Appendix 4.0-A

Florida Keys Specific Ground Cover Plants for Vegetated BMPs

List of Trees/Shrubbery/Ground Covers for Storm-water Landscaped Areas

Examples of Shade Trees/Larger Trees/ Non-Salt Tolerant

Common Name	Botanical Name
Buttonwood, Green	Conocarpus erectus
Buttonwood, Silver	Conocarpus erectus var. sericeus
Gumbo Limbo	Bursera simaruba
Inkwood	Exothea paniculata
Mastic	Mastichodendron foetidissimum
Paradise Tree	Simaruba glauca
Seagrape	Coccoloba uvifera

Examples of Shade Trees/Larger Trees/ Salt Tolerant

Buttonwood, Green	Conocarpus erectus
Buttonwood, Silver	Conocarpus erectus var. sericeus
Seagrape	Coccoloba uvifera

Examples of Screening/Small Trees/Shrubbery Non-Salt Tolerant

Bahama Senna	Cassia chapmanii
Blackbead	Pithecellobium guadalupense
Blolly	Guapira discolor
Caper, Jamaica	Capparis cynophallophora
Cat's Claw	Pithecellobium unguis-cati
Cinnecord	Acacia choriophylla
Geiger	Cordia sebestena
Lignum Vitae	Guaiacum sanctum
Lime, Wild	Zanthoxylum fagara
Locust-berry	Byrsonima lucida
Palm, Silver	Coccothrinax argentata
Palm, Florida Thatch	Thrinax radiata
Palm, Keys Thatch	Thrinax morrisii
Palm, Silver	Coccothrinax argentata
Pigeon Plum	Coccoloba diversifolia
Scarlet Bush	Hamelia patens
Stopper, Spanish	Eugenia foetida
Stopper, White	Eugenia axillaris
Sweet Acacia	Acacia farnesiana
Wild Cotton	Gossypium hirsutum
Yellow Elder	Tecoma stans

Examples of Screening/Small Trees/Shrubbery Salt Tolerant

Bay Cedar	Suriana maritima
Blackbead	Pithecellobium guadalupense
Black Torch	Erithalis fruticos
Cat's Claw	Pithecellobium unguis-cati
Cinnecord	Acacia choriophylla
Geiger	Cordia sebestena
Palm, Silver	Coccothrinax argentata
Sea Lavender	Tournefortia gnaphalodes
Seven Year Apple	Casasia clusiifolia

Examples of Ground Covers /Non- Salt Tolerant

Common Name	Botanical Name
Blue Porterweed	Stachytarpheta jamaicensis
Chaff Flower	Alternanthera racemosa
Golden Creeper	Ernodea littoralis
Lantana, Wild	Lantana involucrata
Lily, Keys	Hymenocallis keyensis
Railroad vine	Ipomoea pes-caprae
Sea Ox-eye Daisy	Borrichia frutescens
Sea Ox-eye Daisy	Borrichia arborescens
Sesuvium	Sesuvium portulacastrum or S. maritimum

Examples of Ground Covers / Salt Tolerant

Batis	Batis maritima
Beach Pea	Canavalia maritima
Cord Grass	Spartina bakeri
Glass Wort	Salicornia virginica
Golden Creeper	Ernodea littoralis
Lily, Keys	Hymenocallis keyensis
Railroad vine	Ipomoea pes-caprae
Salt Grass	Distichlis spicata
Sea Oats	Uniola paniculata
Sea Ox-eye Daisy	Borrichia frutescens
Sea Ox-eye Daisy	Borrichia arborescens
Seashore Dropseed	Sporobolus virginicus
Sesuvium	Sesuvium portulacastrum or S. maritimum

Appendix 4.0-B

Stormwater Retrofit Projects

27th Street - Marathon
Sombrero Isles
Sombrero Beach Road FDOT
24th Street - Marathon
Saddle Bunch Bike Trail FDEP
Bahia Honda Bike Trail FDEP
US1 Rockland Channel to Shark Channel FDOT
US1 Big Coppitt Key Boat Ramp @ MM11 FDOT
US1 Boca Chica Channel to Rockland Channel FDOT
US1 Long Key @ MM66 FDOT
US1 Lower Matecumbe @ MM77 Bay and Ocean Sides FDOT
US1 North Harris Channel to Park Channel FDOT
US1 Bow Channel to Kemp Channel FDOT
US1 Indian Key Bay Side Parking @ MM78 FDOT
Safe Harbor (example - private marina retrofit)

