Table 4-3

Present Worth Cost Analysis (20 year)
Cudjoe Key
Low Pressure Sewer

Current EDU = 1736
Build Out EDU = 2195

Assumptions:

Inflation = 3%
Interest rate = 6%
Add 11 pumps in year 5, 12 pumps in year 10, and 12 pumps in year 15
Labor/hr = $ 100.00 Including overhead
$/KWH = $ 0.10
Electric = $ 30.00 /pump/yr
Prevnt. Maint. = $ 30.00 /pump/yr
Public Education = $ 2.00 /pump/yr
Emergency call out = $ 390.00 /pump/12yr
Pump replacement = $2,000.00 /pump/12yr

Initial Construction Cost = $19,144,853.76

Calculation of present worth of future construction

$5,577,840.00 of construction can be deferred as lots are developed in the future as follows:

In year 5, 10, & 15 a third of construction will be completed. Cost will be escalated at 3% inflation, then converted to present worth at I = 6%

		$5,577,840.00/3=	$	1,859,280.00	
(F/P) at 3% for 5 years =	1.1593	$1,859,280.00x1.1593=	$	2,155,463.30	Construction Cost at year 5
(F/P) at 3% for 10 years =	1.3439	$1,859,280.00x1.3439=	$	2,498,686.39	Construction Cost at year 10
(F/P) at 3% for 15 years =	1.5580	$1,859,280.00x1.5580=	$	2,896,758.24	Construction Cost at year 15

Converting the future construction cost to Present Worth with I = 6% gives:

(P/F) at 6% for 5 years =	0.7473	$2,155,463.30x0.7473=	$	1,610,777.73
(P/F) at 6% for 10 years =	0.5584	$2,498,686.39x0.5584=	$	1,395,266.48
(P/F) at 6% for 15 years =	0.4173	$2,896,758.24x0.4173=	$	1,208,817.21

Present Worth of future construction = $ 4,214,861.42

Annualize cost of pump replacement and emergency call outs in 12 years and again in 24 years

Calculate future price of pump replacement and emergency call out at 3% inflation in 12 yrs

(F/P) at 3% for 12 years =	1.4258	($2,000+$390)x1.4258=	$	3,407.66	per pump

Converting the 12 year future pump replacement/emergency call out cost to Present Worth with I = 6% gives:

(P/F) at 6% for 12 years =	0.4970	$3,407.66x0.4970=	$	**1,693.61**	per pump

Calculate future price of pump replacement and emergency call out at 3% inflation in 24 yrs

(F/P) at 3% for 24 years =	2.0328	($2,000+$390)x2.0328=	$	4,858.39	per pump

Converting the future pump replacement/emergency call out cost to an annualized cost over 12 years with I = 6% gives:

(A/F) at 6% for 12 years =	0.0593	$4,858.39x0.0593=	$	288.10	per pump/yr

By taking the annualized cost for 8 years, a future cost for year 12 can be calculated with I = 6% gives:

(P'/A) at 6% for 8 years =	8.3838	$288.10x8.3838=	$	2,415.39	in year 12

Converting the annualized cost of future pump replacement/emergency call out cost from year 13 to year 20 to Present Worth with I = 6% gives:

(P/F) at 6% for 12 years =	0.4970	$2,415.39x0.4970=	$	**1,200.45**

PW of future pump replacement and emergency call out per pump = $ **2,894.06** (12yr and 24yr combined)

Converting the present worth of two pump replacements to annualized dollars

(A/P) at 6% for 20 years =	0.0872	$2,894.06x0.0872=	$	**252.36**	per pump/yr

Table 4-3 (Con't)

Present Worth Cost Analysis (20 year)
Cudjoe Key
Low Pressure Sewer

Total annualized cost per pump per year:

Pump replacement =	$	252.36	/pump/yr
Electric =	$	30.00	/pump/yr
Prevnt. Maint. =	$	30.00	/pump/yr
Public Education =	$	2.00	/pump/yr
Total =	**$**	**314.36**	/pump/yr

Convert annualized costs to Present Worth

Assume pumps will be phased in as follows:

Period I: 1072 pumps through year 5
Period II: 1236 pumps from year 6 through year 10
Period III: 1400 pumps from year 11 through year 15
Period IV: 1564 pumps from year 16 through year 20

Calculation of present worth of annualized cost for Period I:

Period I: Annualized cost =	$314.36x1072=	$336,996.03	/yr		
(P/A) at 6% for 5 years =	4.2124	$336,996.03x4.2124=	**$**	**1,419,562.09**	**Present Worth for Period I**

Calculation of present worth of annualized cost for Period II:

Period II: Annualized cost =	$314.36x1236=	$388,551.40	/yr		
(P'/A) at 6% for 5 years =	4.2124	$388,551.40x4.2142=	$	1,636,733.91	in year 5 dollars
(P/F) at 6% for 5 years =	0.7473	$1,636,733.91x0.7473=	**$**	**1,223,131.25**	**Present Worth for Period II**

Calculation of present worth of annualized cost for Period III:

Period III: Annualized cost =	$314.36x1400=	$440,106.76	/yr		
(P'/A) at 6% for 5 years =	4.2124	$440,106.76x4.2142=	$	1,853,905.72	in year 10 dollars
(P/F) at 6% for 10 years =	0.5584	$1,853,905.72x0.5584=	**$**	**1,035,220.95**	**Present Worth for Period III**

Calculation of present worth of annualized cost for Period IV:

Period IV: Annualized cost =	$314.36x1564=	$491,662.12	/yr		
(P'/A) at 6% for 5 years =	4.2124	$491,662.12x4.2142=	$	2,071,077.53	in year 15 dollars
(P/F) at 6% for 15 years =	0.4173	$2,071,077.53x0.4173=	**$**	**864,260.65**	**Present Worth for Period IV**

Present Worth of all annualized cost for all periods = $ 4,542,174.95

Total Present Worth = $ 27,901,890.13

Present Worth / Current EDUs = $ 16,072.52
Present Worth / Build-Out EDUs = $ 12,711.57

Cudjoe Key

SEPTIC TANK EFFLUENT PUMP (STEP) SYSTEM

FIGURE 4-2

MATHEWS CONSULTING INC.
Civil and Environmental Engineers

SCALE: 1"=1000' 1000' 500' 0 1000'

Florida Keys Aqueduct Authority

CUDJOE REGIONAL WASTEWATER SYSTEM

CUDJOE KEY
PRELIMINARY STEP COLLECTION SYSTEM LAYOUT

PROJ NO: 1474
DATE: FEB. 2009
DWG: STEP-2

Table 4-4

STEP #2
Cudjoe Key
STEP

Number of EDUs Current	1736
Number of EDUs Build-Out	2195

COLLECTION SYSTEM - INSTALLED COST

CURRENT CONSTRUCTION COSTS

ITEM	QUANTITY	UNITS	UNIT PRICE	TOTAL PRICE
2" Force Main (1)	66565	LF	$ 42.00	$ 2,795,730.00
3" Force Main (1)	9928	LF	$ 48.00	$ 476,544.00
4" Force Main (1)	3410	LF	$ 54.00	$ 184,140.00
6" Force Main (1)	3600	LF	$ 68.00	$ 244,800.00
2" Valves	140	EA	$ 500.00	$ 70,000.00
3" Valves	70	EA	$ 750.00	$ 52,500.00
4" Valves	30	EA	$ 1,100.00	$ 33,000.00
6" Valves	19	EA	$ 2,000.00	$ 38,000.00
Simplex STEP Station (2)	988	EA	$ 14,000.00	$ 13,832,000.00
Duplex STEP Station (2)	42	EA	$ 15,500.00	$ 651,000.00
			Subtotal	**$ 18,377,714.00**
			Other Project Cost (3) 27%	$ 4,961,982.78
			Current Estimated Total =	**$ 23,339,696.78**
			Current Estimated Cost/EDU =	*$ 13,444.53*

BUILD-OUT CONSTRUCTION COSTS

ITEM	QUANTITY	UNITS	UNIT PRICE	TOTAL PRICE
2" Force Main (1)	66565	LF	$ 42.00	$ 2,795,730.00
3" Force Main (1)	9928	LF	$ 48.00	$ 476,544.00
4" Force Main (1)	3410	LF	$ 54.00	$ 184,140.00
6" Force Main (1)	3600	LF	$ 68.00	$ 244,800.00
2" Valves	140	EA	$ 500.00	$ 70,000.00
3" Valves	70	EA	$ 750.00	$ 52,500.00
4" Valves	30	EA	$ 1,100.00	$ 33,000.00
6" Valves	19	EA	$ 2,000.00	$ 38,000.00
Simplex STEP Station (2)	1348	EA	$ 14,000.00	$ 18,872,000.00
Duplex STEP Station (2)	108	EA	$ 15,500.00	$ 1,674,000.00
			Subtotal	**$ 24,440,714.00**
			Other Project Cost (3) 27%	$ 6,598,992.78
			Build-Out Estimated Total =	**$ 31,039,706.78**
			Build-Out Estimated Cost/EDU =	*$ 14,141.10*

Notes:

(1) Cost of force mains includes trench repair and road restoration.

(2) Cost of STEP Station includes tank, equipment, installation, electrical connection and 1-1/4" lateral with restoration.

(3) Other project costs include construction contingencies and engineering fees.

Table 4-5

Present Worth Cost Analysis (20 year)
Cudjoe Key
STEP Collection System

Current EDU =	1736
Build Out EDU =	2195

Assumptions:

Inflation =		3%	
Interest rate =		6%	
Add 11 pumps in year 5, 12 pumps in year 10, and 12 pumps in year 15			
Labor/hr =	$	100.00	Including overhead
$/KWH =	$	0.10	
Electric =	$	20.00	/pump/yr
Prevnt. Maint. =	$	271.30	/pump/yr
Public Education =	$	2.00	/pump/yr
Emergency call out =	$	390.00	/pump/5yr
Tank pump out =	$	400.00	/pump/5yr
Pump replacement =	$	870.00	/pump/20yr

Preventive maintenance labor cost is derived from data from Charlotte County. Nine people work full time to maintain 6,900 STEP units.

Initial Construction Cost = $ 23,339,696.78

Calculation of present worth of future construction

$7,700,010.00 of construction can be deferred as lots are developed in the future as follows:

In year 5, 10, & 15 a third of construction will be completed. Cost will be escalated at 3% inflation, then converted to present worth at I = 6%

		$7,700,010.00/3=	$	2,566,670.00	
(F/P) at 3% for 5 years =	1.1593	$2,566,670.00x1.1593=	$	2,975,540.53	Construction Cost at year 5
(F/P) at 3% for 10 years =	1.3439	$2,566,670.00x1.3439=	$	3,449,347.81	Construction Cost at year 10
(F/P) at 3% for 15 years =	1.5580	$2,566,670.00x1.5580=	$	3,998,871.86	Construction Cost at year 15

Converting the future construction cost to Present Worth with I = 6% gives:

(P/F) at 6% for 5 years =	0.7473	$2,975,540.53x0.7473=	$	2,223,621.44
(P/F) at 6% for 10 years =	0.5584	$3,449,347.81x0.5584=	$	1,926,115.82
(P/F) at 6% for 15 years =	0.4173	$3,998,871.86x0.4173=	$	1,668,729.23

Present Worth of future construction = $ 5,818,466.48

Annualize cost of pump replacement

Calculate future price of pump replacement at 3% inflation in 20 yrs

(F/P) at 3% for 20 years =	1.8061	$870.00x1.8061=	$	1,571.31	per pump

Converting the emergency call out cost to an annualized cost over 20 years with I = 6% gives:

(A/F) at 6% for 20 years =	0.0272	$1,571.31x0.0272=	$	**42.74**	per pump/yr

Annualize cost of emergency call outs and tank pump outs in 5, 10, 15, & 20 years

Calculate future price of emergency call out and tank pump out at 3% inflation in 5 yrs

(F/P) at 3% for 5 years =	1.1593	$790x1.1593=	$	915.85	per pump

Converting the 5 year future emergency call out and tank pump out cost to Present Worth with I = 6% gives:

(P/F) at 6% for 5 years =	0.7473	$915.85x0.7473=	$	**684.41**	per pump

Calculate future price of emergency call out and tank pump out at 3% inflation in 10 yrs

(F/P) at 3% for 10 years =	1.3439	$790x1.3439=	$	1,061.68	per pump

Converting the 10 year future emergency call out and tank pump out cost to Present Worth with I = 6% gives:

(P/F) at 6% for 10 years =	0.5584	$1,061.68x0.5584=	$	**592.84**	per pump

Calculate future price of emergency call out and tank pump out at 3% inflation in 15 yrs

(F/P) at 3% for 15 years =	1.5580	$790x1.5580=	$	1,230.82	per pump

Table 4-5 (Con't)

Present Worth Cost Analysis (20 year)
Cudjoe Key
STEP Collection System

Converting the 15 year future emergency call out and tank pump out cost to Present Worth with I = 6% gives:

(P/F) at 6% for 15 years =	0.4173	$1,230.82x0.4173=	$	**513.62**	per pump

Calculate future price of emergency call out and tank pump out at 3% inflation in 20 yrs

(F/P) at 3% for 20 years =	1.8061	$790x1.8061=	$	1,426.82	per pump

Converting the 20 year future emergency call out and tank pump out cost to Present Worth with I = 6% gives:

(P/F) at 6% for 20 years =	0.3118	$1,426.82x0.3118=	$	**444.88**	per pump

PW of future emergency call out per pump = $ **2,235.76** (5, 10, 15, & 20yr combined)

Converting the present worth of emergency call out and tank pump out cost to annualized dollars

(A/P) at 6% for 20 years =	0.0872	$2,235.76x0.0872=	$	**194.96**	per pump/yr

Total annualized cost per pump per year:

Pump Replacement =	$	42.74	/pump/yr
Emerg. Call Out & Pump Out =	$	194.96	/pump/yr
Electric =	$	20.00	/pump/yr
Prevnt. Maint. =	$	271.30	/pump/yr
Public Education =	$	2.00	/pump/yr
Total =	$	**531.00**	/pump/yr

Convert annualized costs to Present Worth

Assume pumps will be phased in as follows:

Period I: 1072 pumps through year 5
Period II: 1236 pumps from year 6 through year 10
Period III: 1400 pumps from year 11 through year 15
Period IV: 1564 pumps from year 16 through year 20

Calculation of present worth of annualized cost for Period I:

Period I: Annualized cost =		$531.00x1072=	$ 569,229.52	/yr	
(P/A) at 6% for 5 years =	4.2124	$569,229.52x4.2124=	$	**2,397,822.45**	**Present Worth for Period I**

Calculation of present worth of annualized cost for Period II:

Period II: Annualized cost =		$531.00x1236=	$ 656,313.15	/yr	
(P'/A) at 6% for 5 years =	4.2124	$656,313.15x4.2142=	$	2,764,653.49	in year 5 dollars
(P/F) at 6% for 5 years =	0.7473	$2,764,653.49x0.7473=	$	**2,066,025.55**	**Present Worth for Period II**

Calculation of present worth of annualized cost for Period III:

Period III: Annualized cost =		$531.00x1400=	$ 743,396.77	/yr	
(P'/A) at 6% for 5 years =	4.2124	$743,396.77x4.2142=	$	3,131,484.54	in year 10 dollars
(P/F) at 6% for 10 years =	0.5584	$3,131,484.54x0.5584=	$	**1,748,620.97**	**Present Worth for Period III**

Calculation of present worth of annualized cost for Period IV:

Period IV: Annualized cost =		$531.00x1564=	$ 830,480.39	/yr	
(P'/A) at 6% for 5 years =	4.2124	$830,480.39x4.2142=	$	3,498,315.58	in year 15 dollars
(P/F) at 6% for 15 years =	0.4173	$3,498,315.58x0.4173=	$	**1,459,847.09**	**Present Worth for Period IV**

Present Worth of all annualized cost for all periods = $ 7,672,316.06

Total Present Worth = $ 36,830,479.33

Present Worth / Current EDUs = $ 21,215.71
Present Worth / Build-Out EDUs = $ 16,779.26

Cudjoe Key

VACUUM SEWER SYSTEM

FIGURE 4-3

MATCHLINE 'A'

NORTH

MATCHLINE 'A'

LEGEND

- 4" VACUUM SEWER MAIN
- 6" VACUUM SEWER MAIN
- 8" VACUUM SEWER MAIN
- DIVISION VALVE
- VACUUM STATION

MATHEWS CONSULTING INC.
Civil and Environmental Engineers

SCALE: 1"=1000' (1000' 500' 0 1000')

Florida Keys Aqueduct Authority

CUDJOE REGIONAL WASTEWATER SYSTEM

CUDJOE KEY
PRELIMINARY VACUUM COLLECTION SYSTEM LAYOUT

PROJ NO: 1474
DATE: FEB. 2009
DWG: VS-2

Table 4-6

VS #2
Cudjoe Key
Vacuum Sewer

Number of EDUs Current	1736
Number of EDUs Build-Out	2195

COLLECTION SYSTEM - INSTALLED COST

CURRENT CONSTRUCTION COSTS

ITEM	QUANTITY	UNITS	UNIT PRICE	TOTAL PRICE
4" Vacuum Main (1)	85341	LF	$ 66.00	$ 5,632,506.00
6" Vacuum Main (1)	17400	LF	$ 73.70	$ 1,282,380.00
8" Vacuum Main (1)	9600	LF	$ 80.00	$ 768,000.00
4" Division Valves	89	EA	$ 1,210.00	$ 107,690.00
6" Division Valves	16	EA	$ 1,650.00	$ 26,400.00
8" Division Valves	6	EA	$ 2,200.00	$ 13,200.00
Force Main (1)	100	LF	$ 68.00	$ 6,800.00
8" Plulg Valves	2	EA	$ 2,600.00	$ 5,200.00
Vacuum Valve Pits (2)	527	EA	$ 13,000.00	$ 6,851,000.00
Vacuum Station (3)	2	EA	$ 1,500,000.00	$ 3,000,000.00
			Subtotal	**$ 17,693,176.00**
			Other Project Cost (4) 27%	$ 4,777,157.52
			Current Estimated Total =	**$ 22,470,333.52**
			Current Estimated Cost/EDU =	*$ 12,943.74*

BUILD-OUT CONSTRUCTION COSTS

DESCRIPTION	QUANTITY	UNITS	UNIT PRICE	TOTAL PRICE
4" Vacuum Main (1)	85341	LF	$ 66.00	$ 5,632,506.00
6" Vacuum Main (1)	17400	LF	$ 73.70	$ 1,282,380.00
8" Vacuum Main (1)	9600	LF	$ 80.00	$ 768,000.00
4" Division Valves	89	EA	$ 1,210.00	$ 107,690.00
6" Division Valves	16	EA	$ 1,650.00	$ 26,400.00
8" Division Valves	6	EA	$ 2,200.00	$ 13,200.00
Force Main (1)	100	LF	$ 68.00	$ 6,800.00
8" Plulg Valves	2	EA	$ 2,600.00	$ 5,200.00
Vacuum Valve Pits (2)	705	EA	$ 13,000.00	$ 9,165,000.00
Vacuum Station (3)	2	EA	$ 1,500,000.00	$ 3,000,000.00
			Subtotal	**$ 20,007,176.00**
			Other Project Cost (4) 27%	$ 5,401,937.52
			Build-Out Estimated Total =	**$ 25,409,113.52**
			Build-Out Estimated Cost/EDU =	*$ 11,575.91*

Notes:

(1) Cost of force mains and vacuum mains includes trench repair and road restoration.

(2) Valve pit cost includes:

$ 3,500	for purchase of valve & pits
$ 5,000	for installation of valve & pits
$ 3,000	for laterals
$ 1,500	for cross-overs from pit to vacuum main
$ 13,000	Total

(3) Vacuum stations include:

Vacuum station equipment
Odor control
Construction of concrete building with underground construction and bathroom
Emergency back-up generator
Telemetry
Cost of Land
(Cost of legal/real estate fees, public notice and public hearings have not been included.)

(4) Other project costs include construction contingencies and engineering fees.

Table 4-7

Present Worth Cost Analysis (20 year)
Cudjoe Key
Vacuum Sewer Collection System

Current EDU =	1736
Build Out EDU =	2195

Assumptions:

Inflation =		3%		
Interest rate =		6%		
Add 1 vacuum pit in year 5, 1 vacuum pit in year 10, and 0 vacuum pits in year 15				
Add 2 EDUs in year 5, 2 EDUs year 10, and 2 EDUs in year 15				
Labor/hr =	$	100.00	Including overhead	
$/KWH =	$	0.10		
Power =	$	2.92	/EDU/month	
Station Maint. =	$	49,750.00	per year	497.5 hr/yr @ $100/hr
Prevnt. Maint. =	$	452.00	/valve/yr	
Public Education =	$	1.50	/EDU/yr	
Vac. Valve Rebuild=	$	35.25	/valve/10yrs	

Preventive maintenance labor cost is based on FKAA's experience at Little Venice. One full time person is required to maintian a vacuum station with 350 Valve Pits.

Initial Construction Cost = $ 22,470,333.52

NOTE: The cost for land to accommodate the vacuum lift station is not included in this present worth cost analysis.

Calculation of present worth of future construction

$2,938,780.00 of construction can be deferred as lots are developed in the future as follows:

In year 5, 10, & 15 a third of construction will be completed. Cost will be escalated at 3% inflation, then converted to present worth at I = 6%

		$2,938,780.00/3=	$	979,593.33	
(F/P) at 3% for 5 years =	1.1593	$976,593.33x1.1593=	$	1,135,642.55	Construction Cost at year 5
(F/P) at 3% for 10 years =	1.3439	$976,593.33x1.3439=	$	1,316,475.48	Construction Cost at year 10
(F/P) at 3% for 15 years =	1.5580	$976,593.33x1.5580=	$	1,526,206.41	Construction Cost at year 15

Converting the future construction cost to Present Worth with I = 6% gives:

(P/F) at 6% for 5 years =	0.7473	$1,135,642.55x0.7473=	$	848,665.68
(P/F) at 6% for 10 years =	0.5584	$1,316,475.48x0.5584=	$	735,119.91
(P/F) at 6% for 15 years =	0.4173	$1,526,206.41x0.4173=	$	636,885.94

Present Worth of future construction = $ 2,220,671.52

Annualize cost of all Vacuum Valve/Controller Maintenance per Vacuum Valve

Calculate future price of vacuum valve rebuild at 3% inflation in 10 yrs

(F/P) at 3% for 10 years =	1.3439	$35.25x1.3439=	$	47.37	per vacuum valve at year 10

Calculate future price of vacuum valve rebuild at 3% inflation in 20 yrs

(F/P) at 3% for 20 years =	1.8061	$35.25x1.8061=	$	63.67	per vacuum valve at year 20

Converting all the future maintenance cost to Present Worth with I = 6% gives:

(P/F) at 6% for 10 years =	0.5584	$47.37x0.5584=	$	26.45	per vacuum valve
(P/F) at 6% for 20 years =	0.3118	$63.67x0.3118=	$	19.85	per vacuum valve

Present Worth of future maintenance cost per vacuum valve = $ 46.30

Calculating the annualized cost per valve over 20 years at I = 6% gives:

(A/P) at 6% for 20 years =	0.0872	$46.30x0.0872=	$	4.04	per vacuum valve per year

Adding the annualize cost of preventive maintenance gives a total annualized cost per valve of:

$452.00+$4.04= **$ 456.04** per vacuum valve per year

Convert annualized Vacuum Valve Maintenance cost to Present Worth

Assume vacuum valves will be phased in as follows:

Period I: 527 vacuum valves through year 5
Period II: 587 vacuum valves from year 6 through year 10
Period III: 646 vacuum valves from year 11 through year 15
Period IV: 705 vacuum valves from year 16 through year 20

Table 4-7 (Con't)

Present Worth Cost Analysis (20 year)
Cudjoe Key
Vacuum Sewer Collection System

Calculation of present worth of annualized valve maintenance cost for Period I:

Period I: Annualized cost =	$456.04x527=	$ 240,331.85	/yr		
(P/A) at 6% for 5 years =	4.2124	$240,331.85x4.2124=	$	**1,012,373.89**	**Present Worth for Period I**

Calculation of present worth of annualized valve maintenance cost for Period II:

Period II: Annualized cost =	$456.04x587=	$ 267,694.11	/yr		
(P'/A) at 6% for 5 years =	4.2124	$267,694.11x4.2142=	$	1,127,634.68	in year 5 dollars
(P/F) at 6% for 5 years =	0.7473	$1,127,634.68x0.7473=	$	**842,681.39**	**Present Worth for Period II**

Calculation of present worth of annualized valve maintenance cost for Period III:

Period III: Annualized cost =	$456.04x646=	$ 294,600.33	/yr		
(P'/A) at 6% for 5 years =	4.2124	$294,600.33x4.2142=	$	1,240,974.45	in year 10 dollars
(P/F) at 6% for 10 years =	0.5584	$1,240,974.45x0.5584=	$	**692,960.13**	**Present Worth for Period III**

Calculation of present worth of annualized valve maintenance cost for Period IV:

Period IV: Annualized cost =	$456.04x705=	$ 321,506.56	/yr		
(P'/A) at 6% for 5 years =	4.2124	$321,506.56x4.2142=	$	1,354,314.22	in year 15 dollars
(P/F) at 6% for 15 years =	0.4173	$1,354,314.22x0.4173=	$	**565,155.32**	**Present Worth for Period IV**

Present Worth of all annualized valve maintenance cost for all periods = $ 3,113,170.74

Convert annualized Power Cost and Public Education cost to Present Worth

Assume EDUs will be phased in as follows:

Period I: 1736 EDUs through year 5
Period II: 1889 EDUs from year 6 through year 10
Period III: 2042 EDUs from year 11 through year 15
Period IV: 2195 EDUs from year 16 through year 20

Annualize cost per EDU= ($2.92/EDU/month)x(12 months/year)+$1.50/EDU/yr= **$ 36.54**

Calculation of present worth of annualized cost per EDU for Period I:

Period I: Annualized cost =	$36.54x1736=	$ 63,433.44	/yr		
(P/A) at 6% for 5 years =	4.2124	$63,433.44x4.2124=	$	**267,207.02**	**Present Worth for Period I**

Calculation of present worth of annualized cost per EDU for Period II:

Period II: Annualized cost =	$36.54x1889=	$ 69,024.06	/yr		
(P'/A) at 6% for 5 years =	4.2124	$69,024.06x4.2142=	$	290,756.95	in year 5 dollars
(P/F) at 6% for 5 years =	0.7473	$290,756.95x0.7473=	$	**217,282.67**	**Present Worth for Period II**

Calculation of present worth of annualized cost per EDU for Period III:

Period III: Annualized cost =	$36.54x2042=	$ 74,614.68	/yr		
(P'/A) at 6% for 5 years =	4.2124	$74,614.68x4.2142=	$	314,306.88	in year 10 dollars
(P/F) at 6% for 10 years =	0.5584	$314,306.88x0.5584=	$	**175,508.96**	**Present Worth for Period III**

Calculation of present worth of annualized cost per EDU for Period IV:

Period IV: Annualized cost =	$36.54x2195=	$ 80,205.30	/yr		
(P'/A) at 6% for 5 years =	4.2124	$80,205.30x4.2142=	$	337,856.81	in year 15 dollars
(P/F) at 6% for 15 years =	0.4173	$337,856.81x0.4173=	$	**140,987.65**	**Present Worth for Period IV**

Present Worth of all annualized power & education costs for all periods = $ 800,986.30

Convert annualized Vacuum Station Maintenance Cost to Present Worth

Annualized portion of vacuum station maintenance cost to be charged to service area is:

		$49,750.00*2=	$	99,500.00	per year
(P/A) at 6% for 20 years =	11.4699	$99,500.00*11.4699=	$	**1,141,255.05**	**Present Worth of Vacuum Station Maint.**

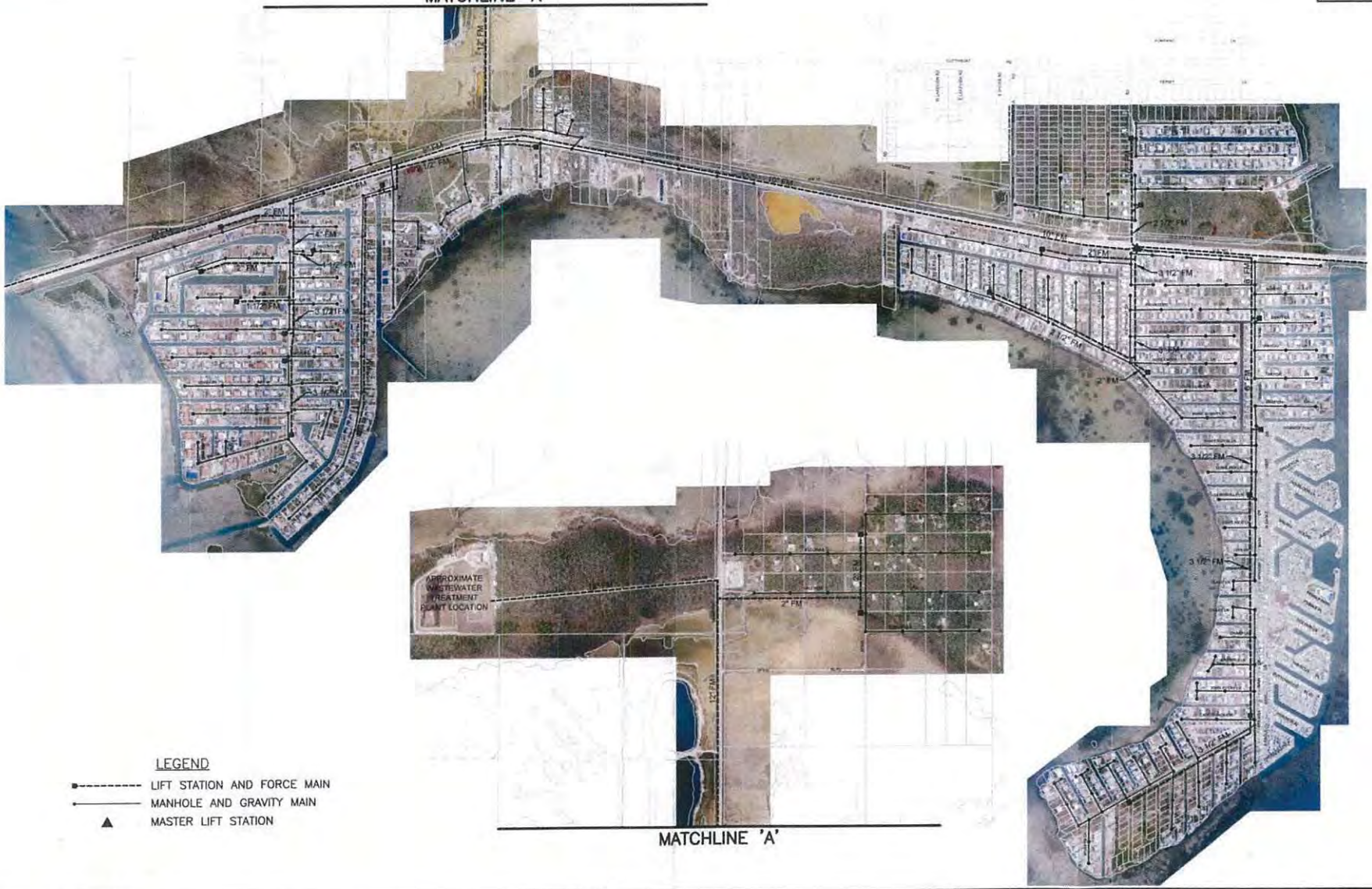
Total Present Worth = $ 29,746,417.13

Present Worth / Current EDUs = $ 17,135.03
Present Worth / Build-Out EDUs = $ 13,551.90

Cudjoe Key

GRAVITY SEWER SYSTEM

FIGURE 4-4



MATHEWS CONSULTING INC.
Civil and Environmental Engineers

SCALE: 1"=1000' 1000' 500' 0 1000'

Florida Keys Aqueduct Authority

CUDJOE REGIONAL WASTEWATER SYSTEM

CUDJOE KEY
PRELIMINARY GRAVITY COLLECTION SYSTEM LAYOUT

PROJ NO: 1474
DATE: FEB. 2009
DWG: GS-2

Table 4-8

Gravity #2 w/Mathews Consulting Updated Costs
Cudjoe Key
Gravity Sewer

Number of EDUs Current	1736
Number of EDUs Build-Out	2195

COLLECTION SYSTEM - INSTALLED COST

BUILD-OUT CONSTRUCTION COSTS

ITEM	QUANTITY	UNITS	UNIT PRICE	TOTAL PRICE
Manholes	293	LF	$ 6,000.00	$ 1,758,000.00
8" Gravity Sewers	76605	LF	$ 118.00	$ 9,039,390.00
6" Service Laterals	25275	LF	$ 78.00	$ 1,971,450.00
Force Mains	55702	LF	$ 54.00	$ 3,007,908.00
Concrete Lift Station	19	EA	$ 131,000.00	$ 2,489,000.00
Primary Lift Station S11	1	EA	$ 350,000.00	$ 350,000.00
			Subtotal	$ 18,615,748.00
			Pavement Restoration (30% of Gravity Sewer Cost)	$ 2,711,817.00
			Construction Cost	**$ 21,327,565.00**
			Other Project Costs (1) 27%	*$ 5,758,442.55*
			Estimated Total =	**$ 27,086,007.55**
			Estimated Cost/EDU Present =	$ 15,602.54
			Estimated Cost/EDU Build-Out =	$ 12,339.87

(1) Other project costs include construction contingencies and engineering fees.

