hour/day for 5 days/week and a weekend visit. For all of the above plants, lead/chief operator must be Class C or higher	None

Table 4 – 2 FDEP Wastewater Treatment Facility Staffing Requirements

4.3 City of Marathon Wastewater Operation and Maintenance Cost Comparison Summary

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