Retrofit Projects
27th Street - Marathon

Description Of Problem Area

27th Street runs from the Overseas Highway (U.S. 1) in Marathon to the south ending at Boot Key Harbor. The land use is residential but highly impervious with many paved yards. Currently, runoff flows down small channels on each side of the street towards Boot Key Harbor where it discharges untreated through a 10-inch PVC pipe to the harbor as shown in Picture 1.

Recommended Action

The overall percent imperviousness for the 3.4 ac tributary area is about 90% resulting in a "C" factor of about 0.87. The following improvements are recommended:

- Install a treatment device such as those developed by CDS or Vortechnics to trap sediment prior to discharge to the harbor.
- Alternatively, this would be an ideal location to pilot test a device manufactured by Stormwater Management. The device is a structure similar to a junction box at the outfall with one or more special cylinders in it. Stormwater flows into the box and through the cylinders. The cylinders are filled with material to remove desired pollutants. For example, a cylinder covered with a mesh will remove TSS; a cylinder covered with a mesh and filled with an additional substance will remove TSS and DP.

Grant money is frequently available for pilot testing such projects. The location of this improvement is presented in **Figure 1**. A typical plan/profile view of the treatment device is presented in **Figure 2**. The estimated capital cost for the improvement is presented in **Table 1**.

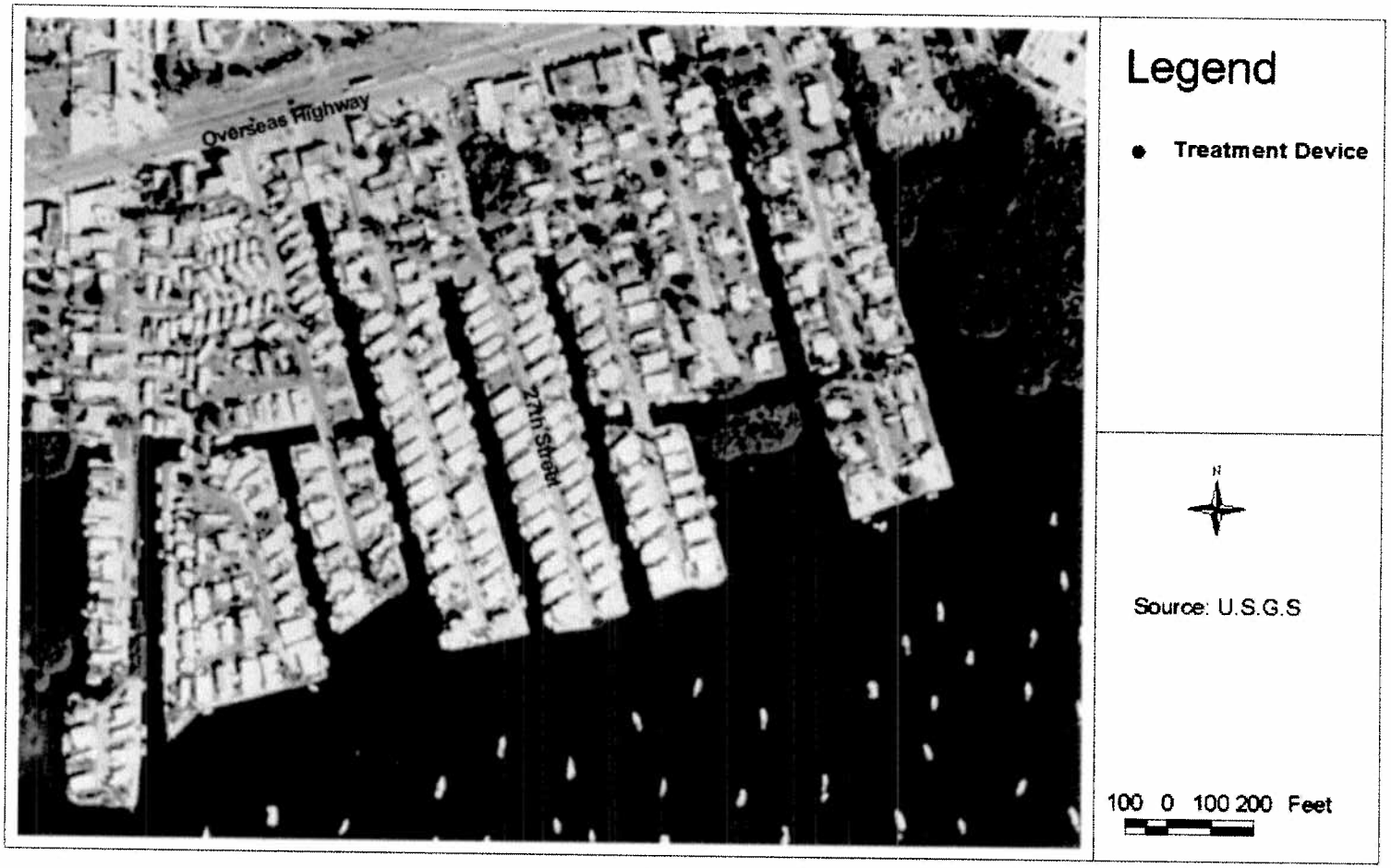
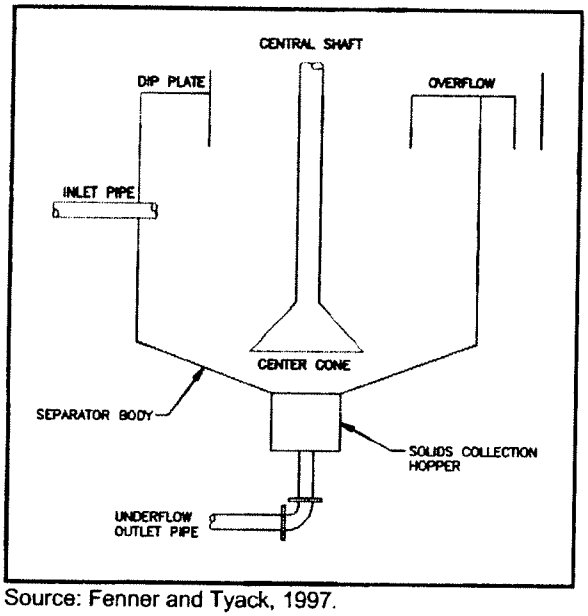