Table 4-9

Present Worth Cost Analysis (20 year)
Cudjoe Key
Gravity Sewer System

Current EDU =	1736
Build Out EDU =	2195

Assumptions:

Inflation =		3%	
Interest rate =		6%	
Labor/hr =	$	100.00	Including overhead
$/KWH =	$	0.10	
Power =	$	2.72	/EDU/month
Prevnt. Maint. =	$	7,500.00	/station/yr 75 hr/station @ $100/hr
Pump replacement =	$	20,000.00	/station/10 yr

Initial Construction Cost = $ 27,086,007.55

Present worth of pump replacement in 10 years and again in 20 years

Calculate future price of pump replacement at 3% inflation in 10 yrs

(F/P) at 3% for 10 years = 1.3439 $20,000x1.3439= $ 26,878.00 per station

Converting the 10 year future pump replacement cost to Present Worth with I = 6% gives:

(P/F) at 6% for 10 years = 0.5584 $26,878.00x0.5584= **$ 15,008.68** per station

Calculate future price of pump replacement at 3% inflation in 20 yrs

(F/P) at 3% for 20 years = 1.8061 $20,000x1.8061= $ 36,122.00 per station

Converting the 20 year future pump replacement cost to Present Worth with I = 6% gives:

(P/F) at 6% for 20 years = 0.3118 $36,122.00x0.3118= **$ 11,262.84** per station

The Study Area will be charged for maintenance at 1.32 stations

Total Present worth of pump replacements ($15,008.68+$11,262.84)*20 = $ 525,430.30

Present worth of preventative maintenance for 20 lift stations:

Convert the annualized cost per station to present worth gives:

(P/A) at 6% for 20 years = 11.4699 $15,000*20*11.4699= **$ 1,720,485.00**

Total annualized cost per EDU per year:

Power = $ 2.72 /EDU/month

Convert annualized costs per EDU to Present Worth

Assume EDUs will be phased in as follows:

Period I: 1736 EDUs through year 5
Period II: 1889 EDUs from year 6 through year 10
Period III: 2042 EDUs from year 11 through year 15
Period IV: 2195 EDUs from year 16 through year 20

Annualize cost per EDU= ($2.72/EDU/month)x(12 months/year)= **$ 32.64**

Calculation of present worth of annualized cost per EDU for Period I:

Period I: Annualized cost = $32.64x1736= $ 56,663.04 /yr

(P/A) at 6% for 5 years = 4.2124 $56,663.04x4.2124= **$ 238,687.39 Present Worth for Period I**

Calculation of present worth of annualized cost per EDU for Period II:

Period II: Annualized cost = $32.64x1889= $ 61,656.96 /yr

(P'/A) at 6% for 5 years = 4.2124 $61,656.96x4.2142= $ 259,723.78 in year 5 dollars

(P/F) at 6% for 5 years = 0.7473 $259,7236.78x0.7473= **$ 194,091.58 Present Worth for Period II**

Table 4-9 (Con't)

Present Worth Cost Analysis (20 year)
Cudjoe Key
Gravity Sewer System

Calculation of present worth of annualized cost per EDU for Period III:

Period III: Annualized cost =	$32.64x2042=	$ 66,650.88	/yr		
(P'/A) at 6% for 5 years =	4.2124	$66,650.88x4.2142=	$	280,760.17	in year 10 dollars
(P/F) at 6% for 10 years =	0.5584	$280,760.17x0.5584=	$	**156,776.48**	**Present Worth for Period III**

Calculation of present worth of annualized cost per EDU for Period IV:

Period IV: Annualized cost =	$32.64x2195=	$ 71,644.80	/yr		
(P'/A) at 6% for 5 years =	4.2124	$71,644.80x4.2142=	$	301,796.56	in year 15 dollars
(P/F) at 6% for 15 years =	0.4173	$301,796.56x0.4173=	$	**125,939.70**	**Present Worth for Period IV**

Present Worth of all annualized cost per EDU for all periods = $ 715,495.15

Total Present Worth = $30,047,418.00

Present Worth / Current EDUs = $ 17,308.42
Present Worth / Build-Out EDUs = $ 13,689.03

Section 5

Study Area - Summerland Key

5.0 Study Area – Summerland Key

Summerland Key is located between Mile Markers 23 and 25. Summerland Key lies between Cudjoe Key and Ramrod Key. Summerland Key has 56 developed commercial lots with room for 77 at build-out within the sewer service area. Currently 715 residential lots are occupied with low to high density. At build-out 838 lots are expected to be occupied. Since Summerland Key has developed 85% of the build-out lots, opportunities exist to utilize alternative collections systems to defer a portion of construction cost.

The sewer collection systems evaluated for this area are listed below in the order they appear.

- Low Pressure Sewer/Grinder Collection System (LPS) (refer to Figure 5-1)
- STEP Effluent Collection System (refer to Figure 5-2)
- Vacuum Sewer Collection System (refer to Figure 5-3)
- Gravity Sewer Collection System (refer to Figure 5-4)

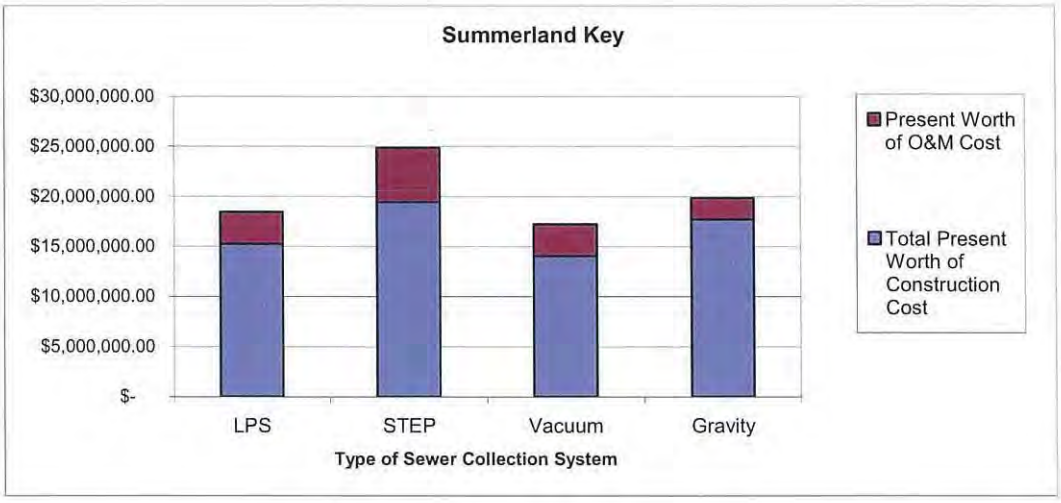
For each system, a preliminary design was developed on an aerial map. A construction cost opinion was developed utilizing recent bid information from the Keys and gathering information from system suppliers. A present worth cost analysis was performed for each potential sewer collection system using O&M data from EPA, published technical reports, engineering reports, system operator interviews and vendors' data.

Table 5-1 provides a summary of present worth cost (including construction, operation, and maintenance cost) for each type of sewer collection system. A twenty year present worth cost analysis (e.g. Lifecycle costs) was calculated based on an interest rate of 6% and an inflation rate of 3%.

Table 5-1
Summerland Key
Present Worth Summary for Each Type of Sewer Collection System

Type of Sewer Collection System	LPS	STEP	Vacuum	Gravity
Initial Construction Cost	$ 13,813,091.50	$ 17,473,919.84	$ 13,055,612.70	$ 17,700,172.37
Future Construction Cost	$ 1,882,140.00	$ 2,600,325.00	$ 1,320,800.00	0
Present Worth of Future Construction	$ 1,422,227.83	$ 1,964,920.03	$ 998,054.62	0
Total Present Worth of Construction Cost	$ 15,235,319.33	$ 19,438,839.87	$ 14,053,667.32	$ 17,700,172.37
Present Worth of O&M Cost	$ 3,208,979.70	$ 5,420,378.29	$ 3,196,563.44	$ 2,129,699.04
Total Present Worth	**$ 18,444,299.03**	**$ 24,859,218.16**	**$ 17,250,230.76**	**$ 19,829,871.41**
PW of Construction Cost/EDU @ Build-Out	$ 15,467.33	$ 19,734.86	$ 14,267.68	$ 17,969.72
Total Present Worth/EDU @ Build-Out	$ 18,725.18	$ 25,237.78	$ 17,512.92	$ 20,131.85

EDUs @ Build-Out = 985



An explanation for each row heading in Table 5-1 is provided below:

Initial Construction Cost: The construction cost required to provide the existing developed lots with sewer service.

Future Construction Cost: The portion of the construction cost required to serve future residents that can be differed. Conventional gravity sewer systems cannot be easily expanded to pick up additional users. The infrastructure necessary to serve future residents is included in the Initial Construction Cost for gravity sewer systems. That is why this column for gravity is $0.

Present Worth of Future Cost: Future construction was assumed to occur 5, 10, and 15 years after initial construction. The future construction expense was discounted to present worth dollars.

Total Present Worth of Construction Cost: The sum of Initial Construction Cost and Present Worth of Future Construction Cost.

Present Worth of O&M Cost: The cost of all forecasted operation and maintenance cost over a 20 year period discounted to present worth dollars.

Total Present Worth: The sum of Total Present Worth of Construction Cost and Present Worth of O&M Cost.

PW of Construction Cost/EDU @ Build-Out: The Total Present Worth of Construction Cost divided by the number of EDUs (Equivalent Dwelling Units) at build-out.

Total Present Worth/EDU @ Build-Out: The Total Present Worth divided by the number of EDUs (Equivalent Dwelling Units) at build-out.

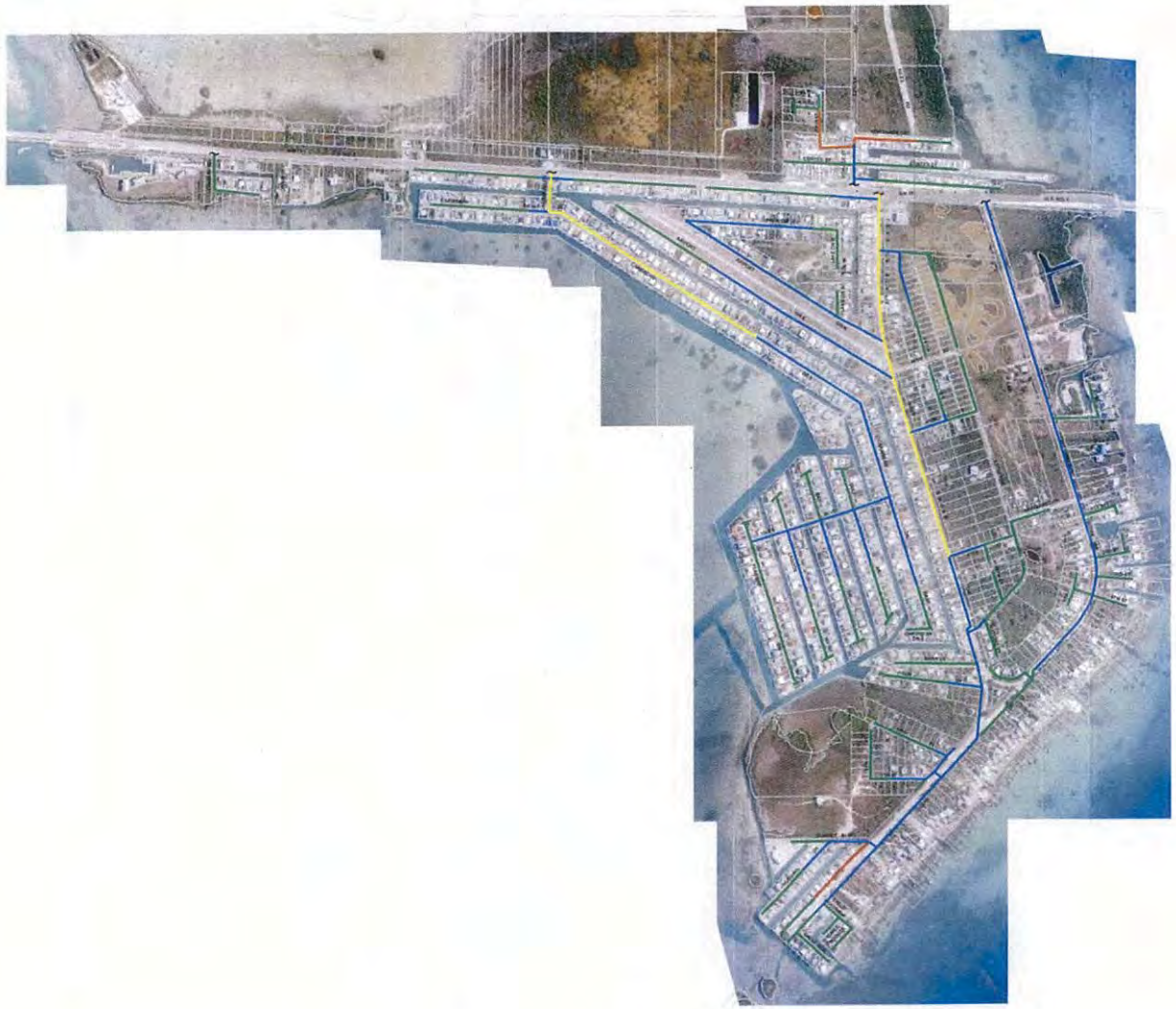
As shown on Table 5-1, the lowest initial construction cost and lowest present worth cost to provide sewer service to Summerland Key is the Vacuum Collection System. However, low density outer areas (with 8 to 10 houses) could be served by a low pressure system. However, to be consistent with other collection systems in this Central Cudjoe Region, a hybrid system utilizing gravity sewer in high density areas and low pressure sewer in low to medium density areas is probably better suited from an operational standpoint. As the system is further designed, the Wastewater Collection System Decision Tree (see Section 6.0) should be used to determine the most optimum hybrid system for either a vacuum collection system/low pressure system or a low pressure system/gravity collection system for this service area.

Another important factor that will be considered in selecting a wastewater collection system will be a "Policy Decision" by FKAA regarding the type of system(s) that they plan to operate and maintain in their Service Areas.

Summerland Key

LOW PRESSURE/GRINDER PUMP SYSTEM

FIGURE 5-1



MATHEWS CONSULTING INC.
Civil and Environmental Engineers

SCALE: 1"=1000' 1000' 500' 0 1000'

Florida Keys Aqueduct Authority

FKAA LOWER KEYS WASTEWATER SYSTEM

SUMMERLAND KEY
PRELIMINARY LPS COLLECTION SYSTEM LAYOUT

PROJ NO: 1474
DATE: FEB. 2009
DWG: LPS-3

Table 5-2

LPS #3
Summerland Key
Low Pressure Sewer

Number of EDUs Current	830
Number of EDUs Build-Out	985

COLLECTION SYSTEM - INSTALLED COST

CURRENT CONSTRUCTION COSTS

ITEM	QUANTITY	UNITS	UNIT PRICE	TOTAL PRICE
2" Force Main (1)	29525	LF	$ 42.00	$ 1,240,050.00
3" Force Main (1)	1825	LF	$ 48.00	$ 87,600.00
4" Force Main (1)	23825	LF	$ 54.00	$ 1,286,550.00
6" Force Main (1)	5700	LF	$ 68.00	$ 387,600.00
2" Valves	36	EA	$ 500.00	$ 18,000.00
3" Valves	3	EA	$ 750.00	$ 2,250.00
4" Valves	24	EA	$ 1,100.00	$ 26,400.00
6" Valves	3	EA	$ 2,000.00	$ 6,000.00
Simplex Low Pressure Station (2)	715	EA	$ 10,000.00	$ 7,150,000.00
Duplex Low Pressure Station (2)	56	EA	$ 12,000.00	$ 672,000.00
			Subtotal	**$ 10,876,450.00**
			Other Project Cost (3) 27%	$ 2,936,641.50
			Current Estimated Total =	**$ 13,813,091.50**
			Current Estimated Cost/EDU =	*$ 16,642.28*

BUILD-OUT CONSTRUCTION COSTS

ITEM	QUANTITY	UNITS	UNIT PRICE	TOTAL PRICE
2" Force Main (1)	29525	LF	$ 42.00	$ 1,240,050.00
3" Force Main (1)	1825	LF	$ 48.00	$ 87,600.00
4" Force Main (1)	23825	LF	$ 54.00	$ 1,286,550.00
6" Force Main (1)	5700	LF	$ 68.00	$ 387,600.00
2" Valves	36	EA	$ 500.00	$ 18,000.00
3" Valves	3	EA	$ 750.00	$ 2,250.00
4" Valves	24	EA	$ 1,100.00	$ 26,400.00
6" Valves	3	EA	$ 2,000.00	$ 6,000.00
Simplex Low Pressure Station (2)	838	EA	$ 10,000.00	$ 8,380,000.00
Duplex Low Pressure Station (2)	77	EA	$ 12,000.00	$ 924,000.00
			Subtotal	**$ 12,358,450.00**
			Other Project Cost (3) 27%	$ 3,336,781.50
			Build-Out Estimated Total =	**$ 15,695,231.50**
			Build-Out Estimated Cost/EDU =	*$ 15,934.25*

Notes:

(1) Cost of force mains includes trench repair and road restoration.

(2) Cost of LPS Station includes tank, equipment, installation, electrical connection and 1-1/4" lateral with restoration.

(3) Other project costs include construction contingencies and engineering fees.

Table 5-3

Present Worth Cost Analysis (20 year)
Summerland Key
Low Pressure / Grinder System

Current EDU =	830
Build Out EDU =	985

Assumptions:

Inflation =		3%	
Interest rate =		6%	
Add 11 pumps in year 5, 12 pumps in year 10, and 12 pumps in year 15			
Labor/hr =	$	100.00	Including overhead
$/KWH =	$	0.10	
Electric =	$	30.00	/pump/yr
Prevnt. Maint. =	$	30.00	/pump/yr
Public Education =	$	2.00	/pump/yr
Emergency call out =	$	390.00	/pump/12yr
Pump replacement =	$	2,000.00	/pump/12yr

Initial Construction Cost = $ 13,813,091.50

Calculation of present worth of future construction

$1,882,140.00 of construction can be deferred as lots are developed in the future as follows:

In year 5, 10, & 15 a third of construction will be completed. Cost will be escalated at 3% inflation, then converted to present worth at I = 6%

		$1,882,140.00/3=	$	627,380.00	
(F/P) at 3% for 5 years =	1.1593	$627,380.00x1.1593=	$	727,321.63	Construction Cost at year 5
(F/P) at 3% for 10 years =	1.3439	$627,380.00x1.3439=	$	843,135.98	Construction Cost at year 10
(F/P) at 3% for 15 years =	1.5580	$627,380.00x1.5580=	$	977,458.04	Construction Cost at year 15

Converting the future construction cost to Present Worth with I = 6% gives:

(P/F) at 6% for 5 years =	0.7473	$727,321.63x0.7473=	$	543,527.46
(P/F) at 6% for 10 years =	0.5584	$843,135.98x0.5584=	$	470,807.13
(P/F) at 6% for 15 years =	0.4173	$977,458.04x0.4173=	$	407,893.24

Present Worth of future construction = $ 1,422,227.83

Annualize cost of pump replacement and emergency call outs in 12 years and again in 24 years

Calculate future price of pump replacement and emergency call out at 3% inflation in 12 yrs

(F/P) at 3% for 12 years =	1.4258	($2,000+$390)x1.4258=	$	3,407.66	per pump

Converting the 12 year future pump replacement/emergency call out cost to Present Worth with I = 6% gives:

(P/F) at 6% for 12 years =	0.4970	$3,407.66x0.4970=	$	**1,693.61**	per pump

Calculate future price of pump replacement and emergency call out at 3% inflation in 24 yrs

(F/P) at 3% for 24 years =	2.0328	($2,000+$390)x2.0328=	$	4,858.39	per pump

Converting the future pump replacement/emergency call out cost to an annualized cost over 12 years with I = 6% gives:

(A/F) at 6% for 12 years =	0.0593	$4,858.39x0.0593=	$	288.10	per pump/yr

By taking the annualized cost for 8 years, a future cost for year 12 can be calculated with I = 6% gives:

(P'/A) at 6% for 8 years =	8.3838	$288.10x8.3838=	$	2,415.39	in year 12

Converting the annualized cost of future pump replacement/emergency call out cost from year 13 to year 20 to Present Worth with I = 6% gives:

(P/F) at 6% for 12 years =	0.4970	$2,415.39x0.4970=	$	**1,200.45**

PW of future pump replacement and emergency call out per pump = **$ 2,894.06** (12yr and 24yr combined)

Converting the present worth of two pump replacements to annualized dollars

(A/P) at 6% for 20 years =	0.0872	$2,894.06x0.0872=	$	**252.36**	per pump/yr

Table 5-3 (Con't)

Present Worth Cost Analysis (20 year)
Summerland Key
Low Pressure / Grinder System

Total annualized cost per pump per year:

Pump replacement =	$	252.36	/pump/yr
Electric =	$	30.00	/pump/yr
Prevnt. Maint. =	$	30.00	/pump/yr
Public Education =	$	2.00	/pump/yr
Total =	**$**	**314.36**	/pump/yr

Convert annualized costs to Present Worth

Assume pumps will be phased in as follows:

Period I: 827 pumps through year 5
Period II: 882 pumps from year 6 through year 10
Period III: 937 pumps from year 11 through year 15
Period IV: 992 pumps from year 16 through year 20

Calculation of present worth of annualized cost for Period I:

Period I: Annualized cost =		$314.36x827= $259,977.35 /yr			
(P/A) at 6% for 5 years =	4.2124	$259,977.35x4.2124=	**$**	**1,095,128.59**	**Present Worth for Period I**

Calculation of present worth of annualized cost for Period II:

Period II: Annualized cost =		$314.36x882= $277,267.26 /yr			
(P'/A) at 6% for 5 years =	4.2124	$277,267.26x4.2142=	$	1,167,960.60	in year 5 dollars
(P/F) at 6% for 5 years =	0.7473	$1,167,960.60x0.7473=	**$**	**872,816.96**	**Present Worth for Period II**

Calculation of present worth of annualized cost for Period III:

Period III: Annualized cost =		$314.36x937= $294,557.17 /yr			
(P'/A) at 6% for 5 years =	4.2124	$294,557.17x4.2142=	$	1,240,792.61	in year 10 dollars
(P/F) at 6% for 10 years =	0.5584	$1,240,792.61x0.5584=	**$**	**692,858.59**	**Present Worth for Period III**

Calculation of present worth of annualized cost for Period IV:

Period IV: Annualized cost =		$314.36x992= $311,847.08 /yr			
(P'/A) at 6% for 5 years =	4.2124	$311,847.08x4.2142=	$	1,313,624.62	in year 15 dollars
(P/F) at 6% for 15 years =	0.4173	$1,313,624.62x0.4173=	**$**	**548,175.56**	**Present Worth for Period IV**

Present Worth of all annualized cost for all periods = $ 3,208,979.70

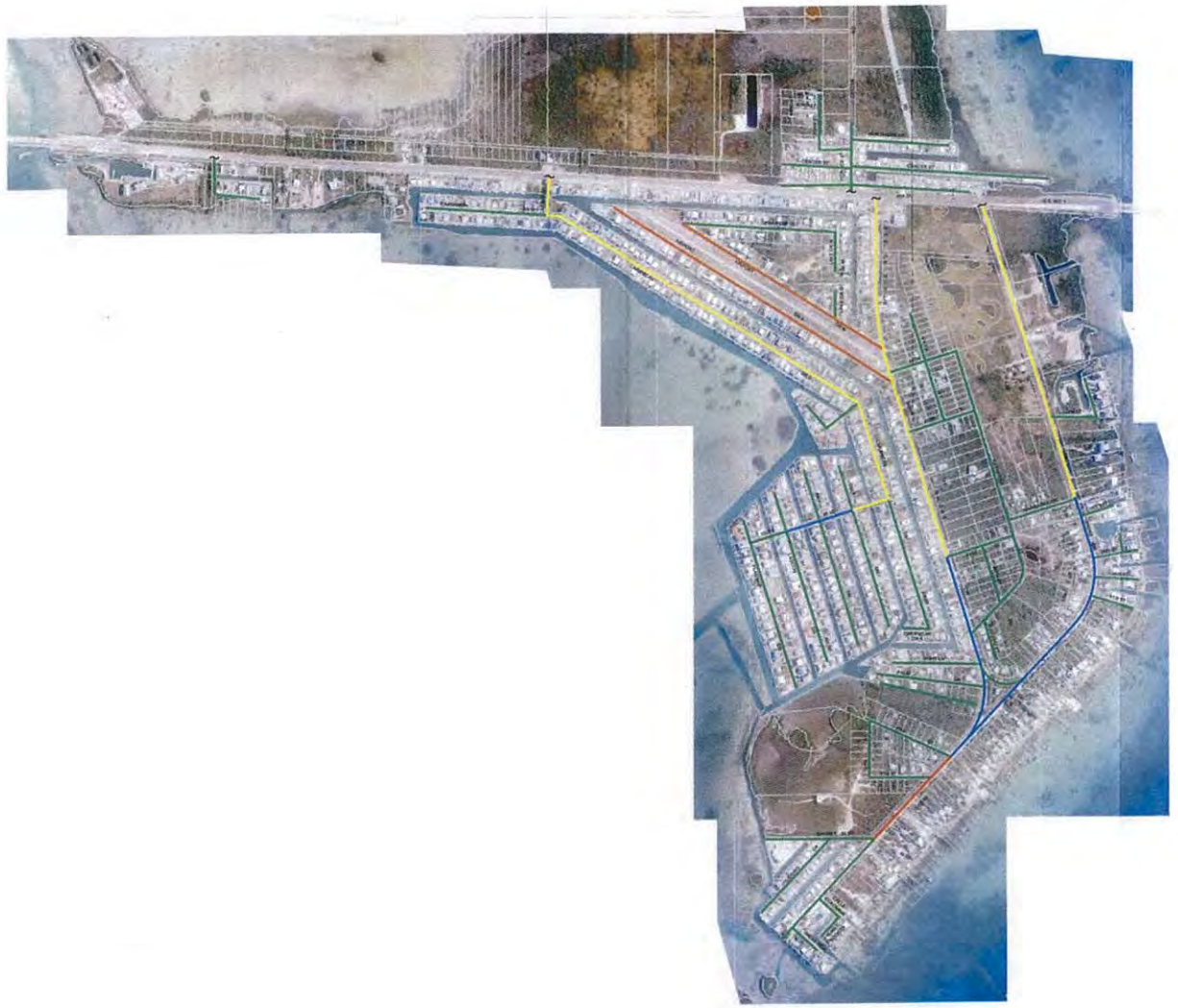
Total Present Worth = $ 18,444,299.03

Present Worth / Current EDUs = $ 22,222.05
Present Worth / Build-Out EDUs = $ 18,725.18

Summerland Key

SEPTIC TANK EFFLUENT PUMP (STEP) SYSTEM

FIGURE 5-2



MATHEWS CONSULTING INC.
Civil and Environmental Engineers

SCALE: 1"=1000' 1000' 500' 0 1000'

Florida Keys Aqueduct Authority

FKAA LOWER KEYS WASTEWATER SYSTEM

SUMMERLAND KEY
PRELIMINARY STEP COLLECTION SYSTEM LAYOUT

PROJ NO: 1474
DATE: FEB. 2009
DWG: STEP-3

Table 5-4

STEP #3
Summerland Key
STEP

Number of EDUs Current	830
Number of EDUs Build-Out	985

COLLECTION SYSTEM - INSTALLED COST

CURRENT CONSTRUCTION COSTS

ITEM	QUANTITY	UNITS	UNIT PRICE	TOTAL PRICE
2" Force Main (1)	37218	LF	$ 42.00	$ 1,563,156.00
3" Force Main (1)	5882	LF	$ 48.00	$ 282,336.00
4" Force Main (1)	4840	LF	$ 54.00	$ 261,360.00
6" Force Main (1)	10605	LF	$ 68.00	$ 721,140.00
2" Valves	46	EA	$ 500.00	$ 23,000.00
3" Valves	4	EA	$ 750.00	$ 3,000.00
4" Valves	10	EA	$ 1,100.00	$ 11,000.00
6" Valves	8	EA	$ 2,000.00	$ 16,000.00
Simplex STEP Station (2)	715	EA	$ 14,000.00	$ 10,010,000.00
Duplex STEP Station (2)	56	EA	$ 15,500.00	$ 868,000.00
			Subtotal	**$ 13,758,992.00**
			Other Project Cost (3) 27%	$ 3,714,927.84
			Present Estimated Total =	**$ 17,473,919.84**
			Present Estimated Cost/EDU =	*$ 21,052.92*

BUILD-OUT CONSTRUCTION COSTS

ITEM	QUANTITY	UNITS	UNIT PRICE	TOTAL PRICE
2" Force Main (1)	37218	LF	$ 42.00	$ 1,563,156.00
3" Force Main (1)	5882	LF	$ 48.00	$ 282,336.00
4" Force Main (1)	4840	LF	$ 54.00	$ 261,360.00
6" Force Main (1)	10605	LF	$ 68.00	$ 721,140.00
2" Valves	46	EA	$ 500.00	$ 23,000.00
3" Valves	4	EA	$ 750.00	$ 3,000.00
4" Valves	10	EA	$ 1,100.00	$ 11,000.00
6" Valves	8	EA	$ 2,000.00	$ 16,000.00
Simplex STEP Station (2)	838	EA	$ 14,000.00	$ 11,732,000.00
Duplex STEP Station (2)	77	EA	$ 15,500.00	$ 1,193,500.00
			Subtotal	**$ 15,806,492.00**
			Other Project Cost (3) 27%	$ 4,267,752.84
			Build-Out Estimated Total =	**$ 20,074,244.84**
			Build-Out Estimated Cost/EDU =	*$ 20,379.94*

Notes:

(1) Cost of force mains includes trench repair and road restoration.

(2) Cost of STEP Station includes tank, equipment, installation, electrical connection and 1-1/4" lateral with restoration.

(3) Other project costs include construction contingencies and engineering fees.

Table 5-5

Present Worth Cost Analysis (20 year)
Summerland Key
STEP Collection System

Current EDU =	830
Build Out EDU =	985

Assumptions:

Inflation =		3%	
Interest rate =		6%	
Add 11 pumps in year 5, 12 pumps in year 10, and 12 pumps in year 15			
Labor/hr =	$	100.00	Including overhead
$/KWH =	$	0.10	
Electric =	$	20.00	/pump/yr
Prevnt. Maint. =	$	271.30	/pump/yr
Public Education =	$	2.00	/pump/yr
Emergency call out =	$	390.00	/pump/5yr
Tank pump out =	$	400.00	/pump/5yr
Pump replacement =	$	870.00	/pump/20yr

Preventive maintenance labor cost is derived from data from Charlotte County. Nine people work full time to maintain 6,900 STEP units.

Initial Construction Cost = $ 17,473,919.84

Calculation of present worth of future construction

$2,600,325.00 of construction can be deferred as lots are developed in the future as follows:

In year 5, 10, & 15 a third of construction will be completed. Cost will be escalated at 3% inflation, then converted to present worth at I = 6%

		$2,600,325.00/3=	$	866,775.00	
(F/P) at 3% for 5 years =	1.1593	$866,755.00x1.1593=	$	1,004,852.26	Construction Cost at year 5
(F/P) at 3% for 10 years =	1.3439	$866,755.00x1.3439=	$	1,164,858.92	Construction Cost at year 10
(F/P) at 3% for 15 years =	1.5580	$866,755.00x1.5580=	$	1,350,435.45	Construction Cost at year 15

Converting the future construction cost to Present Worth with I = 6% gives:

(P/F) at 6% for 5 years =	0.7473	$1,004,852.26x0.7473=	$	750,926.09
(P/F) at 6% for 10 years =	0.5584	$1,164,858.92x0.5584=	$	650,457.22
(P/F) at 6% for 15 years =	0.4173	$1,350,435.45x0.4173=	$	563,536.71

Present Worth of future construction = $ 1,964,920.03

Annualize cost of pump replacement

Calculate future price of pump replacement at 3% inflation in 20 yrs

(F/P) at 3% for 20 years =	1.8061	$870.00x1.8061=	$	1,571.31	per pump

Converting the emergency call out cost to an annualized cost over 20 years with I = 6% gives:

(A/F) at 6% for 20 years =	0.0272	$1,571.31x0.0272=	**$**	**42.74**	per pump/yr

Annualize cost of emergency call outs and tank pump outs in 5, 10, 15, & 20 years

Calculate future price of emergency call out and tank pump out at 3% inflation in 5 yrs

(F/P) at 3% for 5 years =	1.1593	$790x1.1593=	$	915.85	per pump

Converting the 5 year future emergency call out and tank pump out cost to Present Worth with I = 6% gives:

(P/F) at 6% for 5 years =	0.7473	$915.85x0.7473=	**$**	**684.41**	per pump

Calculate future price of emergency call out and tank pump out at 3% inflation in 10 yrs

(F/P) at 3% for 10 years =	1.3439	$790x1.3439=	$	1,061.68	per pump

Converting the 10 year future emergency call out and tank pump out cost to Present Worth with I = 6% gives:

(P/F) at 6% for 10 years =	0.5584	$1,061.68x0.5584=	**$**	**592.84**	per pump

Calculate future price of emergency call out and tank pump out at 3% inflation in 15 yrs

(F/P) at 3% for 15 years =	1.5580	$790x1.5580=	$	1,230.82	per pump

Table 5-5 (Con't)

Present Worth Cost Analysis (20 year)
Summerland Key
STEP Collection System

Converting the 15 year future emergency call out and tank pump out cost to Present Worth with I = 6% gives:

(P/F) at 6% for 15 years =	0.4173	$1,230.82x0.4173=	$	**513.62**	per pump

Calculate future price of emergency call out and tank pump out at 3% inflation in 20 yrs

(F/P) at 3% for 20 years =	1.8061	$790x1.8061=	$	1,426.82	per pump

Converting the 20 year future emergency call out and tank pump out cost to Present Worth with I = 6% gives:

(P/F) at 6% for 20 years =	0.3118	$1,426.82x0.3118=	$	**444.88**	per pump

PW of future emergency call out per pump = **$ 2,235.76** (5, 10, 15, & 20yr combined)

Converting the present worth of emergency call out and tank pump out cost to annualized dollars

(A/P) at 6% for 20 years =	0.0872	$2,235.76x0.0872=	$	**194.96**	per pump/yr

Total annualized cost per pump per year:

Pump Replacement =	$	42.74	/pump/yr
Emerg. Call Out & Pump Out =	$	194.96	/pump/yr
Electric =	$	20.00	/pump/yr
Prevnt. Maint. =	$	271.30	/pump/yr
Public Education =	$	2.00	/pump/yr
Total =	**$**	**531.00**	/pump/yr

Convert annualized costs to Present Worth

Assume pumps will be phased in as follows:
- Period I: 827 pumps through year 5
- Period II: 882 pumps from year 6 through year 10
- Period III: 937 pumps from year 11 through year 15
- Period IV: 992 pumps from year 16 through year 20

Calculation of present worth of annualized cost for Period I:

Period I: Annualized cost =		$531.00x827= $ 439,135.09	/yr		
(P/A) at 6% for 5 years =	4.2124	$439,135.09x4.2124=	$	**1,849,812.65**	**Present Worth for Period I**

Calculation of present worth of annualized cost for Period II:

Period II: Annualized cost =		$531.00x882= $ 468,339.96	/yr		
(P'/A) at 6% for 5 years =	4.2124	$468,339.96x4.2142=	$	1,972,835.26	in year 5 dollars
(P/F) at 6% for 5 years =	0.7473	$1,972,835.26x0.7473=	$	**1,474,299.79**	**Present Worth for Period II**

Calculation of present worth of annualized cost for Period III:

Period III: Annualized cost =		$531.00x937= $ 497,544.84	/yr		
(P'/A) at 6% for 5 years =	4.2124	$497,544.84x4.2142=	$	2,095,857.87	in year 10 dollars
(P/F) at 6% for 10 years =	0.5584	$2,095,857.87x0.5584=	$	**1,170,327.03**	**Present Worth for Period III**

Calculation of present worth of annualized cost for Period IV:

Period IV: Annualized cost =		$531.00x992= $ 526,749.71	/yr		
(P'/A) at 6% for 5 years =	4.2124	$526,749.71x4.2142=	$	2,218,880.47	in year 15 dollars
(P/F) at 6% for 15 years =	0.4173	$2,218,880.47x0.4173=	$	**925,938.82**	**Present Worth for Period IV**

Present Worth of all annualized cost for all periods = $ 5,420,378.29

Total Present Worth = $ 24,859,218.16

Present Worth / Current EDUs = $ 29,950.87
Present Worth / Build-Out EDUs = $ 25,237.78

Summerland Key

VACUUM SEWER SYSTEM

FIGURE 5-3

NORTH

LEGEND

- 4" VACUUM SEWER MAIN
- 6" VACUUM SEWER MAIN
- 8" VACUUM SEWER MAIN
- 10" VACUUM SEWER MAIN
- DIVISION VALVE
- VACUUM STATION

MATHEWS CONSULTING INC.
Civil and Environmental Engineers

SCALE: 1"=1000' (1000' 500' 0 1000')

Florida Keys Aqueduct Authority

FKAA LOWER KEYS WASTEWATER SYSTEM

SUMMERLAND KEY
PRELIMINARY VACUUM COLLECTION SYSTEM LAYOUT

PROJ NO: 1474
DATE: FEB. 2009
DWG: VS-3

Table 5-6

VS #3
Summerland Key
Vacuum Sewer

Number of EDUs Current	830
Number of EDUs Build-Out	985

COLLECTION SYSTEM - INSTALLED COST

CURRENT CONSTRUCTION COSTS

ITEM	QUANTITY	UNITS	UNIT PRICE	TOTAL PRICE
4" Vacuum Main (1)	33700	LF	$ 66.00	$ 2,224,200.00
6" Vacuum Main (1)	10200	LF	$ 73.70	$ 751,740.00
8" Vacuum Main (1)	5230	LF	$ 80.00	$ 418,400.00
10" Vacuum Main (1)	1080	LF	$ 86.00	$ 92,880.00
4" Division Valves	44	EA	$ 1,210.00	$ 53,240.00
6" Division Valves	15	EA	$ 1,650.00	$ 24,750.00
8" Division Valves	4	EA	$ 2,200.00	$ 8,800.00
Force Main (1)	50	LF	$ 68.00	$ 3,400.00
8" Plulg Valves	1	EA	$ 2,600.00	$ 2,600.00
Vacuum Valve Pits (2)	400	EA	$ 13,000.00	$ 5,200,000.00
Vacuum Station (3)	1	EA	$ 1,500,000.00	$ 1,500,000.00
			Subtotal	**$ 10,280,010.00**
			Other Project Cost (4) 27%	$ 2,775,602.70
			Current Estimated Total =	**$ 13,055,612.70**
			Current Estimated Cost/EDU =	*$ 15,729.65*

BUILD-OUT CONSTRUCTION COSTS

ITEM	QUANTITY	UNITS	UNIT PRICE	TOTAL PRICE
4" Vacuum Main (1)	33700	LF	$ 66.00	$ 2,224,200.00
6" Vacuum Main (1)	10200	LF	$ 73.70	$ 751,740.00
8" Vacuum Main (1)	5230	LF	$ 80.00	$ 418,400.00
10" Vacuum Main (1)	1080	LF	$ 86.00	$ 92,880.00
4" Division Valves	44	EA	$ 1,210.00	$ 53,240.00
6" Division Valves	15	EA	$ 1,650.00	$ 24,750.00
8" Division Valves	4	EA	$ 2,200.00	$ 8,800.00
Force Main (1)	50	LF	$ 68.00	$ 3,400.00
8" Plulg Valves	1	EA	$ 2,600.00	$ 2,600.00
Vacuum Valve Pits (2)	480	EA	$ 13,000.00	$ 6,240,000.00
Vacuum Station (3)	1	EA	$ 1,500,000.00	$ 1,500,000.00
			Subtotal	**$ 11,320,010.00**
			Other Project Cost (4) 27%	$ 3,056,402.70
			Build-Out Estimated Total =	**$ 14,376,412.70**
			Build-Out Estimated Cost/EDU =	*$ 14,595.34*

(1) Cost of force mains and vacuum mains includes trench repair and road restoration.

(2) Valve pit cost includes:

$ 3,500	for purchase of valve & pits
$ 5,000	for installation of valve & pits
$ 3,000	for laterals
$ 1,500	for cross-overs from pit to vacuum main
$ 13,000	Total

(3) Vacuum stations include:
- Vacuum station equipment
- Odor control
- Construction of concrete building with underground construction and bathroom
- Emergency back-up generator
- Telemetry
- Cost of Land
- (Cost of legal/real estate fees, public notice and public hearings have not been included.)

(4) Other project costs include construction contingencies and engineering fees.

Table 5-7

Present Worth Cost Analysis (20 year)
Summerland Key
Vacuum Sewer Collection System

Current EDU =	830
Build Out EDU =	985

Assumptions:

Inflation =	3%			
Interest rate =	6%			
Add 1 vacuum pit in year 5, 1 vacuum pit in year 10, and 0 vacuum pits in year 15				
Add 2 EDUs in year 5, 2 EDUs year 10, and 2 EDUs in year 15				
Labor/hr =	$ 100.00	Including overhead		
$/KWH =	$ 0.10			
Power =	$ 2.92	/EDU/month		
Station Maint. =	$ 49,750.00	per year	497.5 hr/yr @ $100/hr	
Prevnt. Maint. =	$ 452.00	/valve/yr		
Public Education =	$ 1.50	/EDU/yr	Preventive maintenance labor cost is based on FKAA's experience at Little Venice. One	
Vac. Valve Rebuild=	$ 35.25	/valve/10yrs	full time person is required to maintian a vacuum station with 350 Valve Pits.	

Initial Construction Cost = $ 13,055,612.70

NOTE: The cost for land to accommodate the vacuum lift station is not included in this present worth cost analysis.

Calculation of present worth of future construction

$1,320,800.00 of construction can be deferred as lots are developed in the future as follows:

In year 5, 10, & 15 a third of construction will be completed. Cost will be escalated at 3% inflation, then converted to present worth at I = 6%

		$1,320,800.00/3=	$ 440,266.67	
(F/P) at 3% for 5 years =	1.1593	$440,266.67x1.1593=	$ 510,401.15	Construction Cost at year 5
(F/P) at 3% for 10 years =	1.3439	$440,266.67x1.3439=	$ 591,674.37	Construction Cost at year 10
(F/P) at 3% for 15 years =	1.5580	$440,266.67x1.5580=	$ 685,935.47	Construction Cost at year 15

Converting the future construction cost to Present Worth with I = 6% gives:

(P/F) at 6% for 5 years =	0.7473	$510,401.15x0.7473=	$ 381,422.78	
(P/F) at 6% for 10 years =	0.5584	$591,674.37x0.5584=	$ 330,390.97	
(P/F) at 6% for 15 years =	0.4173	$685,935.47x0.4173=	$ 286,240.87	

Present Worth of future construction = $ 998,054.62

Annualize cost of all Vacuum Valve/Controller Maintenance per Vacuum Valve

Calculate future price of vacuum valve rebuild at 3% inflation in 10 yrs

(F/P) at 3% for 10 years =	1.3439	$35.25x1.3439=	$ 47.37	per vacuum valve at year 10

Calculate future price of vacuum valve rebuild at 3% inflation in 20 yrs

(F/P) at 3% for 20 years =	1.8061	$35.25x1.8061=	$ 63.67	per vacuum valve at year 20

Converting all the future maintenance cost to Present Worth with I = 6% gives:

(P/F) at 6% for 10 years =	0.5584	$47.37x0.5584=	$ 26.45	per vacuum valve
(P/F) at 6% for 20 years =	0.3118	$63.67x0.3118=	$ 19.85	per vacuum valve

Present Worth of future maintenance cost per vacuum valve = $ 46.30

Calculating the annualized cost per valve over 20 years at I = 6% gives:

(A/P) at 6% for 20 years =	0.0872	$46.30x0.0872=	**$ 4.04**	per vacuum valve per year

Adding the annualize cost of preventive maintenance gives a total annualized cost per valve of:

$452.00+$4.04= **$ 456.04** per vacuum valve per year

Convert annualized Vacuum Valve Maintenance cost to Present Worth

Assume vacuum valves will be phased in as follows:

Period I: 400 vacuum valves through year 5
Period II: 427 vacuum valves from year 6 through year 10
Period III: 454 vacuum valves from year 11 through year 15
Period IV: 480 vacuum valves from year 16 through year 20

Table 5-7 (Con't)

Present Worth Cost Analysis (20 year)
Summerland Key
Vacuum Sewer Collection System

Calculation of present worth of annualized valve maintenance cost for Period I:

Period I: Annualized cost =	$456.04x400=	$ 182,415.07 /yr		
(P/A) at 6% for 5 years =	4.2124	$182,415.07x4.2124=	$ 768,405.23	**Present Worth for Period I**

Calculation of present worth of annualized valve maintenance cost for Period II:

Period II: Annualized cost =	$456.04x427=	$ 194,728.08 /yr		
(P'/A) at 6% for 5 years =	4.2124	$194,728.08x4.2142=	$ 820,272.58	in year 5 dollars
(P/F) at 6% for 5 years =	0.7473	$820,272.58x0.7473=	$ 612,989.70	**Present Worth for Period II**

Calculation of present worth of annualized valve maintenance cost for Period III:

Period III: Annualized cost =	$456.04x454=	$ 207,041.10 /yr		
(P'/A) at 6% for 5 years =	4.2124	$207,041.10x4.2142=	$ 872,139.94	in year 10 dollars
(P/F) at 6% for 10 years =	0.5584	$872,139.94x0.5584=	$ 487,002.94	**Present Worth for Period III**

Calculation of present worth of annualized valve maintenance cost for Period IV:

Period IV: Annualized cost =	$456.04x480=	$ 218,898.08 /yr		
(P'/A) at 6% for 5 years =	4.2124	$218,898.08x4.2142=	$ 922,086.28	in year 15 dollars
(P/F) at 6% for 15 years =	0.4173	$922,086.28x0.4173=	$ 384,786.60	**Present Worth for Period IV**

Present Worth of all annualized valve maintenance cost for all periods = $ 2,253,184.48

Convert annualized Power Cost and Public Education cost to Present Worth

Assume EDUs will be phased in as follows:

Period I: 830 EDUs through year 5
Period II: 882 EDUs from year 6 through year 10
Period III: 934 EDUs from year 11 through year 15
Period IV: 985 EDUs from year 16 through year 20

Annualize cost per EDU= ($2.92/EDU/month)x(12 months/year)+$1.50/EDU/yr= **$ 36.54**

Calculation of present worth of annualized cost per EDU for Period I:

Period I: Annualized cost =	$36.54x830=	$ 30,328.20 /yr		
(P/A) at 6% for 5 years =	4.2124	$30,328.20x4.2124=	$ 127,754.51	**Present Worth for Period I**

Calculation of present worth of annualized cost per EDU for Period II:

Period II: Annualized cost =	$36.54x882=	$ 32,228.28 /yr		
(P'/A) at 6% for 5 years =	4.2124	$32,228.28x4.2142=	$ 135,758.41	in year 5 dollars
(P/F) at 6% for 5 years =	0.7473	$135,758.41x0.7473=	$ 101,452.26	**Present Worth for Period II**

Calculation of present worth of annualized cost per EDU for Period III:

Period III: Annualized cost =	$36.54x934=	$ 34,128.36 /yr		
(P'/A) at 6% for 5 years =	4.2124	$34,128.36x4.2142=	$ 143,762.30	in year 10 dollars
(P/F) at 6% for 10 years =	0.5584	$143,762.30x0.5584=	$ 80,276.87	**Present Worth for Period III**

Calculation of present worth of annualized cost per EDU for Period IV:

Period IV: Annualized cost =	$36.54x985=	$ 35,991.90 /yr		
(P'/A) at 6% for 5 years =	4.2124	$35,991.90x4.2142=	$ 151,612.28	in year 15 dollars
(P/F) at 6% for 15 years =	0.4173	$151,612.28x0.4173=	$ 63,267.80	**Present Worth for Period IV**

Present Worth of all annualized power & education costs for all periods = $ 372,751.44

Convert annualized Vacuum Station Maintenance Cost to Present Worth

Annualized portion of vacuum station maintenance cost to be charged to service area is:

			$ 49,750.00	per year
(P/A) at 6% for 20 years =	11.4699	$49,750.00*11.4699=	$ 570,627.53	**Present Worth of Vacuum Station Maint.**

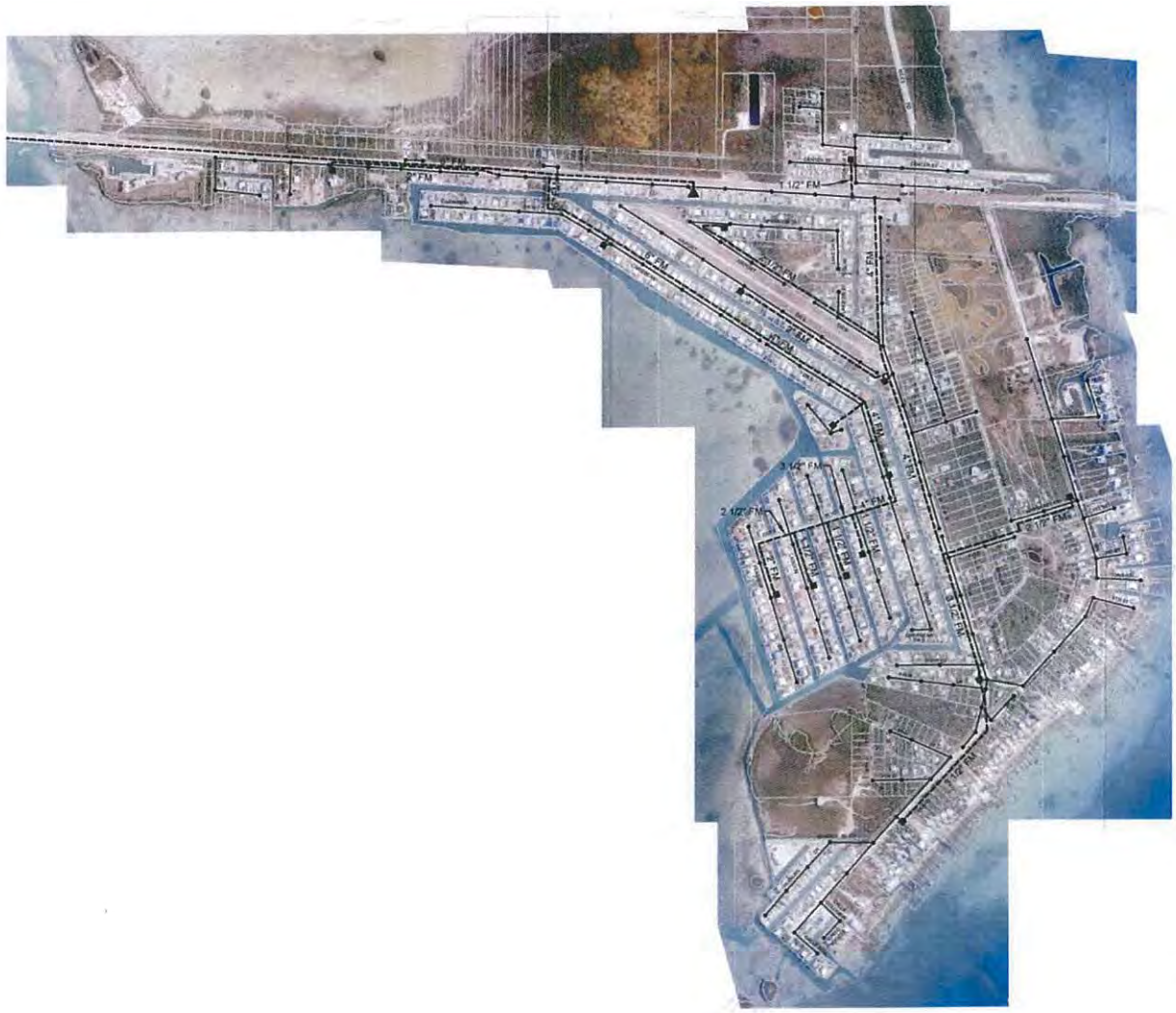
Total Present Worth = $ 17,250,230.76

Present Worth / Current EDUs = $ 20,783.41
Present Worth / Build-Out EDUs = $ 17,512.92

Summerland Key

GRAVITY SEWER SYSTEM

FIGURE 5-4



MATHEWS CONSULTING INC.
Civil and Environmental Engineers

SCALE: 1"=1000' 1000' 500' 0 1000'

Florida Keys Aqueduct Authority

FKAA LOWER KEYS WASTEWATER SYSTEM

SUMMERLAND KEY
PRELIMINARY GRAVITY COLLECTION SYSTEM LAYOUT

PROJ NO: 1474
DATE: FEB. 2009
DWG: GS-3

Table 5-8

Gravity #3 w/Mathews Consulting Updated Costs
Summerland Key
Gravity Sewer

Number of EDUs Current	830
Number of EDUs Build-Out	985

COLLECTION SYSTEM - INSTALLED COST

BUILD-OUT CONSTRUCTION COSTS

ITEM	QUANTITY	UNITS	UNIT PRICE	TOTAL PRICE
Manholes	184	LF	$ 6,000.00	$ 1,104,000.00
8" Gravity Sewers	51584	LF	$ 118.00	$ 6,086,912.00
6" Service Laterals	19275	LF	$ 78.00	$ 1,503,450.00
Force Mains	20402	LF	$ 54.00	$ 1,101,708.00
Concrete Lift Station	15	EA	$ 131,000.00	$ 1,965,000.00
Primary Lift Station S11	1	EA	$ 350,000.00	$ 350,000.00
			Subtotal	$ 12,111,070.00
			Pavement Restoration (30% of Gravity Sewer Cost)	$ 1,826,073.60
			Construction Cost	**$ 13,937,143.60**
			Other Project Costs (1) 27%	*$ 3,763,028.77*
			Estimated Total =	**$ 17,700,172.37**
			Estimated Cost/EDU Current =	$ 21,325.51
			Estimated Cost/EDU Build-Out =	$ 17,969.72

(1) Other project costs include construction contingencies and engineering fees.

Table 5-9

Present Worth Cost Analysis (20 year)
Summerland Key
Gravity Sewer System

Current EDU =	830
Build Out EDU =	985

Assumptions:

Inflation =		3%	
Interest rate =		6%	
Labor/hr =	$	100.00	Including overhead
$/KWH =	$	0.10	
Power =	$	2.72	/EDU/month
Prevnt. Maint. =	$	7,500.00	/station/yr
Pump replacement =	$	20,000.00	/station/10 yr

75 hr/station @ $100/hr

Initial Construction Cost = $ 17,700,172.37

Present worth of pump replacement in 10 years and again in 20 years

Calculate future price of pump replacement at 3% inflation in 10 yrs

(F/P) at 3% for 10 years = 1.3439 $20,000x1.3439= $ 26,878.00 per station

Converting the 10 year future pump replacement cost to Present Worth with I = 6% gives:

(P/F) at 6% for 10 years = 0.5584 $26,878.00x0.5584= **$ 15,008.68** per station

Calculate future price of pump replacement at 3% inflation in 20 yrs

(F/P) at 3% for 20 years = 1.8061 $20,000x1.8061= $ 36,122.00 per station

Converting the 20 year future pump replacement cost to Present Worth with I = 6% gives:

(P/F) at 6% for 20 years = 0.3118 $36,122.00x0.3118= **$ 11,262.84** per station

The Study Area will be charged for maintenance at 16 stations

Total Present worth of pump replacements ($15,008.68+$11,262.84)*16 = $ 420,344.24

Present worth of preventative maintenance for 16 lift stations:

Convert the annualized cost per station to present worth gives:

(P/A) at 6% for 20 years = 11.4699 $7,500*16*11.4699= **$ 1,376,388.00**

Total annualized cost per EDU per year:

Power = $ 2.72 /EDU/month

Convert annualized costs per EDU to Present Worth

Assume EDUs will be phased in as follows:

Period I: 830 EDUs through year 5
Period II: 882 EDUs from year 6 through year 10
Period III: 934 EDUs from year 11 through year 15
Period IV: 985 EDUs from year 16 through year 20

Annualize cost per EDU= ($2.72/EDU/month)x(12 months/year)= **$ 32.64**

Calculation of present worth of annualized cost per EDU for Period I:

Period I: Annualized cost = $32.64x830= $27,091.20 /yr

(P/A) at 6% for 5 years = 4.2124 $27,091.20x4.2124= **$ 114,118.97 Present Worth for Period I**

Calculation of present worth of annualized cost per EDU for Period II:

Period II: Annualized cost = $32.64x882= $28,788.48 /yr

(P'/A) at 6% for 5 years = 4.2124 $28,788.48x4.2142= $ 121,268.59 in year 5 dollars

(P/F) at 6% for 5 years = 0.7473 $121,268.59x0.7473= **$ 90,624.02 Present Worth for Period II**

Table 5-9 (Con't)

Present Worth Cost Analysis (20 year)
Summerland Key
Gravity Sewer System

Calculation of present worth of annualized cost per EDU for Period III:

Period III: Annualized cost =		$32.64x934=	$ 30,485.76	/yr	
(P'/A) at 6% for 5 years =	4.2124	$30,485.76x4.2142=	$	128,418.22	in year 10 dollars
(P/F) at 6% for 10 years =	0.5584	$128,418.22x0.5584=	**$**	**71,708.73**	**Present Worth for Period III**

Calculation of present worth of annualized cost per EDU for Period IV:

Period IV: Annualized cost =		$32.64x985=	$ 32,150.40	/yr	
(P'/A) at 6% for 5 years =	4.2124	$32,150.40x4.2142=	$	135,430.34	in year 15 dollars
(P/F) at 6% for 15 years =	0.4173	$135,430.34x0.4173=	**$**	**56,515.08**	**Present Worth for Period IV**

Present Worth of all annualized cost per EDU for all periods = $ 332,966.80

Total Present Worth = $19,829,871.41

Present Worth / Current EDUs = $ 23,891.41
Present Worth / Build-Out EDUs = $ 20,131.85

Section 6

Wastewater Collection System
Decision Analysis

6.0 Wastewater Collection System Decision Analysis

In order to provide an initial recommendation for the type of wastewater collection system that should be considered, a Wastewater Collection System Decision Tree was established (refer to Figure 6-1). Figure 6-1 shows guidelines, not hard and fast rules, therefore good judgment must be exercised in using the decision tree tool. Recommendations are based on both initial construction cost and a present worth cost analysis including construction cost, operation and maintenance costs, and system reliability.