Figure1
Monroe County Stormwater Management Master Plan
RestorationProjects
27th Street - Marathon
Recommended Improvement Locations

Figure 2 - Vortechnics and CDS Treatment Device



Source: Fenner and Tyack, 1997.

Monroe County Stormwater Master Plan
Capital Cost Summary
27th Street - Marathon

	Item	Units	Unit Cost	Quantity	Total Cost
1	Storm Sewer	Ft	Variable (5)	0	$0
2	Storm Inlets	Each	$2,500	0	$0
3	Swales (1) (2)	Ft	$25	0	$0
4	Road/Driveway Repair	Sq Yd	$20	0	$0
5	Excavation/Earthwork	Cu Yd	$12	0	$0
6	Curb Replacements/Installation	Ft	$10	0	$0
7	Exfiltration Trench	Ft	$250	0	$0
8	Water Quality Treatment Unit (6)	Each	$15,000	1	$15,000
9	Install/Repair Drain Well	Each	$5,000	0	$0
10	Roof Drain Treatment Areas	Each	$1,500	0	$0
11	Berm	Ft	$15	0	$0

Subtotal 1	$15,000
Contingency (30% of Subtotal 1) (3)	$4,500
Subtotal 2	$19,500
Engineering, Survey, & Permitting (15 % of Subtotal 2)	$2,900
TOTAL COST (4)	$22,400

(1) Residential/Roadway swale costs include excavation, sod or landscaping. Commercial swale costs include excavation, inlets, pipes, barricades, and landscaping.
(2) This does not include land acquisition costs for swales not in existing rights-of-way.
(3) Includes contracor's overhead and profit as well as mobilization and standard contingencies.
(4) All costs are in 2001 dollars. Costs include only stormwater related infrastructure. Replacement or rehabilitation of non-stormwater infrastrucure is not included.
(5) Generally between $2.00 and $3.25/foot/in diameter depending on pipe size.
(6) Unit cost based upon sizing for tributary area of 10 acres or less.