In most cases, the initial construction cost accounts for 70% to 90% of the total present worth cost. Conditions that have a significant effect on installed cost are described for each system below:

Gravity Sewer:

- Total number of connections
  - More cost effective as the number of connections increases
- Number of connections per lift station
  - The more connections that can be served per lift station, the more cost effective
  - Obstructions such as canals and large drainage pipes can significantly reduce the number of connections per lift station
- Average linear feet of gravity sewer per developed lot
  - More cost effective when lot lines are short and both side of the street are developed
- Reliability
  - When construction cost are similar to alternative collection systems, gravity sewer systems are preferred

Vacuum Sewer:

- Total number of connections
  - More cost effective for large service areas (750+ connections/vacuum station) with medium to high density
  - Obstructions such as canals and large drainage pipes will have little effect on the number of connections per vacuum station
- Average linear feet of vacuum sewer main per developed lot
  - More cost effective when lot lines are less than 100 feet, or both sides of the street are developed

Low Pressure Sewer:

- Total number of connections
  - Low pressure sewer has a significant cost advantage for small collection systems. As the number of connections increases, the cost advantage is reduced.
- Average linear feet of force main per developed lot.
  - Low pressure sewer has a significant cost advantage for lower density residential areas

- Low pressure sewer can serve outlying areas cost effectively when the average linear feet of force main per developed lot is less than 500 feet

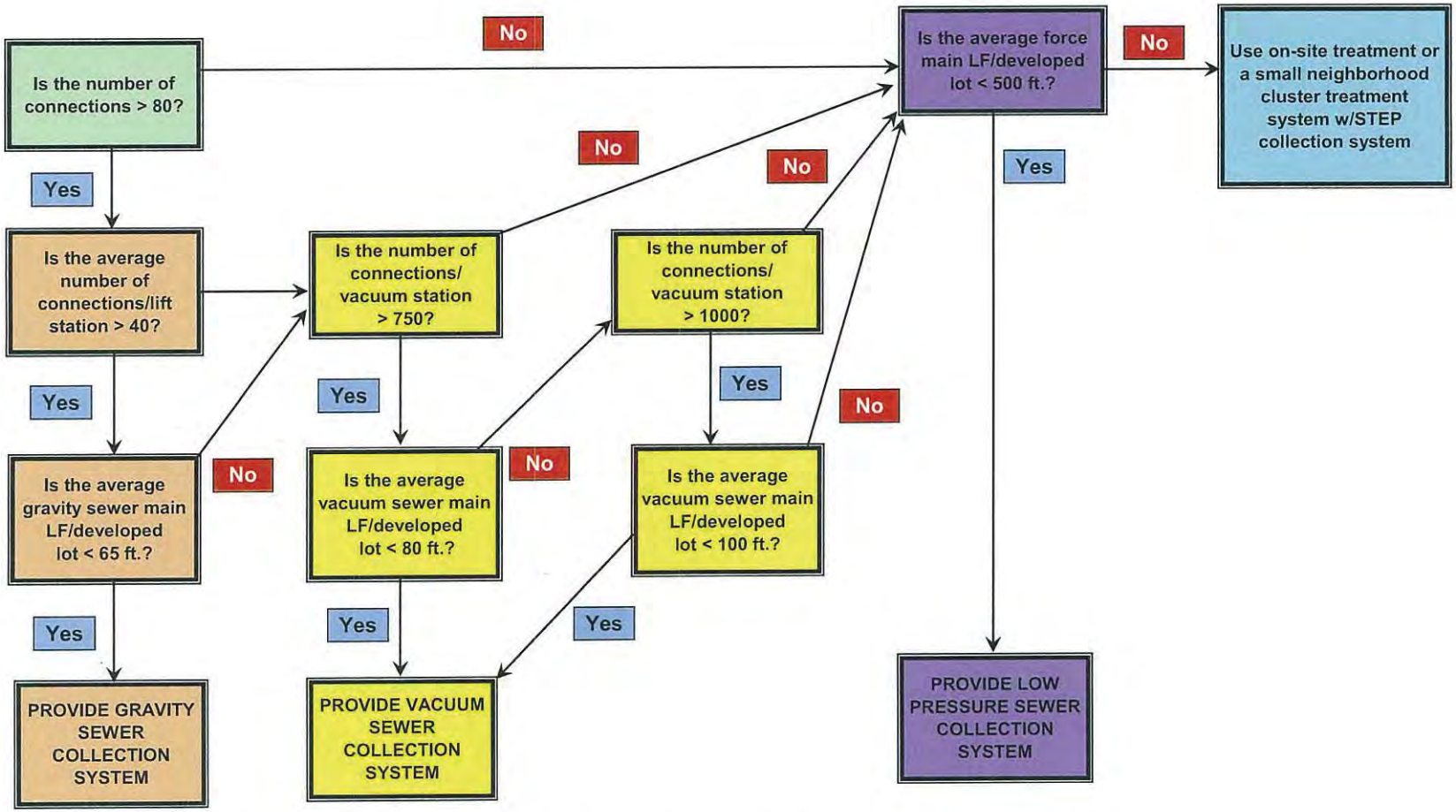
Septic Tank Effluent Pump (STEP) System:

- Not economically viable unless combined with a small neighborhood cluster treatment system
  - The construction cost for a STEP Collection System pumping to a centralized treatment plant is higher than the construction cost of a Low Pressure Sewer System
  - Based on actual information from Charlotte County, there is no significant O&M savings when using a STEP Collection System

On-Site Wastewater Nutrient Reduction Systems (OWNRS):

- More cost effective in sparsely populated areas beyond the reach of a Low Pressure Sewer System based on a life cycle cost of $36,000 per treatment system. Refer to Appendix A for information detailing the Lifecycle Cost Analysis for OWNRS.

Figure 6-1
Wastewater Collection System Decision Tree



Note: The maximum average linear feet of force main per developed lot was calculated based on a life cycle cost of $36,000 for an on-site OWNRS treatment system.

Section 7

Conclusions

7.0 Conclusions

Based upon the information presented in this Letter Report, Mathews Consulting recommends that the FKAA proceed with the final design, permitting and bidding of the Wastewater Collection System project(s) for Upper Sugarloaf Key, Cudjoe Key and Summerland Key. A project schedule to complete the project(s) from final design through the bidding phase is shown in Figure 7-1. The conclusions and recommendations are as follows:

- A hybrid system should be implemented consisting of a combination of (1) conventional gravity sewer systems to serve the densely populated areas; and (2) low pressure sewers to serve the less dense and outer reach areas. Using the Wastewater Collection System Decision Tree in Section 6 of this Letter Report, any houses not served by this wastewater collection system combination will be provided with an On-Site Wastewater Nutrient Removal System (OWNRS). The extent of each collection system technology utilized will be finalized during the design phase using the Wastewater Collection System Decision Tree in Section 6 of this Letter Report as a guideline.

- In most cases, the initial construction cost accounts for 70% to 90% of the total present worth cost. Future construction and operation and maintenance costs are not major factors in the decision making process for these areas.

- Pre-Tac Meeting(s) should be held with FDEP (Monroe County/Ft. Myers Divisions) to update the permit review staff on the Wastewater Collection System technologies that will be implemented in the service areas (i.e. combination of conventional gravity sewer system and low pressure systems). This will ensure "no permitting obstacles" during design of project(s).

Central Cudjoe Regional Wastewater System - Project Schedule (Final Design)

MATHEWS CONSULTING INC.
Civil and Environmental Engineers

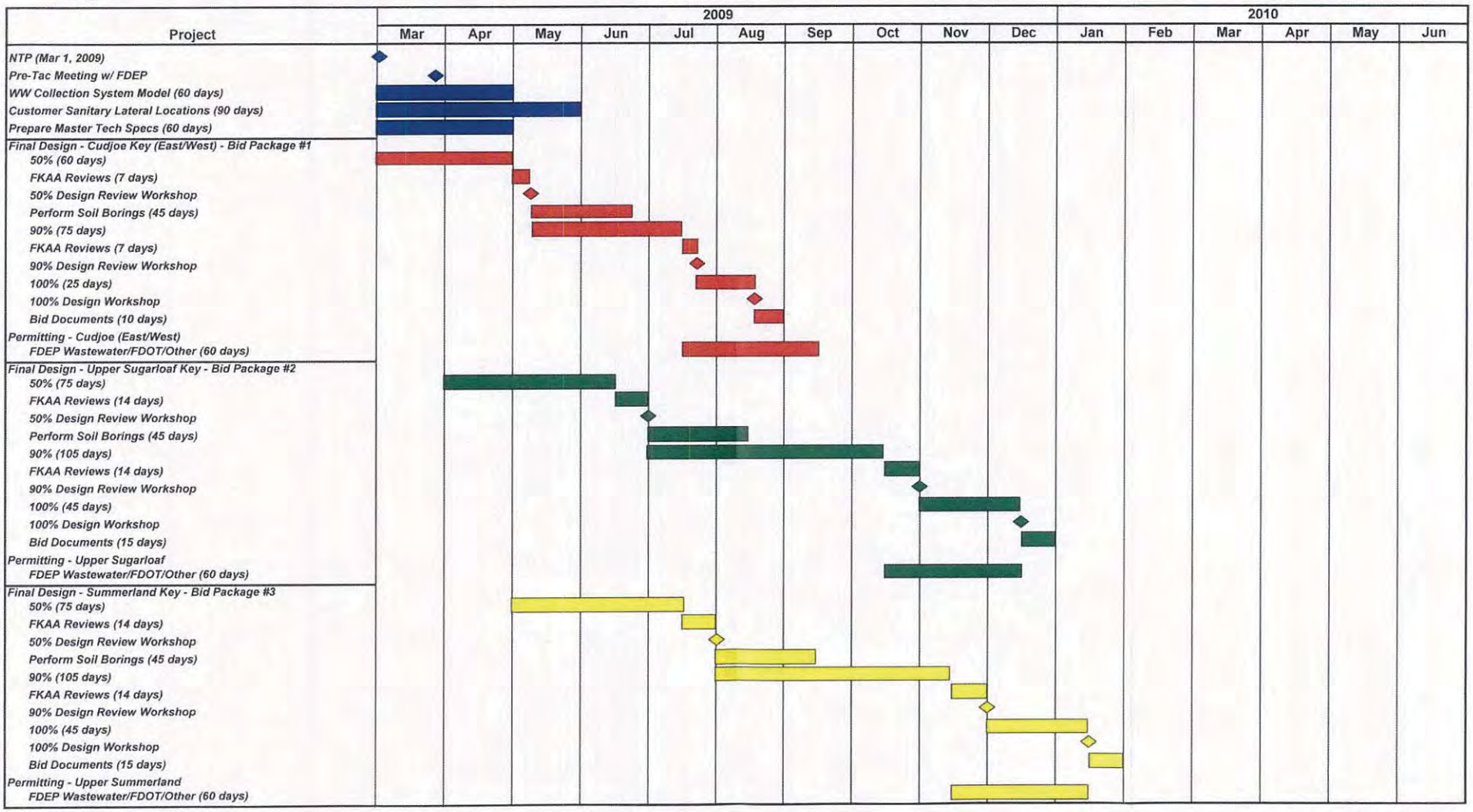


Figure 7-1

Section 8

Works Cited

8.0 Works Cited

CH2M HILL . 1998 . Wastewater Facilities Plan with Phased implementation for the Marathon Area of the Florida Keys . Prepared for Monroe County

CH2M HILL . 2000 . Monroe County Sanitary Wastewater Master Plan . Prepared for Monroe County

CH2M HILL . 2007 . Draft Preliminary Design Report Cudjoe Wastewater Collection and Transmission System Project . Prepared for Florida Keys Aqueduct Authority

CH2M HILL . 2008 . Final Preliminary Design Report Cudjoe Wastewater Collection and Transmission System Project . Prepared for Florida Keys Aqueduct Authority

EPA . 2000 . Decentralized Systems Technology Fact Sheet – "Small Diameter Gravity Sewers"

EPA . 1998 . Decentralized Systems Technology Fact Sheet – "Low Pressure Pipe Systems"

EPA . 2000 . Wastewater Technology Fact Sheet – "Sewers, Force Main"

EPA . 2000 . Collection Systems Technology Fact Sheet – "Sewers, Lift Station"

EPA . 2000 . Collection Systems Technology Fact Sheet – "Sewers, Conventional Gravity"

EPA . 2000 . Wastewater Technology Fact Sheet – "Sewers, Pressure"

Metcalf & Eddy, Inc. 1981 . Wastewater Engineering: Collection and Pumping of Wastewater

Alternative Wastewater Collection Systems Manufacturer Data

1. Environment One Corporation – Low Pressure Systems

2. Airvac – Vacuum Collection Systems

3. Orenco System, Inc. – Septic Tank Effluent Pump (STEP) System

Appendix A

"Development of On-Site Wastewater Nutrient Removal Systems (OWNRS) Lifecycle Costs Using Best Available Technology (BAT)," FKAA - January 2009

DEVELOPMENT OF ON-SITE WASTEWATER NUTRIENT REMOVAL SYSTEMS (OWNRS) LIFECYCLE COSTS USING BEST AVAILABLE TECHNOLOGY (BAT)

January, 2009

FKAA Project #4018-08

Deliverable to Task 3 — Analysis of Alternative Conveyance Systems

PROJECT HISTORY

Recognizing that the economic health of Monroe County and its municipalities relies largely on the environmental health of a unique marine ecosystem, the County's Year 2010 Comprehensive Plan mandated that nutrient loading levels be reduced in the Florida Keys. In June of 2000, the *"Sanitary Wastewater Master Plan"* (Master Plan) was finalized with a firm objective of eliminating approximately 23,000 private on-site septic systems by July 2010. Through interlocal agreement, Monroe County has requested that the Florida Keys Aqueduct Authority (FKAA) design, build, and operate County-owned infrastructure on behalf of the citizens in the Master-Plan prescribed service areas.

The Master Plan identified Cudjoe Key/Summerland Key as just such a service area and, with the assistance of one of its wastewater consultants, FKAA completed a Draft Preliminary Design Report (PDR), entitled *"Cudjoe Wastewater Collection and Transmission System Project"* in December 2007.

In early 2008, County staff requested that the FKAA consider a change in the Master Plan to expand the service area to include the entire area between Sugarloaf Key and Big Pine Key. This change represented a dramatic enlargement of the original Cudjoe Key/Summerland Key service area. A PDR update, completed on February 28, 2008 indicated a potential cost savings should the newly expanded area prove serviceable, and in May 2008, an interlocal agreement amendment allowed for the procurement of professional engineering services necessary to implement the revised goals of the Master Plan.

An engineering task order to Mathews Consulting, Inc. (CONSULTANT) for final planning, design and permitting services to cover the central service area of the regional system was executed on June 26, 2008. Task order initial work efforts include the finalization of mapping services and base sheet preparation, preconstruction data collection, and the finalization of pre-design activities. The latter of these work efforts will research the various collection system technologies and through the use of a "decision tree", select the best value technology tailored to the specific conditions of a particular neighborhood. The final work product will be a permitted conveyance system that will combine various wastewater collection system technologies in order to connect as many on-site septic systems to the regional system as possible for the lowest overall lifecycle cost (LCC). The combined strategic utilization of proper planning and technology, extending to the greatest number of connections for the best value, is an approach developed by the FKAA through its years of experience in the utility business. What follows is an analysis, not included in the CONSULTANT task order, to identify a representative LCC for conversion to an On-Site Wastewater Nutrient Removal System ("OWNRS") to meet the 2010 BAT standard (10 mg/l BOD, 10 mg/l TSS, 10 mg/l total N, and 1 mg/l total P).

VILLAGE MOBILE HOME PARK - ISLAMORADA

*More system installation photographs available in appendix.

INTRODUCTION

FKAA staff familiar with domestic wastewater treatment methods and technologies recognized some time ago that an in-house "knowledge gap" existed regarding OWNRS systems. To close that gap, staff members met with the Monroe County Health Department to become more knowledgeable of what it means to be "OWNRS 2010 compliant".

Appendix #1 contains a synopsis of this initial research. More can be seen at the State Department of Health website at www.doh.state.fl.us/environment/ostds

FKAA has monthly coordination meetings with Monroe County officials regarding the progress being made in meeting the 2010 connection deadline. One such meeting was held in July 2008.* County officials requested that FKAA, in addition to applying best value design methods to collection system design, also research and establish capital and lifecycle costs expected for the average single-family household to convert to BAT using OWNRS technology that is most likely to achieve the 10-10-10-1 standard. Because of lack of funding and the short timeframe involved, this in-house project drew upon existing studies and the expertise of local vendors with many years of experience in OWNRS technology. Four readily available, diverse sources were utilized and checked against each other for acceptable consistency.

*It has been suggested that a "pollution factor" be applied to OWNRS to normalize with advanced treatment technologies. FDEP is currently developing a value for noncompliant package systems that could be applied to OWNRS.

DATA SOURCES

Source #1 was the "*Monroe County Sanitary Waste Water Master Plan, March 2000, Vol #4- Supporting Documents, "Technology Assessment of On-Site Wastewater Treatment Systems"*, by AYRES Associates, Tampa, Florida, June 1998.

Source #2 was obtained from Third-Generation Plumbing (TGP), Pinewood Plumbing, and George's Plumbing each of whom provided data regarding Capital and O&M costs that, in their experience, typified present day domestic conversion installations. The data memo is summarized as Appendix #2, and it's attachment.

Source #3 was the previously mentioned PDR which had a section devoted to present worth analysis of on-site systems, (see Appendix #3).

Source #4 is a recently published study entitled "*Florida Passive Nitrogen Removal Study*" (FPNRS), published June 2008, was consulted and is referenced herein for LCC comparison purposes only, since the study did

not include phosphorous removal technologies.

METHODOLOGY

Source #1 - Master Plan Data- A number of systems were analyzed in the above referenced technology assessment dated 1998. The anticipated capital installed cost data for all systems analyzed, ranged from $11,412 to $17,414 depending on the technology choice. LCC assumptions are contained within the Master Plan document, and include a 20% contingency for restoration, permitting, etc.

Taking the average of all systems* referenced in the Master Plan, an anticipated capital installed cost average of $13,474 in 1998 dollars was used.

Annual operating costs ranged from $1172-$1631 for all systems analyzed and an average annual operating cost of $1360.45 in 1998 dollars was used.

*8 OWNRS systems were evaluated in the Master Plan, but only three are currently approved by DOH. Of those, only one achieved consistent nutrient removal.

Source #2 Plumbing Data- local vendors supplied estimated installation costs which averaged $18,600 to install a FAST BAT unit as illustrated in Appendix 2*. Another $500 dollars was added for electrical installation bringing the total estimated installation cost to $19,100 in 2008 dollars.

*FAST was the sole OWNRS that came close to consistently achieving BAT in the "Big Pine Key OWNRS demonstration project" of 1998 (Andersen et al.) Others have achieved DOH approval using different methods.

Two of three suppliers also supplied annual operating costs as follows:*

- Operating contract renewed every two years at an average cost of $387.50 in 2008 dollars.
- LECA 2 m^3 phosphorous removal media replaced every four years at $2000 each replacement cycle in 2008 dollars.
- Electrical and periodic sludge removal costs are omitted from this analysis for convenience but should be included in any in-depth analysis. All renewal and replacement costs are assumed to be included in the operating contract price. The existing drain field was assumed to be in good usable condition.

Source #3 - Draft Preliminary Design Report (PDR), December 2007 Section 4.3.1 of the

aformentioned PDR indicated that installation costs are expected to be on the order of $20-$25,000, with operating costs expected to be on the order of $3,500-$4,000. Very little source information was provided in the PDR but upon further inquiry, Appendix #4 elaborates on the source(s) of the data.
For this analysis, averages were taken with a capital cost of $22,500 and an annual operating cost of $3750.

Source #4 – FPNRS
Appendix #5 indicates the LCC analysis details. Remember that this study considered nitrogen removal only and did not include facilities for phosphorous removal.

PRESENT WORTH COMPARISON

All costs were adjusted to present day using an average interest rate of 6.0% simple interest compounded over the adjustment period. Inflation was assumed to be 3%.

For Source #1, Master Plan data was brought forward 10 years using the average numbers as indicated above with the following results:

CAPITAL- $24,129.88

ANNUAL OPERATING-$1828.33

For Source #2, Capital data was represented in present-day costs as: $19,100.

Annual operating costs included contractual and phosphorus media renewal obligations only, with five media replacements and ten contract renewals during the 20 year term. This translated into an annual operating cost of $1492.

For Source #3, Averages were taken with a capital cost of $22,500 and an annual operating cost of $3,750.

For Source #4, Table 30 from the report depicts LLC of 12 systems with a PW_{30} of approximately $43,000. Phosphorus removal was not included in the FPNRS and the LCC values are for comparison only.

RESULTS—PRESENT WORTH VALUES

- Source #1:

  Capital $24,129

  Operating (20-yr) $20,566

  Total PW $44,695

- Source #2:

  Capital $19,100

  Operating (20-yr) $16,859

  Total PW $35,959

- Source #3:

  Capital $22,500

  Operating (20-yr) $42,375

  Total PW $64,875

LIFECYCLE COSTS

Source #1 $44,695

Source #2 $35,959

Source #3 $64,875

Source #4 $43,000*

*PW_{30} and no P removal

(See Appendix #5 for a summary of all data sources).

CONCLUSIONS

The 20-year LCCA of an OWNRS conversion given the above set of assumptions is somewhere in the neighborhood of a PW_{20} cost of approximately $35,000 to $65,000. Annual operating costs averaged $2392 or about $200 a month, remaining unrealistically high for most households.

It remains important to remember that BAT and AWT are not environmental equivalents. In fact the average household meeting minimum BAT, will discharge over the course of a year, 4.6 pounds of excess BOD and TSS and 6.4 pounds of nitrogen into the environment, than the same connection tied to a regional system meeting AWT standards. Should the regional facility recycle reclaimed water, then the pollution differential is even greater.

Note that a number of variables exist that will significantly skew LCC in either direction, particularly those that apply to site variability and operating costs. More in-depth study would better reveal variable cost-sensitivity and narrow the expected total.

APPENDIX #1

Meeting with Monroe County Health Department

April 23, 2008

Re: Interim Onsite Treatment and Disposal Systems and Performance-Based On-Site Treatment and Disposal Systems (OSTDS)

Julie Cheon, Jolynn Reynolds and Don Hubbs met with Mr. Bill Brookman, Environmental Supervisor with the Monroe County Health Department. The purpose of the meeting was twofold; to better prepare the FKAA to accurately respond to questions posed by the Public about the decisions they must make regarding their interim OSTDS if they are in an area that will be centrally sewered or Performance-Based OSTDS to meet the 2010 standard if they should be in a designated "cold spot" that will not be centrally sewered, to educate ourselves regarding on-site system conversions in preparation for potentially assuming a significantly greater role in this area. In addition, we are performing a number of conversions at FKAA-owned sites and may wish to standardize/economize this effort, and perhaps use one or more sites as demonstration projects.

The Department of Health (DOH) conducted an evaluation of various systems known as the Big Pine Key Study. This evaluation revealed only 3 systems that could reasonably meet on average the performance-based standards of 10 mg per liter BOD, 10 mg per liter TSS, 10 mg per liter total nitrogen and 1 mg per liter total phosphorus, the so-called 10-10-10-1 standard. The three approved systems were as follows:

Comment [WB1]: Actually only the FAST system came out of this study. The others received approval from different methods. The LECA and Brick Chips as phosphorus reducing media came out of this study.

Comment [WB2]: As of April 29, 2006 (It is a dynamic process with several other manufacturers intensely pursuing FDOH approval)

- FAST System and its derivatives by Bio-Microbics
- HOOT System by Hoot Aerobic Systems
- SINGULAIR system by Norweco Inc.

Any of these systems can be preceded by a septic tank or other pretreatment process and followed by a disposal method which may include subsurface on-site irrigation, a drain field meeting current standards, or a shallow injection well.

INNOVATION

There is a process by which new technology may apply for use in the Florida Keys. An "Application for Innovative Permit Status" may be sent to the Bureau of On-Site Sewage in Tallahassee for special permitting dispensation, but for purposes of this paper, only the above systems are currently being considered. Chapter 64E – 6 of the Florida Administrative Code governs on-site sewage treatment and disposal systems and contains additional provisions that must be adhered to.

Regardless of whether a system is approved or "innovative", each system must be individually engineered based on individual site conditions and loadings. The underground tanks are all preapproved and form the component parts of the system. These component parts must be State Health Office approved and are listed on the DOH web. All systems are aerobic requiring continuous airflow/mixing, preceded by a pretreatment chamber and followed by a solids chamber. Recirculation significantly enhances nitrogen removal. Phosphorus is generally removed by filter media, either brick chips or Light Expanded Clay Aggregate or " LECA". The media has a limited life which is governed by loading rate and

must be periodically replaced. Also, depending on the type of media used, the hydraulics differ – a downflow over the media with brickchips and an upflow through the media with LECA.

PERMITTING (Interim OSTDS – until central sewer is available and Performance-based OSTDS less than 10,000 gallons per day)

The process (simplified) is basically as follows:

1. A "Request for Approval of On-Site Treatment System" form must be filled out. It has a number of attachments including survey, site plan, floor plans, and percolation test.
2. A statement from the engineer of record must be attached.
3. An "Application of Construction for On-Site Systems" must be attached.
4. A "Site Evaluation of System Specifications" must be attached.
5. A schematic of the chosen treatment process along with loading calculations, maintenance manual, O&M manuals, sampling protocol and continuing services agreement must be attached.
6. A Department of Health certificate is issued at the end of the process for a set period of time and constitutes the operations permit.

DESIGN (Rules of Thumb)

Many rules of thumb are used in evaluation of these applications; among them the following:

Single-family dwellings are sized based on the number of bedrooms the residence has (typical residential – 3 bedroom/2 bath).

Comment [WB3]: Flows are calculated from tables in the Florida Administrative Code 64E-6.

Tanks must be on the State Health Office-approved list.
(www.doh.state.fl.us/environment/OSTDS/index.html)

A maximum of 2500 gallons of wastewater per acre can be disposed of, in an interim OSTDS, otherwise, the OSTDS must meet Performance-Based criteria ; DOH permits no more than 2000 gallons per day using an on-site injection well; over 2,000 gallons per day will need to be permitted by FDEP.

An injection well inlet must be 18 inches above the seasonal high water table.

If a drain field is used, its base must be 3 feet above mean sea level, 24 inches above seasonal high water level, and have a soil cap of 6 inches thick.

For phosphorous removal, it is recommended that loading rates of no greater than 5.5 gallons per square foot per day be used with brick filter media 24 inches thick.

Comment [WB4]: required

For LECA, loading rates of 3 to 6 mg phosphorus per kilogram LECA is used; more information on LECA can be found at www.filtralite.com/26264.

If LECA is used in a performance-based drainfield, then the loading rate should not exceed 1.1 to 2 gallons per square foot per day.

Comment [WB5]: We see more Brick chip drainfields. I have not personally seen a LECA drainfield, although I suppose its possible.

MISCELLANEOUS

Carmody Data Systems maintains the Department of Health database. A "septic search" accessible to everyone tells you which site currently has a permitted septic system and which does not.

If a resident has installed an approved system then they are considered 2010 compliant.

Comment [WB6]: 10-10-10-1 Performance-based treatment system

A DEP website, "LABINS" can be useful regarding mean sea level data for design of OSTDS.

The local utility (FKAA) may perform the steps of system abandonment without a permit.

For a typical residential home, the average cost of the Performance-Based OSTDS is $25,000.

There are approximately 958 residential homes that are located in "cold spots" that will require a Performance-Based OSTDS by 2010 (lower keys – 806; middle keys – 2; upper keys - 150).

APPENDIX #2

FLORIDA KEYS AQUEDUCT AUTHORITY

Engineering Department
1100 Kennedy Drive, Key West, Florida 33040
Telephone: 305-296-2454 FAX: 305-293-1425

MEMORANDUM

FROM: **Julie Cheon, Environmental Specialist, in collaboration with Don Hubbs, Assistant Director of Engineering**

DATE: **July 22, 2008**

SUBJECT: **Single Family Residence BAT OSTDS Typical Conversion Cost**

Background

The July 2010 deadline for conversion of on-site systems to central sewer or Best Available Technology (BAT) is just around the corner. Questions have been raised regarding the affordability of centralized sewer as compared to alternatives such as BAT. In addition, FKAA may play a larger role in the future regarding private property BAT conversions in low-density areas. In order to be better informed, FKAA has collected some basic information which may play a role in future decision-making.

Data Basis

Third Generation Plumbing (TGP) was contacted and asked to provide cost information for the conversion of an existing typical single family residence onsite system to a BAT 2010 system based on their local field experience. Although a request was made for written documentation showing alternative systems for a representative cross-section of single-family residences, TGP responded verbally. Below is a summary of the information they provided to me.

TGP considers a typical single family residence to be three bedrooms or less, producing 300gpd of wastewater flow, which would require a 500 gallon tank. This is consistent with information provided by the Department of Health and the Florida Administrative Code 64E-6.008, Table 1, "*Estimated Sewage Flows*".

TGP explained that there are three approved systems, FAST, Norweco, and HOOT, and a fourth system, Delta, which is in the process of being reinstated to the DOH approved list. The HOOT system is the most expensive and works best in a drip irrigation application; the process in which it was certified. The FAST system requires that the unit be placed in a tank. Although the FAST system is less expensive than the HOOT the requirement of the extra tank makes the FAST system more expensive than the aforementioned Norweco.