Site Visit Photos

Picture 1 – 27th Street outfall pipe

Picture 2 – 27th Street looking north

Picture 3 – 27th Street looking south

Retrofit Projects
Sombrero Isles

Description of Problem Area

Sombrero Isles is located in the southeast portion of Marathon. At a public meeting for the SWMP, the area was identified as a chronic flooding problem area. A resident has reported that water ponds up to several feet deep along a wall on the north side of the upper west end of Calle Ensueno. Photos 1, 2, 3, and 4 show the Sombrero Isles area. Note on photo 3 the raised gravel median separating the travel lanes and the wall in photo 2 where the flooding is reported to occur.

Recommended Action

The approximate tributary area is 20.7 acres of low-density residential development. The area is about 25% impervious resulting in a "C" factor of 0.31. The proposed solution will provide for both flooding relief and water quality treatment as described below.

- The existing slightly raised gravel median between the travel lanes should be regraded and lowered to provide for storage of runoff as a landscaped swale. The existing gravel median is about 10-feet wide. If it has the center about 1-ft below the road elevation with 5:1 side slopes, the 2,100-ft of gravel median could provide for about 0.19 ac-ft of storage. Each end of the roadway has large circular turn areas with gravel medians, which could also be regraded to provide for about an additional 0.11 ac-ft of storage. The recessed gravel median would provide a percent annual capture of about 50% of the pollutants. It should be noted that numerous palm trees are planted in the gravel median. Care would have to be taken when regrading to insure they are not damaged.
- The northwest corner of Sombrero Isles needs a small outfall to Sister Creek to prevent chronic flooding. The tributary area to this part of the development is about 3.5 acres. An 18-inch culvert about 150-feet long should provide adequate conveyance. To provide treatment for the discharge, the planted area just to the east of the wall could be regraded into a retention swale with raised inlets so that only overflow from the swale would discharge.

The locations of the recommended improvements are presented in **Figure 1**. A typical swale section is presented in **Figure 2**. The estimated capital costs for these improvements are presented in **Table 1**.

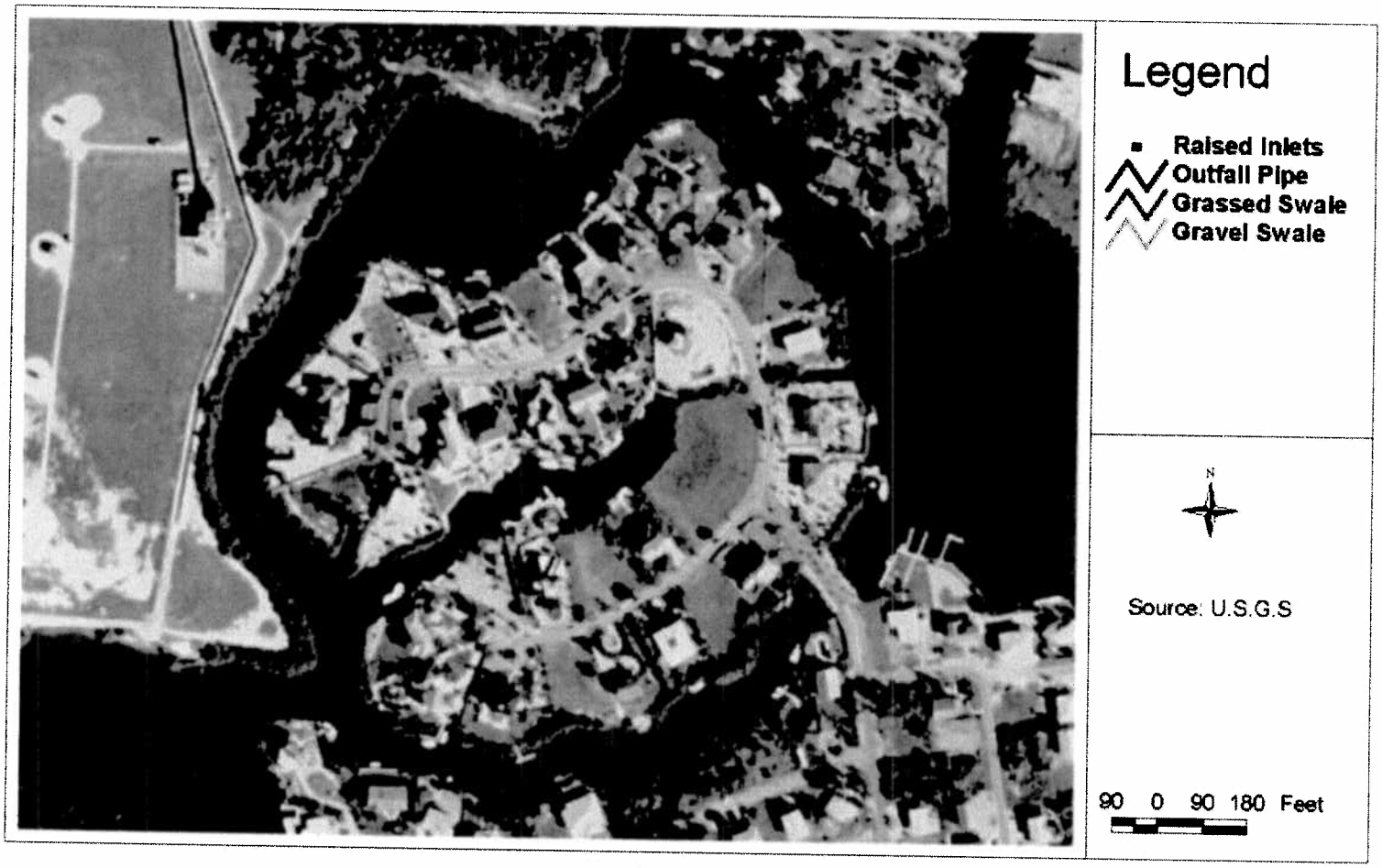
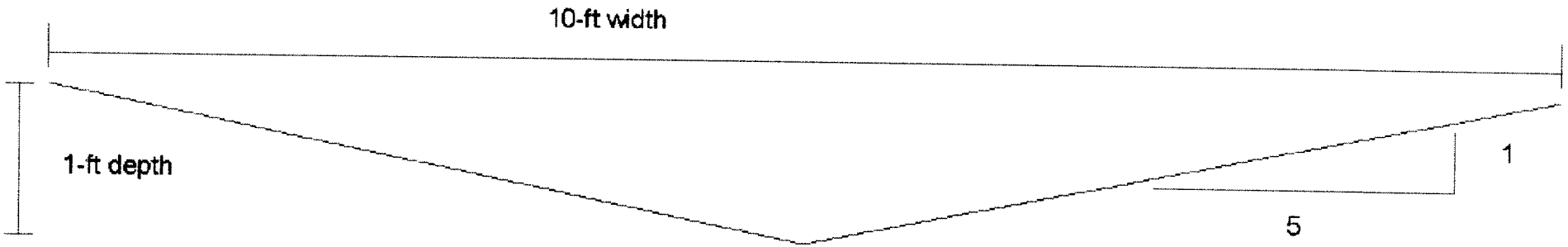


Figure1
Monroe County Stormwater Management Master Plan
RestorationProjects
Sombrero Isles
Recommended Improvement Locations



Existing gravel median to be regraded to above dimensions. Swale will not be grassed, remain gravel with existing plam trees