Components and Costs

A test of several BAT systems was conducted on Big Pine Key by the DOH. The FAST system was determined to meet BAT standards with the most consistency. As such, the FAST unit was used in determining the cost basis.

TGP provided a price of $18,500 for the conversion of a single family residence to a BAT 2010 system.

The price includes a FAST unit in a tank, a 500 gpd filter media tank with 2 cubic meters of LECA filter media and a 2 year maintenance agreement. Also included are the system

engineering & permitting, basic septic abandonment and final plumbing including connection to the house. Final electric is not included but is expected to include installation of an electric receptacle and wiring of the blower and control panel. This was estimated by Third Generation to cost $500. Additional information was provided by Bone Key Electric (BKE). BKE indicated they would charge a flat rate of $325 for all of the connections. When pressed for a worst case scenario BKE stated that $500 would be the worst case for an extremely difficult connection, an older concrete home for example.

Also included in the price is the removal of any fill, if necessary and planting of the required groundcover over the drainfield per DOH specifications. Installation of a borehole in lieu of a drainfield would require an additional $1,000 in upfront costs and an additional $100 charge per maintenance contract (see below). The contractor will rake and remove softball size or larger rocks and hand grade. Also included is simple replanting of any shrubs or small vegetation that had to be removed during the course of construction. Survivability of the transplanted material is not guaranteed. Small sheds and obstructions that can be readily moved will be moved, however the contractor is not responsible for damage to the property. A contingency will probably need to be included for these items.

Although, when compared to brick chips, the LECA media itself was more expensive it was chosen because it reduces both upfront and long term costs. LECA media reduces upfront costs by allowing gravity flow negating the need for installation of a pump. In addition, LECA can be removed via a pump truck while brick chip removal requires a backhoe. This pump truck removal method is much less labor intensive and more cost effective. LECA replacement is driven by the media's ability to remove phosphorous. Two cubic meters will last 4 years based on wastewater flow of 300gpd, the amount of flow estimated to be produced by a 3 bedroom house per DOH regulations.

Costs provided are in 2008 dollars unless otherwise stated.

Cost Summary

Table 1

Capital Costs		
System	**Components Included**	**Costs**
FAST	Permitting & Engineering	
	Septic Abandonment (basic)*	
	FAST unit with Tank	
	500 gallon filter media tank	
	2 cubic meters LECA Filter Media	
	Final plumbing	**$18,500**
	2 year maintenance agreement	
	Drainfield vegetation & planting	
	Hand grading	
	Simple transplantation (not guaranteed)	
	Removal of fill	
	Components Not Included	
	Final Electric	**$500****
Totals		**$18,500*****

*Basic abandonment is considered abandonment of tank in open area. Tanks under homes or in areas not accessible by heavy equipment incur extra costs, typically not more than $600

**Final Electric Price was estimated by BKE.

***Add $1,000 if borehole is used in place of drain field: Subtract $2,000 if a Norweco system is used in lieu of a FAST system

Table 2

Operating Costs

Component	Cost	Frequency/yrs	20 Year Cost**
Filter Media Replacement	$2,000	4	$10,000
Operating Agreement	$425	2	$4,250
Totals			$14,250*

* Add $100 if borehole. Maintenance contract for borehole included is $525/2yrs

** Not adjusted for PW

Donald Hubbs

From: Julie Cheon
Sent: Thursday, October 09, 2008 1:22 PM
To: Donald Hubbs
Subject: FW: FAST Price

Not quite apples to apples, but I think it is the best we are going to get at this time.

Julie

From: Diann Merriman [mailto:diann@pinewoodservices.com]
Sent: Thursday, October 09, 2008 1:09 PM
To: Julie Cheon
Subject: RE: FAST Price

Julie,

Sorry for the delay in getting this information to you. What I have found from looking at our pricing; we would charge between $18,000 and $25,000 for a performance based treatment system. The lesser price would be for systems that only require a drainfield, the higher price for systems that require and injection well. Also, these are just "ballpark figures" they could be less or more depending on the individual job site, and the engineered requirements.

We include permitting, engineering, excavation and fill removal, the labor and materials for installing the system (either Cherokee red brick chips or LECA filter media; whichever the engineer designs for), backfill with approved material, a 2 year maintenance contract, and clean up of the job site.

If we abandon the existing system at the same time we are installing the new, a discounted price of $1000 would be charged.

We do not handle the connection of the plumbing to the system, you would probably want to contact a plumber for those prices.

I'm not sure what to tell you, as far as transplantation. I do not have any pricing to go from on this. I imagine the price would not be outrageous, but I don't know where to begin with pricing. ☺

Any other questions?

I hope this helped answer your questions.

Thank you,
Diann

Diann Merriman
Office Administrator
Pinewood Wastewater Services, Inc.
P.O. Box 432010
Big Pine Key, FL 33043
(305)872-2033
(305)872-2977 fax

From: Julie Cheon [mailto:jcheon@fkaa.com]
Sent: Monday, October 06, 2008 11:07 AM
To: diann@pinewoodservices.com
Subject: FAST Price

Hi Dianne,

I appreciate your assistance on this.

We are looking to for a price on a typical installation of a FAST unit at an existing residence and abandonment or removal of any parts of the existing system that is not likely to be utilized when upgrading to a FAST unit. I understand that prices vary with the anomalies of each installation. We are just looking for a ball park price that we can use in our onsite feasibility study.

Please include in price: (or if not included in price, please note as such)
Permitting and Engineering
Septic Abandonment (basic-tank in open area)
FAST unit with Tank
2 cubic meters LECA filter media
Final Plumbing
2 Year maintenance agreement
Drainfield and Vegetation planting
Hand grading
Simple transplantation, if necessary (not guaranteed)
Removal of fill.

Thanks Again,

Your help is greatly appreciated.

Julie Cheon
Environmental Specialist
Florida Keys Aqueduct Authority
(305) 295-2178

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Donald Hubbs

From: Julie Cheon
Sent: Thursday, October 09, 2008 9:04 AM
To: Donald Hubbs
Subject: OSTDS Price Update

Don,

So far I have extracted a verbal price from George's Plumbing of $15,000 and about $350. Based on my discussion and having only verbal communication I believe the margin of error may be more than we would like.

I have followed up with Pinewood 3x both verbally and in writing, so if they do respond I expect to obtain a number with a better level of accuracy, but I am still waiting.

I also have a call into another plumber as well.

It seems that the plumbers are not real interested in giving quotes. I am not sure if it is because they do not want to take the time, or if they do not want their numbers out there. I'm still working on it.

Julie

APPENDIX #3

4.2.2 Potential to Combine some Pump Station Service Areas

The gravity sewer system layouts shown in Appendix F were developed to minimize the number of lift stations and to provide the most cost-effective gravity sewer systems by extending sewers the full 1,700 feet from lift stations, wherever possible. The biggest constraint to maximizing lift station service area size is the multiple interior canals within the project area.

As a result, only one location (LS-SG7 on Upper Sugarloaf) was identified where two lift station service areas can be combined into one lift station service area, provided FKAA can obtain sewer line easements along property lines to connect the sewers in two adjacent parallel streets. The gravity sewer system layout in Appendix G already shows these two lift station service areas as combined into one at LS-SG7. If FKAA cannot obtain easements, the area can revert to two lift station service areas. Two lift station service areas are still cost-effective for this overall area. The longest sewer length for the combined lift station scenario from last lot to be served to lift station is approximately 1,750 feet. The longest sewer length for the two individual lift station scenarios from last lot to be served to lift station was approximately 1,500 feet.

4.3 Sewer System Alternatives where Gravity Sewers are not Economical

4.3.1 Sparsely Developed Areas

In the very sparsely developed areas where there are developed lots only infrequently, such as the area along North Niles Road on Summerland Key, Onsite Wastewater Nutrient Reduction Systems (OWNRSs) will have to be installed and maintained by the property owner. Individual OWNRSs are expensive to install and to operate and maintain. Installation costs are expected to be on the order of $20,000 to $25,000, and annual operations and maintenance (O&M) costs are expected to be on the order of $3,500 to $4,000 (CH2M HILL, 2003).[1] The present worth of an individual OWNRS is expected to be approximately $66,000.

4.3.2 Marginally Developed Areas

Marginally developed service areas, where development is more developed than in the sparsely developed areas but not dense enough to where gravity sewers are economical, present the greatest challenge of providing the most cost-effective wastewater collection and treatment service that will comply with the FDEP Regulations for Monroe County that become effective in July 2010. An example of marginally developed areas is some of the areas in the western part of Upper Sugarloaf Key.

These marginally developed areas are not dense enough to justify gravity sewers but are developed enough that a less expensive alternative to the expensive OWNRS for each of the developed lots should be investigated. The Low Pressure Sewer System is an alternative that

[1] Capital and O&M costs in this reference have been adjusted to September 2007 costs (Estimated ENR at 7,900).

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APPENDIX #4

Donald Hubbs

From: Ken.Williams@ch2m.com
Sent: Monday, August 04, 2008 2:19 PM
To: Donald Hubbs
Cc: Tom Walker; Andrew.Smyth@ch2m.com
Subject: RE: on-site BAT conversion

Don,

I'm sorry I didn't get back to you sooner, but I just got back from vacation mid last week when when we got a direct hit from lightening. Not only did it blow two power company transformers but we lost our high speed internet connection and a solar heater panel control board. Comcast was out on Saturday (yes, they work on Saturdays up here) and replaced our router and got us back in business with high speed internet.

In Section 4.3.1 of the draft Cudjoe report, footnote 1 indicates that capital and O&M costs were from the CH2M HILL 2003 reference and were adjusted to September 2007 costs (Estimated ENR at 7900). The CH2M HILL 2003 reference is entitled "Monroe County Onsite Decentralized Wastewater System Demonstration Project Feasibility Study", and is noted in Section 6, Works Cited. There should be a copy of this cited report in our Key West office and Monroe County should have a copy of this report.

When we did our work for the 2003 report, we obtained from DOH recently permitted and installed OWNRS facilities and then obtained the costs from contractors installing these systems. Our analysis showed that the costs of the recently installed systems (September 2002 costs) were consistent with those costs estimated in the master plan (September 1998 costs), adjusted for cost escalation (10.5% in the 4 years). This is described in Section 3 of the 2003 report.

The point that was intended to be made in Section 4.3.1 of our draft Cudjoe report is that OWNRS systems are very expensive to install and to operate and maintain. Hence, just escalating costs from 2003, where we had verified actual costs, to 2007 (20% increase) and giving a range of costs we felt was adequate to make our point. Even if the costs for OWNRS had not increased at all from 2003, the present worth of an OWNRS would be approximately $55,000, equivalent to a monthly cost of approximately $400 - still very expensive.

It is good to see that someone is investigating the current costs to install (and also operate and maintain) a private residential OWNRS, or BAT system. I concur that it is needed. The last verification that I am aware of is what we did in 2003, but I'm sure the cost on onsite systems have increased. You note that you have contacted a supplier of such systems and they have given you "verbal unqualified opinions regarding their field experience ; however a better source of information is needed". I don't know what information they gave you, but it sounds like you have reason to doubt the information you were given. My only suggestion is to do what we did in 2003. Get from DOH facilities that were recently permitted and installed and then obtain the installed costs and the costs to operate and maintain the systems from the respective contractors and property owners. There certainly are at least several systems that are approved by DOH. I know from experience that this is a lengthy and time consuming task, but I know of no other way.

Feel free to call me (904-491-3171) to discuss this further if you wish.

Ken

From: Donald Hubbs [mailto:dhubbs@fkaa.com]
Sent: Thursday, July 31, 2008 9:08 AM
To: Williams, Ken/KWF
Cc: Tom Walker; Smyth, Andrew/KWF
Subject: on-site BAT conversion
Importance: High

APPENDIX #5

Table 30 Uniform Annual Cost and Present Worth of Alternatives

SYSTEM ID	STAGE 1		STAGE 2		PASSIVE NITROGEN REMOVAL COMPONENT LIFE CYCLE COST 30 year,i=4%,ENR=3.7%		TOTAL SYSTEM LIFE CYCLE COST 30 year,i=4%,ENR=3.7%	
	Media	Plan Area	Media Volume	Replace	Uniform Annual Cost	Present Worth	Uniform Annual Cost	Present Worth
	Type	ft^2	ft^3	Years	2008 ($)	2008 ($)	2008 ($)	2008 ($)
1	Clino	100	100	15	1,015	17,556	2,463	42,614
2	Clino	100	50	5	1,217	21,061	2,666	46,119
3	Clino	100	11	1	1,279	22,131	2,728	47,189
4	Clay	100	100	15	840	14,526	2,288	39,584
5	Clay	100	50	5	1,042	18,031	2,491	43,089
6	Clay	100	11	1	1,104	19,101	2,552	44,159
7	Clino	75	100	15	945	16,343	2,393	41,401
8	Clino	75	50	5	1,147	19,849	2,596	44,907
9	Clino	75	11	1	1,209	20,919	2,657	45,977
10	Clay	75	100	15	813	14,071	2,262	39,129
11	Clay	75	50	5	1,016	17,576	2,464	42,634
12	Clay	75	11	1	1,078	18,646	2,526	43,704

Notes: Stage 1 Media: Clino: Clinoptilolite AMZ Clay: Livlite Expanded Clay
Stage 2 Media: 3:1 Elemental Sulfur & Oyster Shell
Total System Costs includes base septic tank and drainfield installation

NEW AEROBIC INSTALLATION

PHOSPHORUS REMOVAL PROCESS TANK INSTALLATION

AEROBIC AND PHOSPHORUS REMOVAL TANKAGE
Note extensive footprint, not including drain field

Being filled with LECA (light expanded clay aggregate) media

Ready for phosphorus treatment

Watertight cover being installed.
Effluent will be disposed of by drainfield or borehole
(borehole in this particular case)

DATA SOURCE SUMMARY FOR ON-SITE WASTEWATER NUTRIENT REMOVAL SYSTEMS

DATA SOURCE	INSTALLATION	ANNUAL OPERATING	PRESENT WORTH @ 6%
MASTER PLAN	$24,130	$1,828	$44,786
CUDJOE DESIGN REPORT	$22,500	$3,750	$64,875
FPNRS	$18,101	$2,508	$46,441
LOCAL VENDOR	$19,100	$1,492	$35,956
AVERAGES	$20,958	$2,394	$48,015

Appendix B

FDEP Form 62-604.300(8)(a) "Wastewater Collection/ Transmission System Permit"

Florida Department of Environmental Protection
Twin Towers Office Bldg., 2600 Blair Stone Road, Tallahassee, Florida 32399-2400

NOTIFICATION/APPLICATION FOR CONSTRUCTING A DOMESTIC WASTEWATER COLLECTION/TRANSMISSION SYSTEM

PART I - GENERAL

Subpart A: Permit Application Type

Permit Application Type (mark one only)	EDUs Served	Application Fee*	"X"
Are you applying for an individual permit for a domestic wastewater collection/transmission system? Note: an EDU is equal to 3.5 persons. Criteria for an individual permit are contained in Rule 62-604.600(7), F.A.C.	≥ 10	$500	☐
	< 10	$300	☐
Is this a Notice of Intent to use the general permit for wastewater collection/transmission systems? Criteria for qualifying for a general permit are contained in Rule 62-604.600(6), F.A.C. Projects not meeting the criteria in Rule 62-604.600(6), F.A.C., must apply for an individual permit.	N/A	$250	☐

*Note: Each non-contiguous project (i.e., projects that are not interconnected or are not located on adjacent streets or in the same neighborhood) requires a separate application and fee.

Subpart B: Instructions

(1) This form shall be completed for all domestic wastewater collection/transmission system construction projects as follows:
- If this is a Notice of Intent to use the general permit, this notification shall be submitted to the Department **at least 30 days prior to initiating construction.**
- If this is an application for an individual permit, the permit must be obtained prior to initiating construction.

(2) One copy of the completed form shall be submitted to the appropriate DEP district office or delegated local program along with the appropriate fee, and one copy of the following supporting documents. Checks should be made payable to the Florida Department of Environmental Protection, or the name of the appropriate delegated local program.

- If this is a Notice of Intent to use the general permit, attach a site plan or sketch showing the size and approximate location of new or altered gravity sewers, pump stations and force mains; showing the approximate location of manholes and isolation valves; and showing how the proposed project ties into the existing or proposed wastewater facilities. The site plan or sketch shall be signed and sealed by a professional engineer registered in Florida.
- If this is an application for an individual permit, one set of plans and specifications shall be submitted with this application, or alternatively, an engineering report shall be submitted. Plans and specifications and engineering reports shall be prepared in accordance with the applicable provisions of Chapters 10 and 20 of *Recommended Standards for Wastewater Facilities*. The plans and specifications or engineering report shall be signed and sealed by a Professional Engineer registered in Florida.

(3) All information shall be typed or printed in ink. Where attached sheets (or other technical documentation) are utilized in lieu of the blank spaces provided, indicate appropriate cross-references on the form. For Items (1) through (4) of Part II of this application form, if an item is not applicable to your project, indicate "NA" in the appropriate space provided.

Northwest District
160 Governmental Center
Pensacola, Florida 32502-5794
850-595-8300

Northeast District
7825 Baymeadows Way
Suite 200B
Jacksonville, Florida 32256-7590
904-807-3300

Central District
3319 Maguire Blvd
Suite 232
Orlando, Florida 32803-3767
407-894-7555

Southwest District
3804 Coconut Palm Drive
Tampa, Florida 33619-8318
813-744-6100

South District
2295 Victoria Ave
Suite 364
Fort Myers, Florida 33902-2549
239-332-6975

Southeast District
400 North Congress Ave
Suite 200
West Palm Beach, Florida 33401
561-681-6600

PART II – PROJECT DOCUMENTATION

(1) Collection/Transmission System Permittee

Name _____ Title _____

Company Name _____

Address _____

City _____ State _____ Zip _____

Telephone _____ Fax _____ Email _____

(2) General Project Information

Project Name _____

Location: County _____ City _____ Section _____ Township _____ Range _____

Project Description and Purpose (including pipe length, range of pipe diameter, total number of manholes, and total number of pump stations) _____

Estimated date for: Start of construction _____ Completion of construction _____

Connections to existing system or treatment plant _____

(3) Project Capacity

A = Type of Unit	B = Number of Units	C = Population Per Unit	D = Total Population (Columns B x C)	E = Per Capita Flow	F = Total Average Daily Flow (Columns D x E)	G = Peak hour flow
Single-Family Home						
Mobile Home						
Apartment						
Commercial, Institutional, or Industrial Facility*						
Total						

* Description of commercial, institutional, and industrial facilities and explanation of method used to estimate per capita flow for these facilities:

(4) Pump Station Data (attached additional sheets as necessary)

		Estimated Flow to the Station (GPD)			
Location	Type	Maximum	Average	Minimum	Operating Conditions [GPM @ FT (TDH)]

(5) Collection/Transmission System Design Information

A. This information must be completed for all projects by the applicant's professional engineer, and if applicable, those professional engineers in other disciplines who assisted with the design of the project.

If this project has been designed to comply with the standards and criteria listed below, the engineer shall initial in ink before the standards or criteria. If any of the standards or criteria do not apply to this project or if this project has not been designed to comply with the standards or criteria, mark "X" before the appropriate standard or criteria and provide an explanation, including any applicable rule references, in (5)B. below.

Note, if the project has not been designed in accordance with the standards and criteria set forth in Rules 62-604.400(1) and (2), F.A.C., an application for an individual permit shall be submitted. However, if Rules 62-604.400(1) and (2), F.A.C., specifically allow for another alternative that will result in an equivalent level of reliability and public health protection, the project can be constructed using the general permit.

General Requirements

_____ 1. The project is designed based on an average daily flow of 100 gallons per capita plus wastewater flow from industrial plants and major institutional and commercial facilities unless water use data or other justification is used to better estimate the flow. The design includes an appropriate peaking factor, which covers I/I contributions and non-wastewater connections to those service lines. [RSWF 11.243]

_____ 2. Procedures are specified for operation of the collection/transmission system during construction. [RSWF 20.15]

_____ 3. The project is designed to be located on public right-of-ways, land owned by the permittee, or easements and to be located no closer than 100 feet from a public drinking water supply well and no closer than 75 feet from a private drinking water supply well; or documentation is provided in Part II.(5)B., showing that another alternative will result in an equivalent level of reliability and public health protection. [62-604.400(1)(b) and (c), F.A.C.]

_____ 4. The project is designed with no physical connections between a public or private potable water supply system and a sewer or force main and with no water pipes passing through or coming into contact with any part of a sewer manhole. [RSFW 38.1 and 48.5]

_____ 5. The project is designed to preclude the deliberate introduction of storm water, surface water, groundwater, roof runoff, subsurface drainage, swimming pool drainage, air conditioning system condensate water, non-contact cooling water except as provided by Rule 62-610.668(1), F.A.C., and sources of uncontaminated wastewater, except to augment the supply of reclaimed water in accordance with Rule 62-610.472(3)(c), F.A.C. [62-604.400(1)(d), F.A.C.]

_____ 6. The project is designed so that all new or relocated, buried sewers and force mains, are located in accordance with the separation requirements from water mains and reclaimed water lines of Rules 62-604.400(2)(g)(h) and (i) and (3), F.A.C. Note, if the criteria of Rules 62-604.400(2)(g) 4. or (2)(i) 3., F.A.C., are used, describe in Part II.C. alternative construction features that will be provided to afford a similar level of reliability and public health protection. [62-604.400(2)(g), (h), and (i) and (3), F.A.C.]

Gravity Sewers

_____ 7. The project is designed with no public gravity sewer conveying raw wastewater less than 8 inches in diameter. [RSWF 33.1]

_____ 8. The design considers buoyancy of sewers, and appropriate construction techniques are specified to prevent flotation of the pipe where high groundwater conditions are anticipated. [RSWF 33.3}

_____ 9. All sewers are designed with slopes to give mean velocities, when flowing full, of not less than 2.0 feet per second, based on Manning's formula using an "n" value of 0.013; or if it is not practicable to maintain these minimum slopes and the depth of flow will be 0.3 of the diameter or greater for design average flow, the owner of the system has been notified that additional sewer maintenance will be required. The pipe diameter and slope are selected to obtain the greatest practical velocities to minimize solids deposition problems. Oversized sewers are not specified to justify flatter slopes. [RSWF 33.41, 33.42, and 33.43]

_____ 10. Sewers are designed with uniform slope between manholes. [RWSF 33.44]

_____ 11. Where velocities greater than 15 fps are designed, provisions to protect against displacement by erosion and impact are specified. [RSWF 33.45]

_____ 12. Sewers on 20% slopes or greater are designed to be anchored securely with concrete, or equal, anchors spaced as follows: not over 36 feet center to center on grades 20% and up to 35%; not over 24 feet center to center on grades 35% and up to 50%; and not over 16 feet center to center on grades 50% and over. [RSWF 33.46]

13. Sewers 24 inches or less are designed with straight alignment between manholes. Where curvilinear sewers are proposed for sewers greater than 24 inches, the design specifies compression joints; ASTM or specific pipe manufacturer's maximum allowable pipe joint deflection limits are not exceeded; and curvilinear sewers are limited to simple curves which start and end at manholes. [RSWF 33.5]

14. Suitable couplings complying with ASTM specifications are required for joining dissimilar materials. [RSWF 33.7]

15. Sewers are designed to prevent damage from superimposed loads. [RSWF 33.7]

16. Appropriate specifications for the pipe and methods of bedding and backfilling are provided so as not to damage the pipe or its joints, impede cleaning operations and future tapping, nor create excessive side fill pressures and ovalation of the pipe, nor seriously impair flow capacity. [RSWF 33.81]

17. Appropriate deflection tests are specified for all flexible pipe. Testing is required after the final backfill has been in place at least 30 days to permit stabilization of the soil-pipe system. Testing requirements specify: 1) no pipe shall exceed a deflection of 5%; 2) using a rigid ball or mandrel for the deflection test with a diameter not less than 95% of the base inside diameter or average inside diameter of the pipe, depending on which is specified in the ASTM specification, including the appendix, to which the pipe is manufactured; and 3) performing the test without mechanical pulling devices. [RSWF 33.85]

18. Leakage tests are specified requiring that: 1) the leakage exfiltration or infiltration does not exceed 200 gallons per inch of pipe diameter per mile per day for any section of the system; 2) exfiltration or infiltration tests be performed with a minimum positive head of 2 feet; and 3) air tests, as a minimum, conform to the test procedure described in ASTM C-828 for clay pipe, ASTM C 924 for concrete pipe, ASTM F-1417 for plastic pipe, and for other materials appropriate test procedures. [RSWF 33.93, 33.94, and 33.95]

19. If an inverted siphon is proposed, documentation of its need is provided in Part II.C. Inverted siphons are designed with: 1) at least two barrels; 2) a minimum pipe size of 6 inches; 3) necessary appurtenances for maintenance, convenient flushing, and cleaning equipment; and 4) inlet and discharge structures having adequate clearances for cleaning equipment, inspection, and flushing. Design provides sufficient head and appropriate pipe sizes to secure velocities of at least 3.0 fps for design average flows. The inlet and outlet are designed so that the design average flow may be diverted to one barrel, and that either barrel may be cut out of service for cleaning. [RSWF 35]

Manholes

20. The project is designed with manholes at the end of each line; at all changes in grade, size, or alignment; at all intersections; and at distances not greater than 400 feet for sewers 15 inches or less and 500 feet for sewers 18 inches to 30 inches, except in the case where adequate modern cleaning equipment is available at distances not greater than 600 feet. [RSWF 34.1]

21. Design requires drop pipes to be provided for sewers entering manholes at elevations of 24 inches or more above the manhole invert. Where the difference in elevation between the incoming sewer and the manhole invert is less than 24 inches, the invert is designed with a fillet to prevent solids deposition. Inside drop connections (when necessary) are designed to be secured to the interior wall of the manhole and provide access for cleaning. Design requires the entire outside drop connection be encased in concrete. [RSWF 34.2]

22. Manholes are designed with a minimum diameter of 48 inches and a minimum access diameter of 22 inches. [RSWF 34.3]

23. Design requires that a bench be provided on each side of any manhole channel when the pipe diameter(s) are less than the manhole diameter and that no lateral sewer, service connection, or drop manhole pipe discharges onto the surface of the bench. [RSWF 34.5]

24. Design requires: 1) manhole lift holes and grade adjustment rings be sealed with non-shrinking mortar or other appropriate material; 2) inlet and outlet pipes be joined to the manhole with a gasketed flexible watertight connection or another watertight connection arrangement that allows differential settlement of the pipe and manhole wall; and 3) watertight manhole covers be used wherever the manhole tops may be flooded by street runoff or high water. [RSWF 34.6]

25. Manhole inspection and testing for watertightness or damage prior to placing into service are specified. Air testing, if specified for concrete sewer manholes, conforms to the test procedures described in ASTM C-1244. [RSWF 34.7]

26. Electrical equipment specified for use in manholes is consistent with Item 46 of this checklist. [RSWF 34.9]

Stream Crossings

_____ 27. Sewers and force mains entering or crossing streams are designed to be constructed of ductile iron pipe with mechanical joints or so they will remain watertight and free from changes in alignment or grade. Appropriate materials which will not readily erode, cause siltation, damage pipe during placement, or corrode the pipe are specified to backfill the trench. [RSWF 36.21 and 48.5]

_____ 28. Stream crossings are designed to incorporate valves or other flow regulating devices (which may include pump stations) on the shoreline or at such distances form the shoreline to prevent discharge in the event the line is damaged. [62-604.400(2)(k)5., F.A.C.]

_____ 29. Sewers and force mains entering or crossing streams are designed at a sufficient depth below the natural bottom of the stream bed to protect the line. At a minimum, the project is designed with subaqueous lines to be buried at least three feet below the design or actual bottom, whichever is deeper, of a canal and other dredged waterway or the natural bottom of streams, rivers, estuaries, bays, and other natural water bodies; or if it is not practicable to design the project with less than three-foot minimum cover, alternative construction features (e.g. a concrete cap, sleeve, or some other properly engineered device to insure adequate protection of the line) are described in Part II.C. [62-604.400(2)(k)1., F.A.C., and RSWF 36.11]

_____ 30. Specifications require permanent warning signs be placed on the banks of canals, streams, and rivers clearly identifying the nature and location (including depths below design or natural bottom) of subaqueous crossings and suitably fixed signs be placed at the shore, for subaqueous crossings of lakes, bays, and other large bodies of water, and in any area where anchoring is normally expected. [62-604.400(2)(k)2., F.A.C.]

_____ 31. Provisions for testing the integrity of subaqueous lines are specified. [62-604.400(2)(k)4., F.A.C.]

_____ 32. Supports are designed for all joints in pipes utilized for aerial crossings and to prevent overturning and settlement. Expansion jointing is specified between above ground and below ground sewers and force mains. The design considers the impact of floodwaters and debris. [RSWF 37 and 48.5]

_____ 33. Aerial crossings are designed to maintain existing or required navigational capabilities within the waterway and to reserve riparian rights of adjacent property owners. [62-604.400(2)(k)3., F.A.C.]

Pump Stations

_____ 34. In areas with high water tables, pump stations are designed to withstand flotation forces when empty. When siting the pump station, the design considers the potential for damage or interruption of operation because of flooding. Pump station structures and electrical and mechanical equipment are designed to be protected from physical damage by the 100-year flood. Pump stations are designed to remain fully operational and accessible during the 25-year flood unless lesser flood levels are appropriate based on local considerations, but not less than the 10-year flood. [62-604.400(2)(e), F.A.C.]