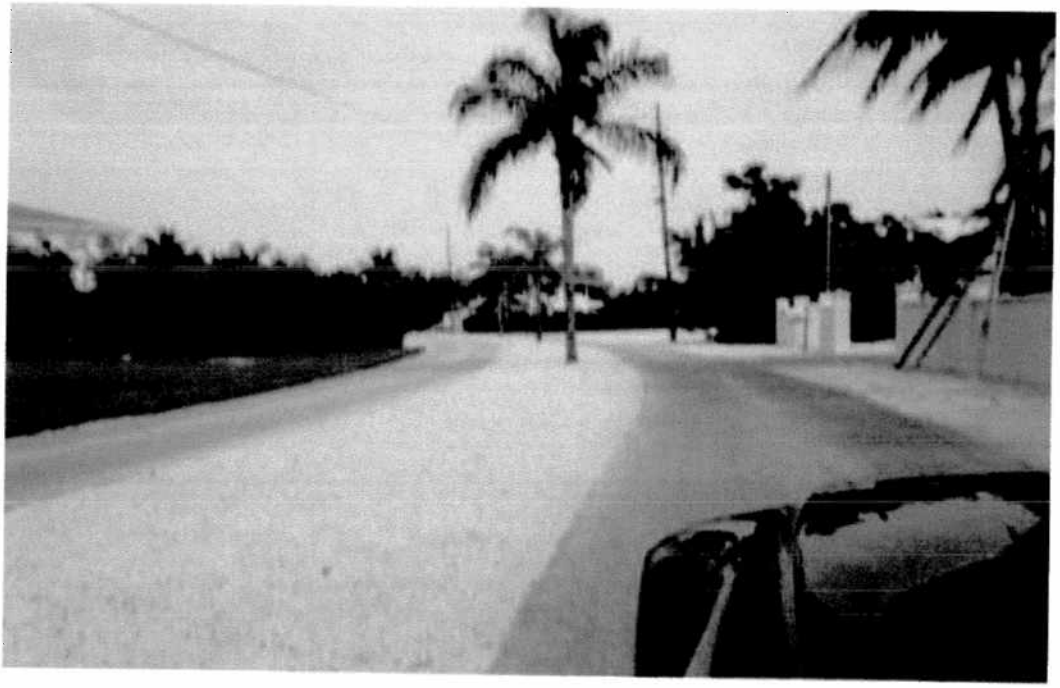
Figure 2
Monroe County Stormwater Management Plan
Restoration Projects
Sombrero Isles
Swale Cross-Sections

Monroe County Stormwater Master Plan
Capital Cost Summary
Sombrero Isles

	Item	Units	Unit Cost	Quantity	Total Cost
1	Storm Sewer	Ft	Variable (5)	250	$12,500
2	Storm Inlets	Each	$2,500	5	$12,500
3	Swales (1) (2)	Ft	$25	2,200	$55,000
4	Road/Driveway Repair	Sq Yd	$20	75	$1,500
5	Excavation/Earthwork	Cu Yd	$12	200	$2,400
6	Curb Replacements/Installation	Ft	$10	0	$0
7	Exfiltration Trench	Ft	$250	0	$0
8	Water Quality Treatment Unit (6	Each	$15,000	1	$15,000
9	Install/Repair Drain Well	Each	$5,000	0	$0
10	Roof Drain Treatment Areas	Each	$1,500	0	$0
11	Berm	Ft	$15	0	$0
	Subtotal 1				$98,900
	Contingency (30% of Subtotal 1) (3)				$29,700
	Subtotal 2				$128,600
	Engineering, Survey, & Permitting (15 % of Subtotal 2)				$19,300
	TOTAL COST (4)				$147,900

(1) Residential/Roadway swale costs include excavation, sod or landscaping. Commercial swale costs include excavation, inlets, pipes, barricades, and landscaping.
(2) This does not include land acquisition costs for swales not in existing rights-of-way.
(3) Includes contracor's overhead and profit as well as mobilization and standard contingencies.
(4) All costs are in 2001 dollars. Costs include only stormwater related infrastructure. Replacement or rehabilitation of non-stormwater infrastrucure is not included.
(5) Generally between $2.00 and $3.25/foot/in diameter depending on pipe size.
(6) Unit cost based upon sizing for tributary area of 10 acres or less.