_____ 35. Pump stations are designed to be readily accessible by maintenance vehicles during all weather conditions. [RSWF 41.2]

_____ 36. Wet well and pump station piping is designed to avoid operational problems from the accumulation of grit. [RSWF 41.3]

_____ 37. Dry wells, including their superstructure, are designed to be completely separated from the wet well. Common walls are designed to be gas tight. [RSWF 42.21]

_____ 38. The design includes provisions to facilitate removing pumps, motors, and other mechanical and electrical equipment. [RSWF 42.22]

____ 39. The design includes provisions for: 1) suitable and safe means of access for persons wearing self-contained breathing apparatus are provided to dry wells, and to wet wells; 2) stairway access to wet wells more than 4 feet deep containing either bar screens or mechanical equipment requiring inspection or maintenance; 3) for built-in-place pump stations, a stairway to the dry well with rest landings at vertical intervals not to exceed 12 feet; 4) for factory-built pump stations over 15 feet deep, a rigidly fixed landing at vertical intervals not to exceed 10 feet unless a manlift or elevator is provided; and 5) where a landing is used, a suitable and rigidly fixed barrier to prevent an individual from falling past the intermediate landing to a lower level. If a manlift or elevator is provided, emergency access is included in the design. [RSWF 42.23]

____ 40. Specified construction materials are appropriate under conditions of exposure to hydrogen sulfide and other corrosive gases, greases, oils, and other constituents frequently present in wastewater. [RSWF 42.25]

____ 41. Except for low-pressure grinder or STEP systems, multiple pumps are specified, and each pump has an individual intake. Where only two units are specified, they are of the same size. Specified units have capacity such that, with any unit out of service, the remaining units will have capacity to handle the design peak hourly flow. [RSWF 42.31 and 42.36]

____ 42. Bar racks are specified for pumps handling wastewater from 30 inch or larger diameter sewers. Where a bar rack is specified, a mechanical hoist is also provided. The design includes provisions for appropriate protection from clogging for small pump stations. [RSWF 42.322]

____ 43. Pumps handling raw wastewater are designed to pass spheres of at least 3 inches in diameter. Pump suction and discharge openings are designed to be at least 4 inches in diameter. [RSWF 42.33] (Note, this provision is not applicable to grinder pumps.)

____ 44. The design requires pumps be placed such that under normal operating conditions they will operate under a positive suction head, unless pumps are suction-lift pumps. [RSWF 42.34]

____ 45. The design requires: 1) pump stations be protected from lightning and transient voltage surges; and 2) pump stations be equipped with lighting arrestors, surge capacitors, or other similar protection devices and phase protection. Note, pump stations serving a single building are not required to provide surge protection devices if not necessary to protect the pump station. [62-604.400(2)(b), F.A.C.]

____ 46. The design requires 1) electrical systems and components (e.g., motors, lights, cables, conduits, switch boxes, control circuits, etc.) in raw wastewater wet wells, or in enclosed or partially enclosed spaces where hazardous concentrations of flammable gases or vapors may be present, comply with the National Electrical Code requirements for Class I Group D, Division 1 locations; 2) electrical equipment located in wet wells be suitable for use under corrosive conditions; 3) each flexible cable be provided with a watertight seal and separate strain relief; 4) a fused disconnect switch located above ground be provided for the main power feed for all pump stations; 5) electrical equipment exposed to weather to meet the requirements of weatherproof equipment NEMA 3R or 4; 6) a 110 volt power receptacle to facilitate maintenance be provided inside the control panel for pump stations that have control panels outdoors; and 7) ground fault interruption protection be provided for all outdoor outlets. [RSWF 42.35]

____ 47. The design requires a sump pump equipped with dual check valves be provided in dry wells to remove leakage or drainage with discharge above the maximum high water level of the wet well. [RSWF 42.37]

____ 48. Pump station design capacities are based on the peak hourly flow and are adequate to maintain a minimum velocity of 2 feet per second in the force main. [RSWF 42.38]

____ 49. The design includes provisions to automatically alternate the pumps in use. [RSWF 42.4]

____ 50. The design requires: 1) suitable shutoff valves be placed on the suction line of dry pit pumps; 2) suitable shutoff and check valves be placed on the discharge line of each pump (except on screw pumps); 3) a check valve be located between the shutoff valve and the pump; 4) check valves be suitable for the material being handled; 5) check valves be placed on the horizontal portion of discharge piping (except for ball checks, which may be placed in the vertical run); 6) all valves be capable of withstanding normal pressure and water hammer; and 7) all shutoff and check valves be operable from the floor level and accessible for maintenance. [RSWF 42.5]

____ 51. The effective volume of wet wells is based on design average flows and a filling time not to exceed 30 minutes unless the facility is designed to provide flow equalization. The pump manufacturer's duty cycle recommendations were utilized in selecting the minimum cycle time. [RSWF 42.62]

____ 52. The design requires wet well floors have a minimum slope of 1 to 1 to the hopper bottom and the horizontal area of hopper bottoms be no greater than necessary for proper installation and function of the inlet. [RSWF 42.63]

____ 53. For covered wet wells, the design provides for air displacement to the atmosphere, such as an inverted "j" tube or other means. [RSWF 42.64]

____ 54. The design provides for adequate ventilation all pump stations; mechanical ventilation where the dry well is below the ground surface; permanently installed ventilation if screens or mechanical equipment requiring maintenance or inspection are located in the wet well. Pump stations are designed with no interconnection between the wet well and dry well ventilation systems. [RSWF 42.71]

____ 55. The design requires all intermittently operated ventilation equipment to be interconnected with the respective pit lighting system and the manual lighting/ventilation switch to override the automatic controls. [RSWF 42.73]

____ 56. The design requires the fan wheels of ventilation systems be fabricated from non-sparking material and automatic heating and dehumidification equipment be provided in all dry wells. [RSWF 42.74]

____ 57. If wet well ventilation is continuous, design provides for at least 12 complete 100% fresh air changes per hour; if wet well ventilation is intermittent, design provides for at least 30 complete 100% fresh air changes per hour; and design requires air to be forced into wet wells by mechanical means rather than solely exhausted from the wet well. [RSWF 42.75]

____ 58. If dry well ventilation is continuous, design provides at least 6 complete 100% fresh air changes per hour; and dry well ventilation is intermittent, design provides for at least 30 complete 100% fresh air changes per hour, unless a system of two speed ventilation with an initial ventilation rate of 30 changes per hour for 10 minutes and automatic switch over to 6 changes per hour is used to conserve heat. [RSWF 42.76]

____ 59. Pump stations are designed and located on the site to minimize adverse effects from odors, noise, and lighting. [62-604.400(2)(c), F.A.C.]

____ 60. The design requires pump stations be enclosed with a fence or otherwise designed with appropriate features to discourage the entry of animals and unauthorized persons. Posting of an unobstructed sign made of durable weather resistant material at a location visible to the public with a telephone number for a point of contact in case of emergency is specified. [62-604.400(2)(d), F.A.C.]

____ 61. The design requires suitable devices for measuring wastewater flow at all pump stations. Indicating, totalizing, and recording flow measurement are specified for pump stations with a 1200 gpm or greater design peak flow. [RSWF 42.8]

____ 62. The project is designed with no physical connections between any potable water supplies and pump stations. If a potable water supply is brought to a station, reduced-pressure principle backflow-prevention assemblies are specified. [RSWF 42.9 and 62-555.30(4), F.A.C.]

Additional Items to be Completed for Suction-Lift Pump Stations

____ 63. The design requires all suction-lift pumps to be either self-priming or vacuum-priming and the combined total of dynamic suction-lift at the "pump off" elevation and required net positive suction head at design operating conditions not to exceed 22 feet. For self-priming pumps, the design requires: 1) pumps be capable of rapid priming and repriming at the "lead pump on" elevation with self-priming and repriming accomplished automatically under design operating conditions; 2) suction piping not to exceed the size of the pump suction or 25 feet in total length; and 3) priming lift at the "lead pump on" elevation to include a safety factor of at least 4 feet from the maximum allowable priming lift for the specific equipment at design operating conditions. For vacuum-priming pump stations, the design requires dual vacuum pumps capable of automatically and completely removing air from the suction-lift pumps and the vacuum pumps be adequately protected from damage due to wastewater. [RSWF 43.1]

____ 64. The design requires: 1) suction-lift pump equipment compartments to be above grade or offset and to be effectively isolated from the wet well to prevent a hazardous and corrosive sewer atmosphere from entering the equipment compartment; 2) wet well access not to be through the equipment compartment and to be at least 24 inches in diameter; 3) gasketed replacement plates be provided to cover the opening to the wet well for pump units to be remove for service; and 4) no valving be located in the wet well. [RSWF 43.2]

Additional Items to be Completed for Submersible Pump Stations

____ 65. Submersible pumps and motors are designed specifically for raw wastewater use, including totally submerged operation during a portion of each pump cycle and to meet the requirements of the National Electrical Code for such units. Provisions for detecting shaft seal failure or potential seal failure are included in the design. [RSWF 44.1]

____ 66. The design requires submersible pumps be readily removable and replaceable without dewatering the wet well or disconnecting any piping in the wet well. [RSWF 44.2]

____ 67. In submersible pump stations, electrical supply, control, and alarm circuits are designed to provide strain relief; to allow disconnection from outside the wet well; and to protect terminals and connectors from corrosion by location outside the wet well or through use of watertight seals. [RSWF 44.31]

____ 68. In submersible pump stations, the design requires the motor control center to be located outside the wet well, readily accessible, and protected by a conduit seal or other appropriate measures meeting the requirements of the National Electrical Code, to prevent the atmosphere of the wet well from gaining access to the control center. If a seal is specified, the motor can be removed and electrically disconnected without disturbing the seal. The design requires control equipment exposed to weather to meet the requirements of weatherproof equipment NEMA 3R or 4. [RSWF 44.32]

____ 69. In submersible pump stations, the design requires: 1) pump motor power cords be flexible and serviceable under conditions of extra hard usage and to meet the requirements of the National Electrical Code standards for flexible cords in wastewater pump stations; 2) ground fault interruption protection be used to de-energize the circuit in the event of any failure in the electrical integrity of the cable; and 3) power cord terminal fittings be corrosion-resistant and constructed in a manner to prevent the entry of moisture into the cable, provided with strain relief appurtenances, and designed to facilitate field connecting. [RSWF 44.33]

____ 70. In submersible pump stations, the design requires all shut-off and check valves be located in a separate valve pit. Provisions to remove or drain accumulated water from the valve pit are included in the design. [RSWF 44.4]

Emergency Operations for Pump Stations

____ 71. Pump stations are designed with an alarm system which activates in cases of power failure, sump pump failure, pump failure, unauthorized entry, or any cause of pump station malfunction. Pump station alarms are designed to be telemetered to a facility that is manned 24 hours a day. If such a facility is not available and a 24-hour holding capacity is not provided, the alarm is designed to be telemetered to utility offices during normal working hours and to the home of the responsible person(s) in charge of the lift station during off-duty hours. Note, if an audio-visual alarm system with a self-contained power supply is provided in lieu of a telemetered system, documentation is provided in Part II.C. showing an equivalent level of reliability and public health protection. [RSWF 45]

____ 72. The design requires emergency pumping capability be provided for all pump stations. For pump stations that receive flow from one or more pump stations through a force main or pump stations discharging through pipes 12 inches or larger, the design requires uninterrupted pumping capability be provided, including an in-place emergency generator. Where portable pumping and/or generating equipment or manual transfer is used, the design includes sufficient storage capacity with an alarm system to allow time for detection of pump station failure and transportation and connection of emergency equipment. [62-604.400(2)(a)1. and 2., F.A.C., and RSWF 46.423 and 46.433]

____ 73. The design requires: 1) emergency standby systems to have sufficient capacity to start up and maintain the total rated running capacity of the station, including lighting, ventilation, and other auxiliary equipment necessary for safety and proper operation; 2) special sequencing controls be provided to start pump motors unless the generating equipment has capacity to start all pumps simultaneously with auxiliary equipment operating; 3) a riser from the force main with rapid connection capabilities and appropriate valving be provided for all pump stations to hook up portable pumps; and 4) all pump station reliability design features be compatible with the available temporary service power generating and pumping equipment of the authority responsible for operation and maintenance of the collection/transmission system. [62-604.400(2)(a)3., F.A.C., and RSWF 46.431]

____ 74. The design provides for emergency equipment to be protected from operation conditions that would result in damage to the equipment and from damage at the restoration of regular electrical power. [RSWF 46.411, 46.417, and 46.432]

____ 75. For permanently-installed internal combustion engines, underground fuel storage and piping facilities are designed in accordance with applicable state and federal regulations; and the design requires engines to be located above grade with adequate ventilation of fuel vapors and exhaust gases. [RSWF 46.414 and 46.415]

____ 76. For permanently-installed or portable engine-driven pumps are used, the design includes provisions for manual start-up. [RSWF 46.422]

____ 77. Where independent substations are used for emergency power, each separate substation and its associated transmission lines is designed to be capable of starting and operating the pump station at its rated capacity. [RSWF 46.44]

Force Mains

____ 78. Force mains are designed to maintain, at design pumping rates, a cleansing velocity of at least 2 feet per second. The minimum force main diameter specified for raw wastewater is not less than 4 inches. [RSWF 48.1]

____ 79. The design requires: 1) branches of intersecting force mains be provided with appropriate valves such that one branch may be shut down for maintenance and repair without interrupting the flow of other branches; and 2) stubouts on force mains, placed in anticipation of future connections, be equipped with a valve to allow such connection without interruption of service. [62-604.400(2)(f), F.A.C.]

____ 80. The design requires air relief valves be placed at high points in the force main to prevent air locking. [RSWF 48.2]

____ 81. Specified force main pipe and joints are equal to water main strength materials suitable for design conditions. The force main, reaction blocking, and station piping are designed to withstand water hammer pressures and stresses associated with the cycling of wastewater pump stations. [RSWF 48.4]

____ 82. When the Hazen and Williams formula is used to calculate friction losses through force mains, the value for "C" is 100 for unlined iron or steel pipe for design. For other smooth pipe materials, such as PVC, polyethylene, lined ductile iron, the value for C does not exceed 120 for design. [RSWF 48.61]

____ 83. Where force mains are constructed of material, which might cause the force main to be confused with potable water mains, specifications require the force main to be clearly identified. [RSWF 48.7]

____ 84. Leakage tests for force mains are specified including testing methods and leakage limits. [RSWF 48.8]

*RSWF = *Recommended Standards for Wastewater Facilities* (1997) as adopted by rule 62-604.300(5)(c), F.A.C.

B. Explanation for Requirements or Standards Marked "X" in II(5)A. Above (Attach additional sheets if necessary):

_____

_____

_____

_____

_____

PART III - CERTIFICATIONS

(1) Collection/Transmission System Permittee

I, the undersigned owner or authorized representative* of _____
am fully aware that the statements made in this application for a construction permit are true, correct and complete to the best of my knowledge and belief. I agree to retain the design engineer or another professional engineer registered in Florida, to conduct on-site observation of construction, to prepare a certification of completion of construction, and to review record drawings for adequacy. Further, I agree to provide an appropriate operation and maintenance manual for the facilities pursuant to Rule 62-604.500(4), F.A.C., and to retain a professional engineer registered in Florida to examine (or to prepare if desired) the manual. I am fully aware that Department approval must be obtained before this project is placed into service for any purpose other than testing for leaks and testing equipment operation.

Signed _____ Date _____

Name _____ Title _____

**Attach a letter of authorization.*

(2) Owner of Collection/Transmission System

I, the undersigned owner or authorized representative* of _____ certify that we will be the Owner of this project after it is placed into service. I agree that we will operate and maintain this project in a manner that will comply with applicable Department rules. Also I agree that we will promptly notify the Department if we sell or legally transfer ownership of this project.

Signed _____ Date _____
Name _____ Title _____
Company Name _____
Address _____
City _____ State _____ Zip _____
Telephone _____ Fax _____ Email _____
** Attach a letter of authorization.*

(3) Wastewater Facility Serving Collection/Transmission System**

If this is a Notice of Intent to use a general permit, check here:

☐ The undersigned owner or authorized representative* of the _____ wastewater facility hereby certifies that the above referenced facility has the capacity to receive the wastewater generated by the proposed collection system; is in compliance with the capacity analysis report requirements of Rule 62-600.405, F.A.C.; is not under a Department order associated with effluent violations or the ability to treat wastewater adequately; and will provide the necessary treatment and disposal as required by Chapter 403, F.S., and applicable Department rules.

If this is an application for an individual permit, check one:

☐ The undersigned owner or authorized representative* of the _____ wastewater facility hereby certifies that the above referenced facility has and will have adequate reserve capacity to accept the flow from this project and will provide the necessary treatment and disposal as required by Chapter 403, F.S., and applicable Department rules.

☐ The undersigned owner or authorized representative* of the _____ wastewater facility hereby certifies that the above referenced facility currently does not have, but will have prior to placing the proposed project into operation, adequate reserve capacity to accept the flow from this project and will provide the necessary treatment and disposal as required by Chapter 403, F.S., and applicable Department rules.

Name of Treatment Plant Serving Project _____
County _____ City _____
DEP permit number FL _____ Expiration Date _____
Maximum monthly average daily flow over the last 12 month period _____ MGD Month(s) used _____
Maximum three-month average daily flow over the last 12 month period _____ MGD Month(s) used _____
Current permitted capacity _____ MGD ☐AADF ☐MADF ☐TMADF
Current outstanding flow commitments (including this project) against treatment plant capacity: _____

Signed _____ Date _____
Name _____ Title _____
Address _____
City _____ State _____ Zip _____
Telephone _____ Fax _____ Email _____
** Attach a letter of authorization.*
*** If there is an intermediate collection system, a letter shall be attached certifying that the intermediate downstream collection system has adequate reserve capacity to accept the flow from this project.*

(4) Professional Engineer Registered in Florida

I, the undersigned professional engineer registered in Florida, certify that I am in responsible charge of the preparation and production of engineering documents for this project; that plans and specifications for this project have been completed; that I have expertise in the design of wastewater collection/transmission systems; and that, to the best of my knowledge and belief, the engineering design for this project complies with the requirements of Chapter 62-604, F.A.C.

(Affix Seal)

Signed _____
Date _____

Name _____ Florida Registration No. _____
Company Name _____
Address _____
City _____ State _____ Zip _____
Telephone _____ Fax _____ Email _____
Portion of Project for Which Responsible _____

(Affix Seal)

Signed _____
Date _____

Name _____ Florida Registration No. _____
Company Name _____
Address _____
City _____ State _____ Zip _____
Telephone _____ Fax _____ Email _____
Portion of Project for Which Responsible _____

(Affix Seal)

Signed _____
Date _____

Name _____ Florida Registration No. _____
Company Name _____
Address _____
City _____ State _____ Zip _____
Telephone _____ Fax _____ Email _____
Portion of Project for Which Responsible _____

Appendix C

DEP Rule Chapter 62-604, F.A.C. "Collection Systems and Transmission Facilities"

CHAPTER 62-604 COLLECTION SYSTEMS AND TRANSMISSION FACILITIES

62-604.100 Scope, Intent, Purpose, and Applicability.
62-604.110 Applicability. (Repealed)
62-604.120 Variations from Requirements.
62-604.130 Prohibitions.
62-604.200 Definitions.
62-604.300 General Technical Guidance, Related Rules, and Forms.
62-604.400 Design/Performance Considerations.
62-604.410 Low Pressure Sewer Systems. (Repealed)
62-604.420 Reuse Distribution Systems. (Repealed)
62-604.500 Operation and Maintenance.
62-604.550 Abnormal Events.
62-604.600 Procedure to Obtain Construction Permits.
62-604.700 Placing Collection/Transmission Systems into Operation.
62-604.900 Forms and Instructions. (Repealed)

62-604.100 Scope, Intent, Purpose, and Applicability.

(1) Section 403.021(2), Florida Statutes, as amended, the Florida Air and Water Pollution Control Act, established that no wastes are to be discharged to any waters of the state without first being given the degree of the treatment necessary to protect the beneficial uses of such water. Section 403.051(2)(a), Florida Statutes, mandates that any Department planning, design, construction, modification or operating standards, criteria, and requirements for wastewater collection/transmission be developed as a rule or regulation. This rule is promulgated to implement the provisions and requirements of Sections 403.051, 403.085, 403.086, 403.087, 403.088, Florida Statutes, concerning wastewater collection/transmission systems.

(2) It is the policy of the Department to encourage an applicant, prior to submittal of a permit application, to study and evaluate alternative techniques and to discuss alternatives with the Department.

(a) The Department encourages inclusion of relevant public health, economic, scientific, energy, engineering and environmental considerations in such evaluations.

(b) The Department encourages environmentally acceptable alternatives which provide the most economic and energy efficient methods of complying with the requirements of this rule.

(3) The Commission, recognizing the complexity of water quality management and the necessity to temper regulatory actions with the realities of technological progress and social and economic well-being, nevertheless, intends to prohibit any discharge of pollution that constitutes a hazard to human health.

(4) These rules shall be liberally construed to assure that all waters of the state shall be free from components of wastewater discharges which, alone or in combination with other substances, are acutely toxic; are present in concentrations which are carcinogenic, mutagenic, or teratogenic to humans, animals, or aquatic species; or otherwise pose a serious threat to the public health, safety, and welfare.

(5) The requirements of this rule represent the specific requirements of the Florida Department of Environmental Protection and of Local Pollution Control Programs approved and established pursuant to Section 403.182, Florida Statutes, where such authority has been delegated to those programs. It may be necessary for wastewater facilities to conform with requirements of other agencies, established via interagency agreements (e.g., for mosquito control); the absence of reference to such arrangements in this chapter does not negate the need for compliance with those requirements.

(6) Pursuant to Section 403.1815, Florida Statutes, the Department may authorize a county or municipality to independently regulate the construction of gravity sewage collection systems of 12 inches or less in diameter, sewage force mains of 12 inches or less in diameter, and pump stations appurtenant to such force mains, provided the treatment plant is owned by the county or municipality making the request for approval or, pursuant to local agreement, plant capacity is provided from a plant owned by another county or municipality. Such authorization does not negate the necessity for complying with the applicable design standards contained in this rule.

(7) The purpose of Chapter 62-604, F.A.C., is to provide minimum design and operation and maintenance standards for domestic wastewater collection/transmission systems. Systems shall be designed in accordance with sound engineering practice. Supported by moderating provisions, it is intended that Chapter 62-604, F.A.C., establish a framework whereby design flexibility and sound engineering practice can be used in developing systems with which to collect and transport domestic wastewater in an environmentally sound manner.

(8) As appropriate, Chapter 62-604, F.A.C., shall be used in conjunction with other Department rules relating to the design and operation and maintenance of domestic wastewater collection/transmission systems.

(9) Requirements in this rule shall apply to both public and private domestic wastewater collection/transmission systems.

(10) Requirements for design and construction of reclaimed water distribution systems are included in Chapter 62-610, F.A.C.

(11) This rule provides for exemptions, allowances and variations from requirements. Unless specifically provided otherwise, requirements in this rule shall be applicable only to new domestic wastewater collection/transmission facilities for which construction permit applications are approved by the Department after November 6, 2003. This rule also shall apply to all facilities existing prior to November 6, 2003, when such facilities are to be modified, but such applicability shall apply only to the modification thereof.

(12) Specific activities required to obtain a permit are outlined in Rule 62-604.600, F.A.C.

(13) Individual service connections from single family residences are not required to be permitted by the Department.

Specific Authority 403.061, 403.087 FS. Law Implemented 403.021, 403.061, 403.062, 403.085, 403.086, 403.087, 403.088 FS. History–New 11-27-89, Amended 6-4-92, Formerly 17-604.100, Amended 12-26-96, 11-6-03.

62-604.120 Variations from Requirements.

Additional relief from the criteria established by this rule may be provided through an exemption, pursuant to Rule 62-4.243, F.A.C., or a variance, pursuant to Rule 62-110.104, F.A.C.

Specific Authority 403.061, 403.087 FS. Law Implemented 403.021, 403.061, 403.062, 403.085, 403.086, 403.087, 403.088 FS. History–New 11-27-89, Formerly 17-604.120, Amended 12-26-96, 11-6-03.

62-604.130 Prohibitions.

The following acts and the causing thereof are prohibited.

(1) The release or disposal of excreta, sewage, or other wastewaters or residuals without providing proper treatment approved by the Department; construction or operation of a wastewater collection system not in compliance with this rule; or any act otherwise violating provisions of this rule or of any other rules of the Department.

(2) Violations of the odor prohibition in subsection 62-296.320(2), F.A.C.

(3) Cross-connection, as defined in Rule 62-550.200, F.A.C.

(4) Except to augment the supply of reclaimed water when all conditions of paragraph 62-610.472(3)(c), F.A.C., are met, the deliberate introduction of stormwater in any amount into collection/transmission systems designed solely for the introduction (and conveyance) of domestic/industrial wastewater and/or the deliberate introduction of stormwater into collection/transmission systems designed for the introduction or conveyance of combinations of storm and domestic/industrial wastewater in amounts which may reduce the efficiency of pollutant removal by the treatment plant.

(5) The acceptance, by the operating authority of a collection/transmission system or by the permittee of a treatment plant, of connections of wastewater discharges which have not received necessary pretreatment or which contain materials or pollutants (other than domestic wastewater constituents):

(a) Which may cause fire or explosion hazards; or

(b) Which may cause excessive corrosion or other deterioration of wastewater facilities due to chemical action or pH levels; or

(c) Which are solid or viscous and obstruct flow or otherwise interfere with wastewater facility operations or treatment; or

(d) Which result in the wastewater temperature at the introduction of the treatment plant exceeding 40°C or otherwise inhibiting treatment; or

(e) Which result in the presence of toxic gases, vapors, or fumes that may cause worker health and safety problems.

(6) The failure to maintain equipment in a condition which will enable the intended function.

(7) The submission, by the owner, manager, or operator of a collection/transmission system, or agent or employee thereof, of misleading, false, or inaccurate information to the Department, either knowingly or through neglect.

Specific Authority 403.061, 403.087 FS. Law Implemented 403.021, 403.061, 403.062, 403.085, 403.086, 403.087, 403.088, 403.121, 403.131, 403.161 FS. History–New 11-27-89, Formerly 17-604.130, Amended 12-26-96, 11-6-03.

62-604.200 Definitions.

Terms used in this rule shall have the meaning specified below. The meaning of any term not defined below may be taken from definitions in other rules of the Department, unless such meaning would defeat the purposes or intent of Chapter 62-604, F.A.C.

(1) "Alternative collection/transmission systems" means those systems referenced in paragraphs 62-604.300(5)(b), (c), and (j), F.A.C., or other collection/transmission systems not comprised of strictly conventional gravity sewers, pump stations, and force mains.

(2) "Collection/transmission systems" means sewers, pipelines, conduits, pumping stations, force mains, and all other facilities used for collection and transmission of wastewater from individual service connections to facilities intended for the purpose of providing treatment prior to release to the environment.

(3) "Commission" means the Environmental Regulation Commission.

(4) "Delegated local program" means any county, municipality, or combination thereof that has established and administers a pollution control program approved by the Department in compliance with Section 403.182, F.S., as amended.

(5) "Department" means the State of Florida Department of Environmental Protection, or delegated local program, where applicable.

(6) "District office" means the regional district offices of the Department.

(7) "Domestic wastewater" means wastewater derived principally from dwellings, business buildings, institutions, and the like, commonly referred to as sanitary wastewater or sewage. When industrial wastewater is combined with domestic wastewater for treatment, determination of whether the treatment plant is designated as domestic shall be in accordance with the definition of domestic wastewater provided in Rule 62-600.200, F.A.C.

(8) "Individual service connection" means the sewer which connects the point(s) at which wastewater leaves a building which is its source and the point at which it enters a collection system.

(9) "Modification" means any alteration, expansion, upgrade, extension, replacement of, or addition to an existing wastewater facility or activity.

(10) "Permittee" means the owner, operator or other entity to which a permit for a wastewater facility or activity is issued by the Department. The term "permittee" shall be functionally synonymous with the terms "owner", "contractor", or "licensee", but shall not include licensed individuals, such as State certified operators, unless they are the persons to whom a facility permit is issued by the Department. The term shall extend to a permit "applicant" for purposes of this chapter.

(11) "Pollution" is as defined in Section 403.031, F.S.

(12) "Pretreatment" means the reduction of the amount of pollutants, the elimination of pollutants, or the alteration of the nature of pollutant properties in wastewater prior to, or in lieu of, introducing such pollutants into the treatment facility. This reduction or alteration can be obtained by physical, chemical, or biological processes; by process changes; or by other means, except by diluting the concentration of the pollutants unless allowed by an applicable pretreatment standard.

(13) "Private drinking water supply well" means a well serving a private or multifamily water system as defined in Rule 62-532.200, F.A.C.

(14)"Public drinking water supply well" means a well serving a public water system as defined in Rule 62-550.200, F.A.C.

(15) "Secretary" means the Secretary of the Department of Environmental Protection.

(16) "Treatment" means any method, technique, or process which changes the physical, chemical, or biological character or composition of wastewater and thereby reduces its potential for polluting waters of the state.

(17) "Treatment plant" means any plant or other works used for the purpose of treating, stabilizing, or holding wastes.

(18) "Wastes" means sewage, industrial wastes, and all other liquid, gaseous, solid, radioactive, or other substances which may pollute or tend to pollute any waters of the State.

(19) "Wastewater" means the combination of liquid and water-carried pollutants from residences, commercial buildings, industrial plants, and institutions together with any groundwater, surface runoff or leachate that may be present.

(20) "Wastewater facility" or "facility" means any facility which discharges wastes into waters of the State or which can reasonably be expected to be a source of water pollution and includes any or all of the following: the collection and transmission system, the wastewater treatment works, the reuse or disposal system, and the residuals management facility.

(21) "Waters" shall be as defined in Section 403.031, Florida Statutes.

Specific Authority 403.061, 403.087 FS. Law Implemented 403.021, 403.061, 403.062, 403.085, 403.086, 403.087, 403.088 FS. History–New 11-27-89, Amended 6-4-92, Formerly 17-604.200, Amended 12-26-96, 11-6-03.

62-604.300 General Technical Guidance, Related Rules, and Forms.

(1) The technical standards and criteria contained in the following standard manuals and technical publications listed in subsection (5) below and those referenced throughout this rule are hereby incorporated by reference and shall be applied, if applicable, in determining whether permits allowing construction or modification of collection/transmission systems shall be issued or denied.

(2) Deviations from the standards and criteria contained in the publications listed in subsection (5) below shall be approved by the Department provided that:

(a) The engineer's report provides reasonable assurance that the proposed design will provide collection/transmission meeting the requirements of this rule; and either

(b) Conforming with these standards cannot be done except at unreasonably higher costs; or

(c) It is not technically feasible to conform to these standards because of site conditions or incompatibility with a proposed facility design employing new and innovative techniques which assure compliance with the remainder of this rule.

(3) In cases where the standards and criteria contained in the publications listed in subsection (5) below conflict with this rule or other rules of the Department, Department standards and rules shall control.

(4) In cases where the standards and criteria contained in the publications listed in subsection (5) below conflict, the standards and criteria contained in the publication listed in paragraph (5)(g) shall be used.

(5) Standard Manuals and Publications.

(a) Odor and Corrosion Control in Sanitary Sewerage Systems and Treatment Plants (1985). EPA/625/1-85/018. NTIS# PB88184031. National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161. www.ntis.gov.

(b) Alternative Wastewater Collection Systems (1991). EPA/625/1-91/024. NTIS# PB93-1162591N2. National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161. www.ntis.gov.

(c) Manual of Practice No. FD-12. Alternative Sewer Systems (1986). Water Environment Federation, 601 Wythe Street, Alexandria, VA 22314. www.wef.org.

(d) Manual of Practice No. FD-4. Design of Wastewater and Stormwater Pumping Stations (1993). Water Environment Federation, 601 Wythe Street, Alexandria, VA 22314. www.wef.org.

(e) Manual of Practice No. FD-5. Gravity Sanitary Sewer Design and Construction (1982). Water Environment Federation, 601 Wythe Street, Alexandria, VA 22314. www.wef.org.

(f) Manual of Practice No. 7. Wastewater Collection Systems Management (1999). Water Environment Federation, 601 Wythe Street, Alexandria, VA 22314. www.wef.org.

(g) Recommended Standards for Wastewater Facilities (1997). Health Education Service, Inc., P. O. Box 7126, Albany, New York 12224. www.hes.org.

(h) Design Criteria for Mechanical, Electric, and Fluid System and Component Reliability – MCD-05 (1974). EPA-430-99-74-001, Department of Environmental Protection, 2600 Blair Stone Road, MS 3540, Tallahassee, FL 32399. www.dep.state.fl.us/water.

(i) Operation and Maintenance of Wastewater Collection Systems Volume I (1999) and Volume II (1998). California State University, Department of Civil Engineering, 6000 J Street, Sacramento, California 95819. www.owp.xux.edu.

(j) Design and Specification Guidelines for Low Pressure Sewer Systems (1981). Department of Environmental Protection, 2600 Blair Stone Road, MS 3540, Tallahassee, FL 32399. www.dep.state.fl.us/water.

(6) Members of the public may request and obtain copies of the publications listed in subsection (5) above by contacting the appropriate publisher at the address indicated. Copies of the above publications are on file with the Florida Secretary of State. Copies are also on file and available for review in the Department's Tallahassee offices (including the Information Center) and in the Department's district offices where they may be reviewed during normal business hours.

(7) Related rules. Permitting requirements and fees related to permitting are listed in Chapter 62-4, F.A.C.

(8) Forms. The forms and instructions used by the Department are listed in this rule. The rule numbers are the form numbers. The forms are hereby incorporated by reference in this rule. Copies of these forms and instructions may be obtained by writing to the Bureau of Water Facilities Regulation, Mail Station 3535, Department of Environmental Protection, Twin Towers Office Building, 2600 Blair Stone Road, Tallahassee, Florida 32399-2400. In addition, these forms are available at the Department's district offices and on the Department's website.

(a) Notification/Application for Constructing a Domestic Wastewater Collection/Transmission System, effective November 6, 2003.

(b) Request for Approval to Place a Domestic Wastewater Collection/Transmission System into Operation effective November 6, 2003.

Specific Authority 403.061(7) FS. Law Implemented 403.061, 403.085, 403.086, 403.087, 403.088 FS. History–New 11-27-89, Amended 6-4-92, 5-31-93, Formerly 17-604.300, Amended 12-26-96, 11-6-03.

62-604.400 Design/Performance Considerations.

(1) All new collection/transmission systems and modifications of existing systems for which construction permits are required by the Department shall be designed:

(a) In accordance with the provisions of Rule 62-604.300, F.A.C.;

(b) To be located on public right-of-ways, land owned by the permittee, or easements;

(c) Except as provided in subsection 62-604.400(3), F.A.C., to be located no closer than 100 feet from a public drinking water supply well and no closer than 75 feet from a private drinking water supply well unless the applicant provides documentation accompanying the permit application showing that another alternative will result in an equivalent level of reliability and public health protection; and

(d) To preclude the deliberate introduction of storm water, surface water, groundwater, roof runoff, subsurface drainage, swimming pool drainage, air conditioning system condensate water, non-contact cooling water except as provided by subsection 62-610.668(1), F.A.C., and sources of uncontaminated wastewater. However, collection/transmission systems may be designed to augment the supply of reclaimed water when all conditions of paragraph 62-610.472(3)(c), F.A.C., are met.

(2) In addition to subsection (1), above, the following requirements shall be met where applicable:

(a) Emergency pumping capability shall be provided for all pump stations. Pumping capability shall be provided as follows:

1. Pump stations that receive flow from one or more pump stations through a force main or pump stations discharging through pipes 12 inches or larger shall provide for uninterrupted pumping capabilities, including an in-place emergency generator.

2. For pump stations not addressed in subparagraph (2)(a)1. above, emergency pumping capability may be accomplished by connection of the station to at least two independent utility substations, by providing a connection for portable or in-place engine-driven generating equipment, or by providing portable pumping equipment.

3. Such emergency standby systems shall have sufficient capacity to start up and maintain the total rated running capacity of the station. Regardless of the type of emergency standby system provided, a riser from the force main with rapid connection capabilities and appropriate valving shall be provided for all pump stations to hook up portable pumps. All pump station reliability design features shall be compatible with the available temporary service power generating and pumping equipment of the authority responsible for operation and maintenance of the collection/transmission system.

(b) Pumping stations shall be protected from lightning and transient voltage surges. As a minimum, stations shall be equipped with lightning arrestors, surge capacitors or other similar protection devices, and phase protection. Small pumping stations serving a single building will not be required to provide surge protection devices when they are not necessary to protect the pump station. Complex or critical pumping stations shall be designed to incorporate standby pumping capability, power generation, and other appropriate features pursuant to paragraph 62-604.300(5)(h), F.A.C.

(c) New pumping stations shall be designed and located on the site so as to minimize adverse effects resulting from odors, noise, and lighting. The permittee shall give reasonable assurance that the facility shall not cause odor, noise or lighting in such amounts or at such levels that they adversely affect neighboring residents, in commercial or residential areas, so as to be potentially harmful or injurious to human health or welfare or unreasonably interfere with the enjoyment of life or property, including outdoor recreation. Reasonable assurance may be based on such means as aeration, landscaping, treatment of vented gases, buffer zones owned or under the control of the permittee, chemical additions, prechlorination, ozonation, innovative structural design or other similar techniques and methods, as may be required.

(d) New pumping stations shall be enclosed with a fence or otherwise designed with appropriate features that discourage the entry of animals and unauthorized persons. An unobstructed sign made of durable weather resistant material shall be posted at a location visible to the public with a telephone number for a point of contact in case of emergency.

(e) In areas with high water tables, the pump station shall be designed to include measures to withstand flotation forces when empty. The potential for damage or interruption of operation because of flooding shall be considered by the permittee when siting new pumping stations. The electrical and mechanical equipment shall be protected from physical damage by the 100-year flood. The pumping station shall be designed to remain fully operational and accessible during the 25-year flood; lesser flood levels may be designed for, dependent on local conditions, but in no case shall less than a 10-year flood be used. Design considerations (water surface elevation, forces arising from water movement, etc.) shall be based upon available information; where site-specific information is unavailable, sound engineering practices shall be used in siting and design of pump station facilities.

(f) Branches of intersecting force mains shall be provided with appropriate valves such that one branch may be shut down for maintenance and repair without interrupting the flow of other branches. Stubouts on a force main, placed in anticipation of future connections, shall be equipped with a valve to allow such connections without interruption of service.

(g) Except as provided in subsection 62-604.400(3), F.A.C., sewers and force mains shall be laid at least ten feet (outside to outside) horizontally from water mains. Provided the applicant demonstrates there is no reasonable alternative, the Department shall approve smaller horizontal separation distances for sewers if one of the following conditions is met:

1. The top of the sewer is installed at least 18 inches below the bottom of the potable water line.

2. The sewer is encased in watertight carrier pipe or concrete.

3. Both the sewer and the water main are constructed of slip-on or mechanical joint pipe complying with public water supply design standards and pressure tested to 150 psi to assure watertightness.

4. The applicant provides documentation accompanying the permit application showing that another alternative will result in an equivalent level of reliability and public health protection.

(h) Except as provided in subsection 62-604.400(3), F.A.C., sewers and force mains shall be laid at least three feet (outside to outside) horizontally from any existing or proposed reclaimed water line permitted under Part III of Chapter 62-610, F.A.C. Smaller horizontal distances shall be approved in accordance with subsection 62-610.469(7), F.A.C.

(i) Except as provided in subsection 62-604.400(3), F.A.C., sewer pipes and force mains shall cross under water mains, unless there is no alternative. Sewers and force mains crossing water mains or reclaimed water lines permitted under Part III of Chapter 62-610, F.A.C., shall be laid to provide a minimum vertical distance of 18 inches between the invert of the upper pipe and the crown of the lower pipe. The minimum vertical separation shall be maintained whether the water main is above or below the sewer. For sewer crossings, the crossing shall be arranged so that the sewer pipe joints are equidistant and as far as possible from the water main joints. Adequate structural support shall be provided for the sewer or force main to maintain line and grade. For sewers, provided the applicant demonstrates there is no reasonable alternative, the Department shall approve smaller vertical separation distances if one of the following conditions is met:

1. The sewer is encased in a watertight carrier pipe or concrete.

2. The sewer is designed and constructed equal to water pipe and pressure tested to 150 psi to assure watertightness.

3. The applicant provides documentation accompanying the permit application showing that another alternative will result in an equivalent level of reliability and public health protection.

(j) The provisions of paragraphs 62-604.400(2)(g)-(i), F.A.C., above are applicable to in-ground crossings. No vertical or horizontal separation distances are required for above-ground crossings.

(k) Special protection shall be furnished for sewer lines crossing canals or other waterways subject to maintenance dredging or where damage may occur from water craft anchorage so as to minimize the potential for unintentional discharge of wastewater into surface waters.

1. Subaqueous lines shall be buried at least three feet below the design or actual bottom, whichever is deeper, of a canal and other dredged waterway or the natural bottom of streams, rivers, estuaries, bays, and other natural water bodies. Designs with less than the three-foot minimum cover shall be protected by a concrete cap, sleeve, or some other properly engineered device to insure

adequate protection of the line; subaqueous crossings shall be designed to lie on the bottom of waterways only when the engineering report provides reasonable assurance that, because of the depth of the water or other circumstances, the pipeline shall be adequately protected from damage from natural occurrences or mankind's activities.

2. Subaqueous crossings shall be clearly marked by permanent warning signs placed on the banks of canals, streams, and rivers clearly identifying the nature and location (including depths below design or natural bottom) of the crossings. Crossings of lakes, bays and other large bodies of water shall be similarly identified at the shore and, with suitably fixed signs, in any area where anchoring may normally be expected. Signs shall have characteristics compatible with surrounding land use, while serving the intended purpose.

3. Aerial crossings, whether hung from existing structures, self-supporting, or supported by utility bridges or structures, shall be designed to maintain existing or required navigational capabilities within the waterway and to reserve the riparian rights of adjacent property owners.

4. Provisions for testing the integrity of underwater lines shall be made, and special pipe material suitable for underwater construction shall be used.

5. Lines shall be designed to incorporate valves or other flow regulating devices (which may include pump stations) on the shoreline or at such distances from the shoreline as may be approved by the Department to prevent discharge in the event the line is damaged.

(3) If there are conflicts in the separation requirements between collection systems and drinking water facilities established in (1) and (2) above and those established in Chapter 62-532 or 62-555, F.A.C., then the requirements in Chapter 62-532 or 62-555, F.A.C., shall apply.

(4) The manuals referenced in paragraphs 62-604.300(5)(b), (c), and (j), F.A.C., shall be used in evaluation of the design and construction of alternative collection/transmission systems in Florida. A central management entity, be it public or private, shall be responsible for operation and maintenance of the on-lot facilities associated with alternative collection/transmission systems.

Specific Authority 403.061, 403.087 FS. Law Implemented 403.021, 403.061, 403.062, 403.085, 403.086, 403.087, 403.088 FS. History–New 11-27-89, Amended 6-4-92, Formerly 17-604.400, Amended 12-26-96, 11-6-03.

62-604.500 Operation and Maintenance.

(1) Even though operation permits are not issued for collection systems, the operation and maintenance provisions of Rule 62-604.500, F.A.C., are applicable to both new and existing domestic wastewater collection/transmission facilities.

(2) All collection/transmission systems shall be operated and maintained so as to provide uninterrupted service as required by this rule.

(3) All equipment necessary for the collection/transmission of domestic wastewater, including equipment provided pursuant to subsection 62-604.400(2), F.A.C., shall be maintained so as to function as intended. In the event odor, noise or lighting adversely affect neighboring developed areas at levels prohibited by paragraph 62-604.400(2)(c), F.A.C., corrective action (which may include modifications of the collection/transmission system) shall be taken by the permittee. Other corrective action may be required to ensure compliance with rules of the Department.

(4) Copies of record drawings and the operation and maintenance manual shall be available at a site within the boundaries of the district office or delegated local program permitting the collection/transmission system, for use by operation and maintenance personnel and for inspection by Department personnel.

(a) The operation and maintenance manual shall provide for reliable and efficient operation and maintenance of the collection/transmission system.

(b) The detail of the operation and maintenance manual shall be consistent with the complexity of the system. The manual shall be developed in accordance with the technical guidance document contained in paragraph 62-604.300(4)(i), F.A.C., and the unique requirements of the individual wastewater facility and shall provide the operator with adequate information and description regarding the design, operation, and maintenance features of the facility involved, including an emergency response plan.

(c) The operation and maintenance manual shall be revised periodically to reflect any alterations performed or to reflect experience resulting from operation.

(d) A new operation and maintenance manual is not required to be developed for each project if there is already an existing manual that is applicable to the facilities being constructed.

Specific Authority 403.061, 403.087 FS. Law Implemented 403.021, 403.061, 403.087, 403.088 FS. History–New 11-27-89, Amended 6-4-92, Formerly 17-604.500, Amended 12-26-96, 11-6-03.

62-604.550 Abnormal Events.

(1) The provisions of Rule 62-604.550, F.A.C., are applicable to both new and existing domestic wastewater collection/transmission systems.

(2) The owner/operator of the collection/transmission system shall report to the Department all unauthorized releases or spills of wastewater to surface or ground waters from its collection/transmission system or any other abnormal events as described below:

(a) Unauthorized releases or spills in excess of 1,000 gallons per incident, or other abnormal events where information indicates that public health or the environment will be endangered, shall be reported orally to the STATE WARNING POINT TOLL FREE NUMBER (800) 320-0519 as soon as practical, but no later than 24 hours from the time that the owner/operator becomes aware of the circumstances. The owner/operator, to the extent known, shall provide the following information to the State Warning Point:

1. Name, address, and telephone number of person reporting;
2. Name, address, and telephone number of owner/operator of the collection/transmission system or responsible person for the discharge;
3. Date and time of the discharge and status of discharge (ongoing or ceased);
4. Characteristics of the wastewater spilled or released (untreated or treated, industrial or domestic wastewater);
5. Estimated amount of the discharge;
6. Location or address of the discharge;
7. Source and cause of the discharge;
8. Whether the discharge was contained on-site, and cleanup actions taken to date;
9. Description of area affected by the discharge, including name of water body affected, if any; and
10. Other persons or agencies contacted.

(b) Unauthorized releases or spills of 1000 gallons per incident or less shall be reported orally to the Department within 24 hours from the time that the owner/operator of the collection/transmission system becomes aware of the circumstances.

(c) The oral notification shall be followed by a written submission, which shall be provided within five days of the time that the owner/operator becomes aware of the circumstances. The written submission shall contain: a description of the spill, release or abnormal event and its cause; the duration including exact dates and time, and if it has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent recurrence. The Department shall waive the written report if the oral report has been received within 24 hours from the time that the owner/operator of the collection/transmission system becomes aware of the circumstances, and the release, spill or abnormal event has been corrected and did not endanger health or the environment.

Specific Authority 403.061, 403.087 FS. Law Implemented 403.021, 403.061, 403.062, 403.087, 403.088, 403.182 FS. History–New 11-27-89, Amended 6-4-92, 5-31-93, Formerly 17-604.550, Amended 12-26-96, 11-6-03.

62-604.600 Procedure to Obtain Construction Permits.

(1) Except as noted in subsection (2) below, either a general or individual construction permit is required for the construction or modification of any collection/transmission system in accordance with subsections (6) and (7) below.

(2) The following activities do not require a collection system permit.

(a) Replacement of any facilities with new facilities of the same capacity at the same location as the facilities being replaced;

(b) Construction of any single gravity or non-gravity individual service connection from a single building to a gravity collection system; however, construction of a non-gravity connection from other than a single family residence to an existing force main system requires a permit;

(c) Construction of a low pressure (grinder pump or STEP) or vacuum sewer individual service connection where the system serving the area has been previously permitted by the Department;

(d) Installation of odor control facilities;

(e) Modifications associated with routine maintenance; or

(f) Modifications associated with ancillary and electrical equipment and structures.

(3) Each non-contiguous project shall require a separate application and fee pursuant to paragraph 62-4.050(4)(t), F.A.C.

(4) Collection/transmission systems can either be constructed under the general permit procedures and criteria specified in Part III, Chapter 62-4, F.A.C., and subsection 62-604.600(6), F.A.C., or by individual permit specified in subsection 62-604.600(7), F.A.C. Permittees shall comply with applicable design/performance criteria contained in this chapter as part of the permitting standards under Chapter 62-4, F.A.C.

(5) Collection/transmission system permits shall be issued for a period no longer than five years, unless specifically authorized by the Florida Statutes.

(6) General Permits.

(a) Except for alternative collection/transmission systems, a general permit is hereby granted to any person for the construction of a wastewater collection/transmission system that has been designed in accordance with the standards and criteria set forth in subsections 62-604.400(1) and (2), F.A.C., provided that:

1. Notice to the Department under subsection 62-4.530(1), F.A.C., is submitted on Form 62-604.300(8)(a) at least 30 days prior to initiating construction; and

2. The wastewater facility to which the system will be connected:

a. Has the capacity to receive the wastewater generated by the proposed collection system;

b. Is in compliance with the capacity analysis requirements of Rule 62-600.405, F.A.C.;

c. Is not under a Department Order associated with effluent violations or the ability to treat wastewater adequately; and

d. Will provide the necessary treatment and disposal as required by Chapter 403, F.S., and applicable Department rules.

(b) This general permit is subject to the general conditions of Rule 62-4.540, F.A.C., and the following specific conditions:

1. This general permit does not relieve the permittee of the responsibility for obtaining a dredge and fill permit where it is required.

2. This general permit can not be revised, except to transfer the permit.

(7) Individual Permits.

(a) Collection/transmission systems not meeting the general permit criteria in subsection (6) above shall submit an application for an individual permit on Form 62-604.300(8)(a), Notification/Application for Constructing a Domestic Wastewater Collection/ Transmission System, effective November 6, 2003. Copies of this form and instructions may be obtained by writing to the Bureau of Water Facilities Regulation, Mail Station 3535, Department of Environmental Protection, Twin Towers Office Building, 2600 Blair Stone Road, Tallahassee, Florida 32399-2400. In addition, these forms are available at the Department's district offices and on the Department's website.

(b) A Department permit shall be obtained prior to construction.

(8) Permit revisions for collection/transmission systems permitted under this rule shall only be made in accordance with paragraph 62-4.050(4)(s), F.A.C. Request for revisions shall be made to the Department in writing and shall include the appropriate fee. Revisions not covered under paragraph 62-4.050(4)(s), F.A.C., shall require a new permit.

(9) If, after review of Form 62-604.300(8)(a) and any supporting documentation, the Department determines that the applicant has not provided reasonable assurance that the construction, modification, expansion, or operation of the installation will be in accordance with applicable laws or rules, including rules of delegated local programs, the Department shall deny the permit or notify the applicant that the general permit cannot be used, as appropriate.

Specific Authority 403.061, 403.087 FS. Law Implemented 403.021, 403.061, 403.062, 403.085, 403.086, 403.087, 403.088 FS. History–New 11-27-89, Amended 6-4-92, Formerly 17-604.600, Amended 11-6-03.

62-604.700 Placing Collection/Transmission Systems into Operation.

(1) The following requirements apply to collection/transmission systems permitted under the general permit and to collection/ transmission systems permitted under the individual permit.

(2) Upon completion of construction of the collection/transmission system, and before placing the facilities into operation for any purpose other than testing for leaks or testing equipment operation, the permittee shall submit to the appropriate district office, Form 62-604.300(8)(b), Request for Approval to Place a Domestic Wastewater Collection/Transmission System into Operation, effective November 6, 2003. Copies of this form and instructions may be obtained by writing to the Bureau of Water Facilities Regulation, Mail Station 3535, Department of Environmental Protection, Twin Towers Office Building, 2600 Blair Stone Road, Tallahassee, Florida 32399-2400. In addition, these forms are available at the Department's district offices and on the Department's website.

(3) New or modified collection/transmission facilities shall not be placed into service until the Department clears the project for use. The Department shall approve or deny the clearance within 10 business days after Department receipt of Form 62-604.300(8)(b) for a general permit, or within 30 business days for an individual permit.

Specific Authority 403.814(1) FS. Law Implemented 403.061, 403.087, 403.088, 403.814 FS. History–New 11-27-89, Amended 6-4-92, Formerly 17-604.700, Amended 12-26-96, 11-6-03.

Appendix D

Monroe County/FDEP/FKAA Meeting Minutes for Sugar Pine Wastewater Project (July 7, 2008)

#403-06

MINUTES
OF
MEETING FOR SUGAR PINE WASTEWATER PROJECT
MONROE COUNTY/ DEP /FKAA

July 7, 2008
Fort Myers/Marathon

Introductions made. See attached attendance list. Attendees from FDEP-South District, Monroe County and FKAA were present.

Service Area of project presented by FKAA and discussion of the change from initial Master Plan (three treatment plants) to revised plan with one treatment plant on Cudjoe Key to handle the entire service area.

Project Schedule discussed. Design is underway and to be completed within about 1 year. Permitting is to be completed within similar timeframe, so construction can begin on critical project elements by middle of 2009. Construction will be phased for workload and financing this large project.

Collection Systems

- System permit application can be submitted as dry line request, as no plant is currently available. Can be 1 or more applications, depending upon phasing, contiguous areas or engineering break-out.

- FDEP input on system types
  - Gravity preferred wherever possible for reliability
  - E1 low pressure grinder pumping system/force mains okay where gravity not available
    - Need agreement with users for operations, easement, and electrical supply
  - Vacuum systems show failure, not preferred
  - STEP not preferred. Problems with tanks and maintenance
  - STEG - none in District; question system capabilities

- ERP permitting needs to cover any and all wetland areas being crossed by the pipeline systems.

Channel Crossings

- Numerous waterway crossings are required for collecting and transmitted the wastewater from the islands in the service area to the new WRF on Cudjoe Key. Pipes will be attached to County and FDOT bridges to the maximum extent possible and feasible. The pipe alignment and details for these bridge crossings will be presented in the collection system permit application documents.

- The Niles Channel crossing may be most feasible by attaching the pipeline to the older bridge, currently under FDEP Heritage Park jurisdiction. If this alignment proves the most feasible and beneficial, a few hundred feet of open channel along this route would require a submerged pipeline (since a portion of the old bridge has been removed for navigation at the center of the channel). Discussion over the different techniques:

    - Open cut would be first choice. Construction means and methods and pipe details would need to show minimization of environmental impacts during and after construction.

    - Easement and submerged land approval would be required.

    - Directional drilling would be challenging in the fragmented rock, per FDEP, as drilling mud could escape and could cause both construction problems and environmental impacts.

- ERP permitting will need to cover the submerged pipeline crossing, if selected as most feasible.

Water Reclamation Facility (WRF)

- Project site located on unused cells of Cudjoe landfill
    - County needs to apply for land use change as owner
    - Agreement with FKAA for land use or ownership
    - Current stormwater permit to under SFWMD jurisdiction; but new WRF will be FDEP jurisdiction
- Project phasing
    - May apply for 2 phase permit. Phase 1 for under 1 MGD, and Phase 2 to about 1.5 MGD
    - Will allow sequencing to match collection system tie-in and flow increase, and will allow disposal options to be better pursued and financed
- Deep well requirements
    - One or two wells required when plant flow approaches 1 MGD

- Will look at overall disposal options during WRF preliminary design. A combination of reuse, shallow wells, and single deep well may provide best long-term operation.

- Reuse Feasibility Study is required per FDEP rule. FKAA and Monroe County interested in reuse option for portion of service area which looks cost competitive.
- Existing site will need evaluation for:
  - Potential migration of landfill leachate resulting from construction and/or operation of new WRF
  - Potential location for deep well(s), as the preliminary layout for WRF will be tight for 1.5 MGD AWT system

Summary of Activity Anticipated

1. Permitting

   a. Dry-line Collection Systems - 2 applications:
      i. Central Islands (Mathews)
      ii. Outer Islands (Chen)

   b. Environmental Resource Permit (ERP) - 3 applications:
      i. Pipeline routes and pump station locations, if needed
      ii. WRF Site
      iii. Niles Channel crossing

   c. WRF Permit Application for 2 phased flow approach

   d. Injection well(s) - 2 phased approach
      i. Shallow wells for initial plant flow
      ii. Deep well(s) for second phase

   e. Permittee
      i. FDEP recommended joint application as permittee - Monroe County/FKAA. Need further discussion and clarification for various permits and areas of responsibilities. Yet, FDEP would like similarity of all applications of project.

FKAA DEP Meeting

July 7, 2008

10:00 am

Abdul B. Ahmadi DEP 239-332-6975 ext. 141
JACK D. MYERS " " " 113
Charles DAVAULT " " " x165
Grous Minhaj " " " x185
Dave Rhodes " " " x125
RAY SHIMOKURO FKAA 305 296 2454
Lucy Blair DEP 239-332-6975 x157
Tom Walker FKAA 305/296-2454
Julie Cheon " "
Judy Clark Monroe Co. 305/295-4329
Gus Rios - DEP Marathon 305/289/2310
Steve Johnson " " " "
Ed Russell - Environmental Specialist " " " "

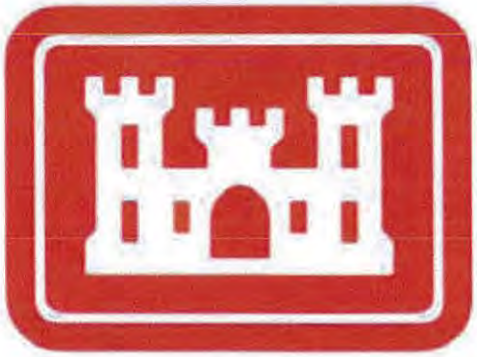
APPENDIX E

November 2010

Draft Environmental Assessment

Florida Keys Water Quality Improvements Program (FKWQIP)

Florida Keys Aqueduct Authority
Cudjoe Regional Wastewater System
Monroe County, Florida



U.S. Army Corps of Engineers
Jacksonville District

Executive Summary

The United States (U.S.) Congress has directed the U.S. Army Corps of Engineers (Corps) to assist local municipalities and public utility companies in Monroe County, Florida, in the planning and construction of wastewater and stormwater improvements designed to accomplish the following goals listed below:

- Reduce nutrient loading to the nearshore waters of the Florida Keys National Marine Sanctuary (Sanctuary);
- Improve water quality throughout the waters of the Sanctuary; and
- Comply with relevant federal and state regulatory standards.

A Programmatic Environmental Impact Statement (PEIS) was previously prepared by the Corps for the proposed Florida Keys Water Quality Improvements Program (FKWQIP) in accordance with the National Environmental Policy Act (NEPA) and the Council on Environmental Quality (CEQ) regulations implementing NEPA (40 Code of Federal Regulation [CFR] 1500-1508). These laws and regulations require the Corps to consider and address environmental issues when funding a major federal action.

This Draft Environmental Assessment (EA) tiers from the PEIS for the FKWQIP and hereby incorporates the PEIS by reference, in accordance with 40 CFR Part 1508.28. The Florida Keys Aqueduct Authority's (FKAA) proposed Cudjoe Regional Wastewater Treatment System will address 12 of the 45 water quality *hot spots* in the Florida Keys identified in the Monroe County Sanitary Wastewater Master Plan (MCSWMP, Monroe County 2000) as requiring water quality improvements.

The overall Cudjoe Regional Wastewater Treatment Service Area (Service Area) is located in the Lower Florida Keys, and extends from Mile Marker (MM) 17 to MM 33, and includes ten islands (**Figure ES-1**):

- No Name
- Big Pine Key
- Little Torch Key
- Middle Torch Key
- Big Torch Key
- Ramrod Key
- Summerland Key
- Cudjoe Key
- Upper Sugarloaf Key
- Lower Sugarloaf Key

The FKAA and Monroe County have partnered through interlocal agreements to provide wastewater conveyance and treatment strategies that will comply with the Monroe County Master Plan and the standards mandated by the Florida Legislature. The cost-effectiveness of various strategies has been evaluated and centralized sewer will be provided to a majority of the residences and commercial businesses within the Cudjoe Regional Service Area. These centralized areas are referred to as "Hot Spot" areas and those decentralized areas where centralized sewer is not deemed cost-effective are termed "Cold Spot" areas (**Figure ES-2**).

Figure ES-1
Cudjoe Regional Service Area

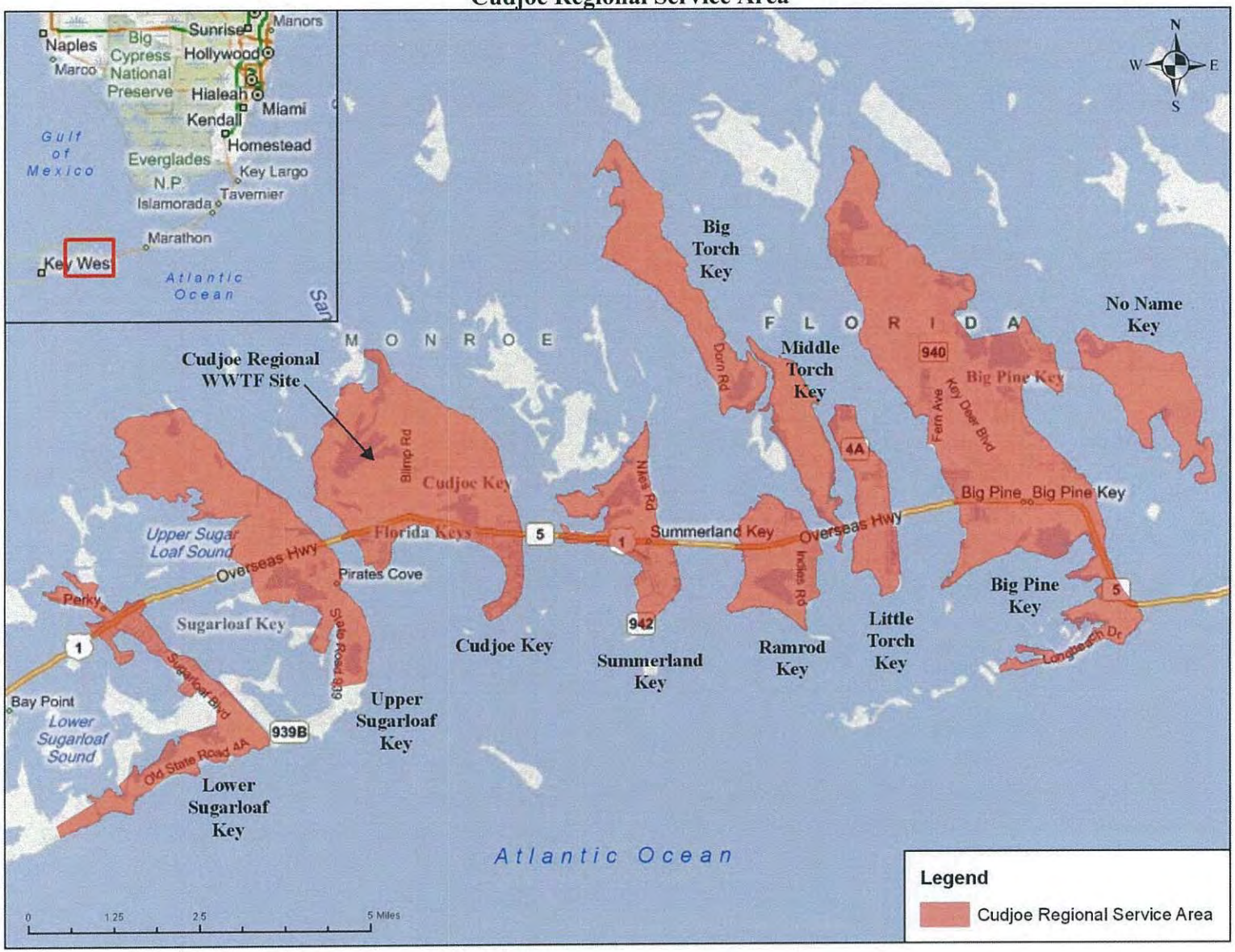
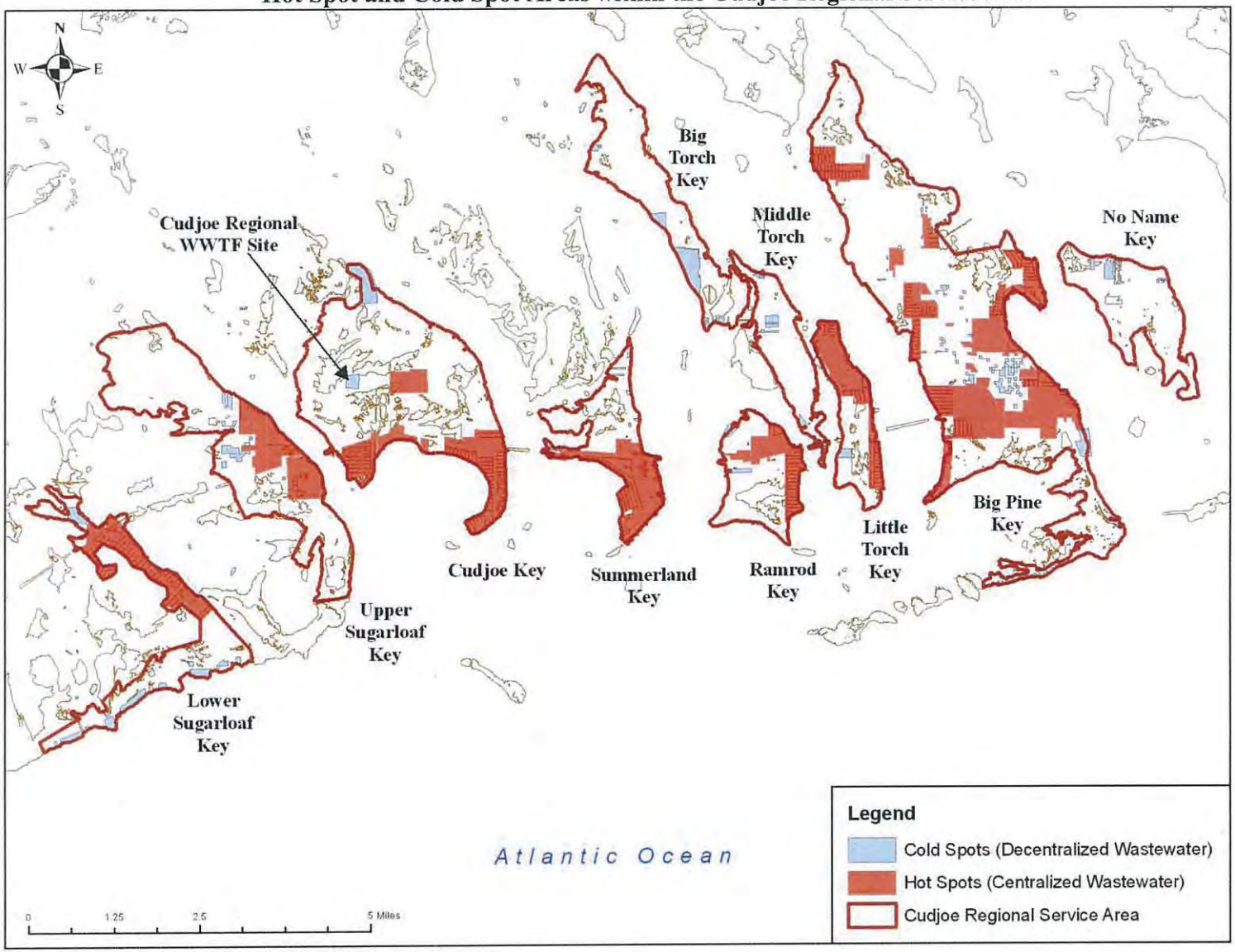


Figure ES-2
Hot Spot and Cold Spot Areas within the Cudjoe Regional Service Area



The proposed Wastewater Treatment Facility (WWTF) will use a five-stage Bardenpho system capable of meeting Monroe County effluent standards. The proposed design capacity of the WWTF is one MGD and the maximum anticipated flows will be 0.94 MGD, with a three-month average daily flow of 0.84 MGD. The WWTF will use shallow well injection for effluent disposal.

The proposed decentralized wastewater system will be centrally managed by the FKAA, as an U.S. Environmental Protection Agency (USEPA) Model 5 management entity. The proposal, as described by USEPA Grant ID 83310702-0, is for the FKAA to replace onsite systems in areas not scheduled to be provided with central sewer, with new Florida Department of Health (FDOH) approved Best Available Technology (BAT) systems and provide complete management of those systems. Cold Spot areas outside of the Cudjoe Regional Service Area may undergo additional review not included in this Draft EA.

Purpose and Need

In recognition of the importance of improving water quality in the Sanctuary, the purpose of the *Proposed Action* is to provide financial assistance to the FKAA for the planning and implementation of a central wastewater system that will support the goals and objectives of the Florida Keys Water Quality Improvements Act (FKWQIA) and the FKWQIP. The *Proposed Action* is needed to reduce nutrient and bacteria loading to the Sanctuary, improve water quality in the Sanctuary, and comply with relevant federal and state regulatory standards.

The Sanctuary includes unique and nationally significant marine environments such as seagrass meadows, mangrove islands, and the only living coral barrier reef in North America. Similar to other Florida ecosystems, human activities during the past 100 years have affected water quality in the Sanctuary. Bacteria and nutrients from human wastes, and chemicals such as pesticides and mercury, that may reach this delicate ecosystem as a result of little or no treatment can adversely impact water quality and pose a public health risk.

Water quality is critical to maintaining the marine ecosystem of the Sanctuary and influences the coral reef and the organisms dependent on the reef. Numerous scientific studies have documented the contribution of failing septic tanks and cesspools to the deterioration of canal and nearshore water quality in the Florida Keys. In addition, research has suggested that increased nutrient loadings from wastewater into canals and nearshore waters are one of the major contributors to the decline of water quality within the Sanctuary.

Decision to be Made

Due to the capital costs of implementing the proposed water quality improvement projects, municipal governments and public utility companies in the Florida Keys have requested assistance from the Federal government to develop and implement wastewater treatment and stormwater management actions that will reduce nutrient loadings and improve water quality in the Sanctuary. Based on the potential benefits of the Cudjoe Regional Wastewater System and the adverse affects on the natural and manmade environment if water quality improvements are not made, the Corps must decide whether to provide financial assistance to the FKAA in

developing and implementing wastewater improvements for the Cudjoe Regional Service Area. Once the proposed system is completed Lower Keys residents and visitors can expect improved water quality in the surrounding Sanctuary and nearshore waters.

Description of Alternatives

Wastewater project alternatives for the Cudjoe Regional Service Area provide the basis for decision-making, thereby making up the core of this Draft EA. The three alternatives evaluated as part of this Draft EA are described briefly below.

- ***Alternative 1: No Action.*** No federal agency would provide funding to the FKAA for implementation of wastewater treatment improvement projects that would address state mandates to meet wastewater treatment standards. Public entities would not construct or operate WWTFs. Lower Florida Keys residents, communities, and businesses would be responsible for addressing state mandates aimed at improving water quality in the Sanctuary.
- ***Alternative 2: Proposed Action.*** Provide federal financial assistance from the Corps, as part of the FKWQIP, to develop and implement a centralized regional wastewater collection and treatment system for the Cudjoe Regional Service Area that would address mandatory state wastewater treatment standards.
- ***Alternative 3: Pursue Other Sources of Funding for Project Implementation.*** In the absence of federal funding, provided by the Corps, alternative funding sources would be pursued to implement projects for the FKAA that would address state mandates and improve water quality in the Sanctuary. Sources of monies may include other state and federal funding mechanisms (other than Corps) and/or additional costs levied against Florida Keys residents.

While other funding sources are currently being evaluated to assist in implementing wastewater improvement projects in the Lower Florida Keys, the proposed federal funding would expedite construction of the regional WWTF and associated infrastructure.

Scoping Issues

Public meetings for various stakeholders, interested parties, and Lower Keys residents were held on December 8, 2008 and December 11, 2008. The scoping issues identified, which have guided the preparation of this document, are listed below.

- **Issue 1: Water Quality.** A number of recent scientific studies have documented the contribution of failing septic tanks and cesspools to the deterioration of the canal and nearshore marine water quality in the Florida Keys. The studies attribute increased algal blooms, seagrass die-off, and the decline in coral reef ecosystems health to inadequate wastewater treatment. Scientists concur that one of the principal sources of water quality degradation in the Sanctuary is the elevated level of nutrients in surrounding canals and nearshore waters. The USEPA has concluded that the magnitude and extent of estimated nutrient loadings from wastewater sources are regionally substantial (USEPA 1993). Based on calculations prepared for similar central wastewater districts within the Florida

Keys (Marathon, Islamorada and Key Largo), reductions in TN, TP and TSS loadings of 85-88, 79-81, and 77-91 percent, respectively, are anticipated for the Cudjoe Regional Service Area as a result of implementing the proposed wastewater improvements.

- **Issue 2: Facility Location.** Vacant lands suitable for placement of a WWTF are scarce in the Florida Keys. As a result, potential sites for a WWTF may include sensitive or critical habitat for protected species (see issue 3, below). The proposed WWTF will be constructed on approximately 3 acres of a larger 10.2 acre parcel that is located on Cudjoe Key at the decommissioned landfill owned by Monroe County. Construction of sewer collection systems may cross naturally or culturally sensitive lands.
- **Issue 3: Protected Species.** The Florida Keys are a relatively small landmass in a subtropical to tropical island setting and provide habitat for many rare and protected plants and animals. Because remaining natural areas are scarce, any action by the FKAA that results in the loss of natural areas has the potential to impact protected species. Protected species that occur or may occur in the Service Area, associated habitats and regulatory framework affecting these species, are addressed in this Draft EA. Consultation with U.S. Fish and Wildlife Service (USFWS) will be continual.
- **Issue 4: Effluent Disposal.** Residents within the Service Area currently rely on septic tanks, cesspools, and package treatment facilities. Shallow injection wells may be used for WWTFs with capacities less than one MGD. The Cudjoe Regional WWTF treated effluent would be disposed of through 4 shallow injection wells once the centralized WWTF is constructed. Shallow injection wells are governed by Chapter 62-528 Florida Administrative Code (FAC). Shallow injection wells would be designed and constructed to meet both Florida Department of Environmental Protection (FDEP) Class V reliability standards and FDEP Underground Injection Control (UIC) Class V well construction and monitoring requirements.
- **Issue 5: Tourism.** The quality of life for tourists in the Florida Keys relies on a healthy marine ecosystem and can be negatively impacted by water quality degradation. Over two million individuals per year visit the Florida Keys to enjoy its unique natural features. Water related activities, including snorkeling, diving, fishing, and other activities support 70 percent of tourism in the Florida Keys, which generates over $1.3 billion per year and supports over 21,000 jobs. Poorly treated wastewater presents a public health risk to nearshore water of the Florida Keys, which in turn can result in beach advisories, decreases in tourism, and fewer individuals participating in recreational activities in the Sanctuary.
- **Issue 6: Environmental Justice.** Nearly 25 percent of population within the Service Area is made up of individuals regarded as either low income or over 65 years of age. Approximately 7.7 percent of the population was living below the poverty level in 2008, and the portion of residents over the age of 65 is estimated to be approximately the same as that of the county and state (14.7 percent and 17.6 percent, respectively). This segment of the population often lives on fixed incomes and, while their income may not be below the poverty level, they are affected by cost of living changes. These factors suggest that while the majority of the residents within the Service Area are above poverty levels, there are considerable impacts to residents associated with the costs of the Cudjoe Regional Wastewater System, raising potential environmental justice concerns.

Comparison of Alternatives

The alternatives examined as part of this Draft EA were premised on the need to implement water quality improvement projects that will reduce nutrient loading and result in commensurate water quality improvements in the Sanctuary. The environmental consequences are summarized in **Table ES-1**.

Table ES-1
Comparison of Environmental Consequences Resulting from the Alternative Actions

Scoping Issue	Alternative 1 *No Action*	Alternative 2 *Proposed Action*	Alternative 3 *Alternative Funding Sources*
1. Water Quality	Adverse impacts due to continued untreated wastewater runoff and associated nutrients, toxins, bacteria, and viruses to canals and nearshore waters in the Sanctuary. State and federal mandates to improve water quality in the Sanctuary may not be addressed.	Benefits of centralized wastewater treatment include water quality improvements due to decreased nutrient and other contaminants into canals and nearshore waters of the Sanctuary. Reductions in TN, TP and TSS loadings between 85-88, 79-81 and 77-91 percent, respectively, are anticipated. These improvements will address state and federal legislation.	Continued degradation of water quality is anticipated until funding is obtained to construct all the regional WWTF. Piece-meal construction may delay full achievement of project and program objectives.
2. Facility Location	No impacts are anticipated. No lands will be required for the location and construction of wastewater facilities. Therefore, with the exception of the other scoping issues, existing residences, fish and wildlife habitats, and land uses will not be disrupted.	Net environmental benefits due to improved water quality. The facility is located at a decommissioned landfill, contain little to no ecological value. Therefore, no adverse impacts are anticipated.	Impacts similar to those described under the *Proposed Action* area expected.
3. Protected Species	Adverse impacts to protected species anticipated as a result of continued runoff of untreated wastewater into canals and nearshore waters and subsequent water quality degradation. Because no new facilities would be required, no impacts to habitat for protected species are anticipated.	Section 7 USFWS/ National Marine Fisheries Service (NMFS) consultation and Florida Fish and Wildlife Conservation Commission (FFWCC) for protected species will occur as needed. No critical habitat will be impacted.	Impacts similar to those described under the Proposed Action are expected, with delays in benefits, in addition to potentially greater impacts due to larger number of smaller facilities being constructed.
4. Effluent Disposal	Adverse impacts anticipated as a result of unchanged effluent disposal practices. Runoff from cesspools and	Construction of centralized sewers will expedite the removal of cesspools, septic tanks and associated	Construction of sewers will be less effective due to fragmented approach. Delays in

	septic tanks will continue to enter canals and nearshore waters in the Sanctuary.	pollutants in the Cudjoe Regional *hot spots*.	construction are also anticipated.
5. Tourism	Increasing impacts anticipated related to water quality degradation. Continued beach health advisories would adversely affect immediate recreational and tourist opportunities, and long-term impacts could be detrimental to tourism and the local economy.	Improved water quality would decrease the incidence of beach advisories and closings, thereby increasing the opportunity for saltwater-based recreation. Temporary adverse impacts would include transportation delays due to construction activities.	Improved water quality would decrease the incidence of beach advisories and closings, thereby increasing the opportunity for saltwater-based recreation albeit at a slower pace than the *Proposed Action*.
6. Environmental Justice	Adverse impacts to low-income households who will have difficulties affording the cost of meeting 2015 mandates for wastewater treatment are expected.	Without special consideration and financial assistance, low-income and fixed-income households may have difficulty paying for wastewater hook-up and service fees.	Without special consideration and financial assistance, low-income and fixed-income households may have difficulty paying for wastewater hook-up and service fees.

Preferred Alternative

The preferred alternative is Alternative 2, the *Proposed Action*. Under the *Proposed Action*, the Corps would provide financial assistance to the FKAA for planning and implementation of a wastewater improvement project that would reduce nutrient loads and pollutants to nearshore waters in the Sanctuary.

Areas of Controversy

Controversial issues associated with FKWQIP include the cost of program implementation, the means of recovering initial capital investment, and the means of generating revenues to support maintenance and operational activities.

The disposal of wastewater effluent into the groundwater through injection wells and the potential for groundwater contamination is of concern to the public. Most wastewater in the Service Area remains untreated or inadequately treated. Disinfecting and treating the effluent to AWT standards and disposing of it via injection wells is an acceptable alternative. The proposed wastewater improvements for the Cudjoe Regional Wastewater System would use shallow well injection.

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List of Acronyms

AFVP	Atlas of Florida Vascular Plants
AIRFA	American Indian Religious Freedom Act
ARPA	Archaeological Resources Protection Act
ASTM	American Society of Testing and Materials
ATU	Aerobic Treatment Units
AWT	Advanced Wastewater Treatment
BAT	Best Available Technology
BFE	Base Flood Elevation
BLS	Below Land Surface
BMPs	Best management practices
BNR	Biological Nutrient Removal
BOCC	Board of County Commissioners
BOD	Biological Oxygen Demand
CBIA	Coastal Barrier Improvement Act
CBRA	Coastal Barrier Resources Act
CBRS	Coastal Barrier Resource System
CDBGs	Community Development Block Grants
CEQ	Council on Environmental Quality
CERP	Comprehensive Everglades Restoration Plan
CFR	Code of Federal Regulations
Corps	U.S. Army Corps of Engineers
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
dBA	Decibel
DIN	Dissolved Inorganic Nitrogen
DOI	Department of Interior
EA	Environmental Assessment
EDU	Equivalent Dwelling Unit
EFH	Essential Fish Habitat
EO	Executive Order
ERP	Environmental Resource Permit
ESA	Endangered Species Act
FAC	Florida Administrative Code
FCMP	Florida Coastal Management Program
FDCA	Florida Department of Community Affairs
FDEP	Florida Department of Environmental Protection
FDER	Florida Department of Environmental Regulation
FDOH	Florida Department of Health
FDOT	Florida Department of Transportation
FFWCC	Florida Fish and Wildlife Conservation Commission

FEMA	Federal Emergency Management Agency
FIU	Florida Atlantic University
FKAA	Florida Keys Aqueduct Authority
FKCCS	Florida Keys Carrying Capacity Study
FKEC	Florida Keys Electric Cooperative
FKWQIA	Florida Keys Water Quality Improvement Act
FKWQIP	Florida Keys Water Quality Improvements Program
FLUM	Future Land Use Maps
FNAI	Florida Natural Areas Inventory
FPL	Florida Power and Light
GIS	Geographical Information System
GPD	Gallons per day
HUD	U.S. Department of Housing and Urban Development
KEYS	Keys Energy Services
LOS	Level of Service
MCSWMP	Monroe County Sanitary Wastewater Master Plan
MGD	Million gallons per day
mg/L	Milligrams per Liter
MHI	Median Household Income
MM	Mile Marker
MSA	Magnuson-Stevens Fishery Conservation and Management Act
NAGPRA	Native American Graves Protection and Repatriation Act
NEPA	National Environmental Policy Act of 1969
NHPA	National Historical Preservation Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NPDES	National Pollution Discharge Elimination System
O&M	Operations and Maintenance
OFW	Outstanding Florida Waters
OSTDS	On-site sewage treatment and disposal system
OWNRS	On-site wastewater nutrient reduction systems
OWTS	On-site wastewater treatment systems
PCBs	Polychlorinated Biphenyls
PEIS	Programmatic Environmental Impact Statement
ppm	Parts per million
RCRA	Resource Conservation and Recovery Act

ROGO	Rate of Growth Ordinance
ROWs	Rights of Way
Sanctuary	Florida Keys National Marine Sanctuary
SCUBA	Self Contained Underwater Breathing Apparatus
SERC	Southeast Environmental Research Center
Service Area	Cudjoe Regional Service Area
SFA	Sustainable Fisheries Act
SFWMD	South Florida Water Management District
SHCA	Strategic Habitat Conservation Area
SHPO	State Bureau of Historic Preservation Office
TN	Total nitrogen
TOC	Total organic carbon
TP	Total phosphorus
TSS	Total Suspended Solids
UIC	Underground Injection Control
USDW	Underground Source of Drinking Water
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WQPP	Water Quality Protection Program
WWTF	Wastewater Treatment Facility
ZCTA	Zip Code Tabulation Area

1.0 Purpose of and Need for Action

The United States (U.S.) Congress has directed the U.S. Army Corps of Engineers (Corps) to assist local municipalities and public utility companies in Monroe County, Florida, in the planning and construction of wastewater and stormwater improvements designed to accomplish the following goals listed below:

- Reduce nutrient loading to the nearshore waters of the Florida Keys National Marine Sanctuary (Sanctuary);
- Improve water quality throughout the waters of the Sanctuary; and
- Comply with relevant federal and state regulatory standards.

A Programmatic Environmental Impact Statement (PEIS) was previously prepared by the Corps for the proposed Florida Keys Water Quality Improvements Program (FKWQIP) in accordance with the National Environmental Policy Act (NEPA) and the Council on Environmental Quality (CEQ) regulations implementing NEPA (40 Code of Federal Regulation [CFR] 1500-1508). These laws and regulations require the Corps to consider and address environmental issues when funding a major federal action.

The PEIS prepared by the Corps provides a framework to address potential environmental impacts associated with design and implementation of eligible wastewater treatment projects for the FKWQIP. This Draft Environmental Assessment (EA) tiers from the PEIS for the FKWQIP and hereby incorporates the PEIS by reference, in accordance with 40 CFR Part 1508.28. The Florida Keys Aqueduct Authority's (FKAA) Cudjoe Regional Wastewater Treatment System will address 12 of the 45 water quality *hot spots* in the Florida Keys identified in the Monroe County Sanitary Wastewater Master Plan (MCSWMP, Monroe County 2000) as requiring water quality improvements.

The overall Cudjoe Regional Wastewater Treatment Service Area (Service Area) is located in the Lower Florida Keys, and extends from Mile Marker (MM) 17 to MM 33, and includes ten islands (from north to south):

- No Name Key
- Big Pine Key
- Little Torch Key
- Middle Torch Key
- Big Torch Key
- Ramrod Key
- Summerland Key
- Cudjoe Key
- Upper Sugarloaf Key
- Lower Sugarloaf Key

The scope of the project is the construction of a centralized wastewater treatment system to service residents and commercial businesses located in the Cudjoe Regional Service Area. The proposed Wastewater Treatment Facility (WWTF) would use a five-stage Bardenpho system capable of meeting Monroe County effluent standards. This technology is considered appropriate for the Cudjoe Regional Service Area because it is a very stable and consistent

method of meeting the stringent nutrient removal standards. The anticipated plant flows are less than one Million Gallons per Day (MGD), so the WWTF will use shallow well injection for effluent disposal. The proposed design capacity of the WWTF is one MGD.

This section of the Draft EA explains the purpose and need for the federal action and the decision to be made by the Federal government. Authorizing legislation for the FKWQIP is described and the Cudjoe Regional Service Area delineated. Relevant issues and related environmental documentation addressed during the scoping process are discussed. Finally, the organization of the Draft EA is outlined.

1.1 Authorization

Under authority of Section 109 of the Consolidated Appropriation Act (Public Law106-554 (114 Stat. 2763A-222) dated December 21, 2000 (Appendix A of the PEIS), the Corps is authorized to provide technical and financial assistance to carry out projects for the planning, design, and construction of treatment works to improve water quality in the Sanctuary. Typically, large programs of this nature are not in accordance with Administration Program priorities of the Corps (i.e. navigation, flood control, or environmental restoration). However, non-traditional projects are routinely undertaken by the Corps as "work for others."

The Florida Keys Water Quality Improvement Act (FKWQIA) authorizes Congress to appropriate up to $100 million for FKWQIP projects for the planning and construction of wastewater and stormwater improvements in the Florida Keys. The total cost of the proposed project is an estimated $174 million.

1.2 Cudjoe Regional Wastewater Treatment Service Area

The overall Cudjoe Regional Service Area is located in the Lower Florida Keys, and extends from MM 17 to MM 33 (see **Figure 1-1**). The Service Area is bordered on the north by Florida Bay and on the south by the Atlantic Ocean. Additionally, most of the Service Area lies with the fragmented boundaries of the Florida Keys Wildlife Refuges Complex, which includes the National Key Deer Refuge and the Great White Heron National Wild Refuge. The following islands are located within the Service Area.

No Name Key

No Name Key is located east of Big Pine Key, and is approximately 3 miles north of U.S. Highway 1. The island covers approximately 998 acres, and is sparsely settled. No Name Key lies within the heart of the National Key Deer Refuge, and is positions just south of the Great White Heron National Wildlife Refuge.

Big Pine Key

Big Pine Key is located between MM 29.5 and MM 33. The island covers approximately 6330 acres, making it the largest island within the Service Area. With the exception of several moderately-populated subdivisions the island is sparsely settled. In general, businesses are located along the U.S. Highway 1 corridor. Additionally, a shopping center is located just north of the highway, between Wilder Road and Key Deer Boulevard. Big Pine Key lies within the
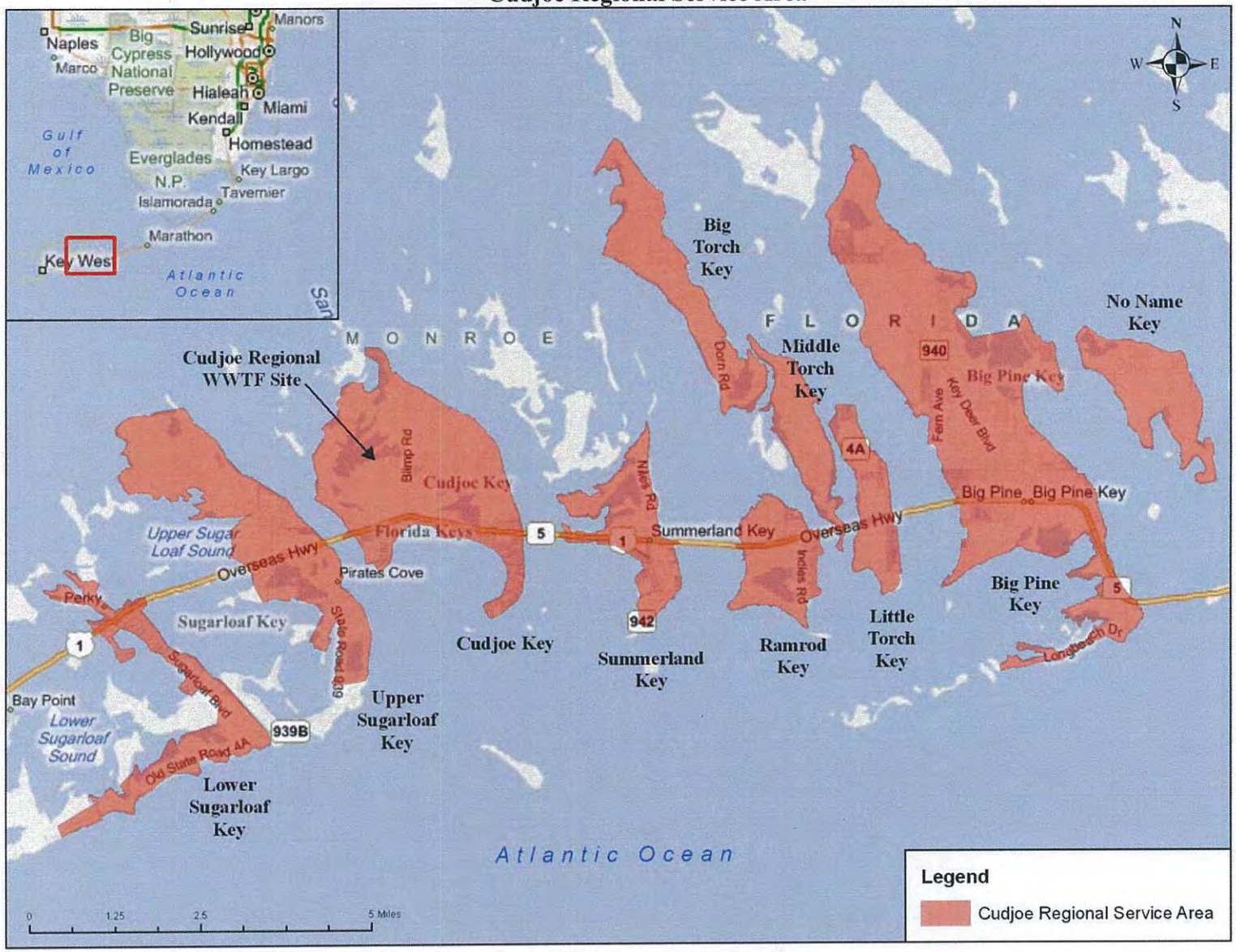
Figure 1-1
Cudjoe Regional Service Area