Site Visit Photos



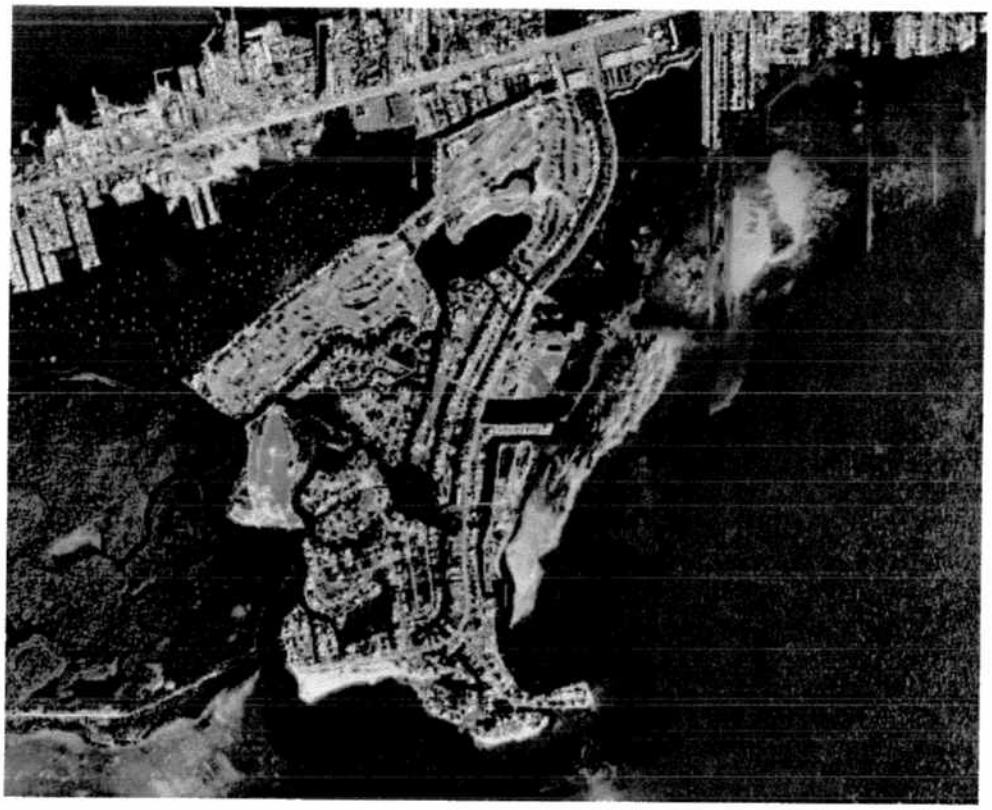
Picture 1 – Sombrero Isles, Calle Ensueno looking north

Picture 2 – Sombrero Isles, north portion Calle Ensueno looking west

Picture 3 – Sombrero Isles, west end Calle Ensueno looking west

Picture 4 – Sombrero Isles, south portion Calle Ensueno, east end looking west

Retrofit Projects
Sombrero Beach Road FDOT



Description of Problem Area

Sombrero Beach Road is a state road located in Marathon on the southeast end of Boot Key. Sombrero Beach Road is about 2.0 miles long and bordered primarily by residential areas, a school, and open areas in the northeast portion. This project was selected because it was high on FDOT's list of study areas and is slated for resurfacing in their 5-Year Plan. A canal is located about 150-feet to the west of the roadway for most of its length. The canal is about 75-feet wide and has only three outlets, therefore, flushing of pollutants will not readily occur. FDOT plans for the road indicate that it was designed to slope from the east to the west towards the canal for much of the northern portion. There is a bike path about 10-feet from the west side of the road. FDOT constructed a swale on the west side of a 500-ft section of the road in 1993. An injection well with a raised inlet was also installed at that time. Additionally, there are swales on both sides of the road in the vicinity of the school. Photos 1, 2, 3, 4, 5, 6, and 7 show the Sombrero Beach Road area during a recent field visit.

Recommended Action

The FDOT plans also indicate a right-of-way of about 100-feet with an average impervious area of 35 percent resulting in a "C" value of 0.40. The tributary area within the right-of-way is about 23.4 acres. The recommendation is:

- Construct a shallow grassed swale in the rights-of-way on both sides of the road where space permits and swales do not currently exist. The swale dimensions would be 9.0-feet wide, depth of 1.25-feet and side slopes of 3.6:1.
- If feasible, when the road is resurfaced, have the northern 3,000-feet sloped to the east. Overflow to the swale along this part of the road would flow through a wide marshy area prior to discharge to the ocean.

This swale configuration would provide 2.6 ac-ft of treatment volume. If this were reduced by 5 percent to take into account driveway crossings etc., the resulting treatment volume would be 2.5 ac-ft providing a percent annual capture of about 95% of the pollutants.

The location of the proposed improvements is presented in **Figure 1**. **Figure 2** presents a representative swale cross-section. The estimated capital costs for the improvements are presented in **Table 1**.

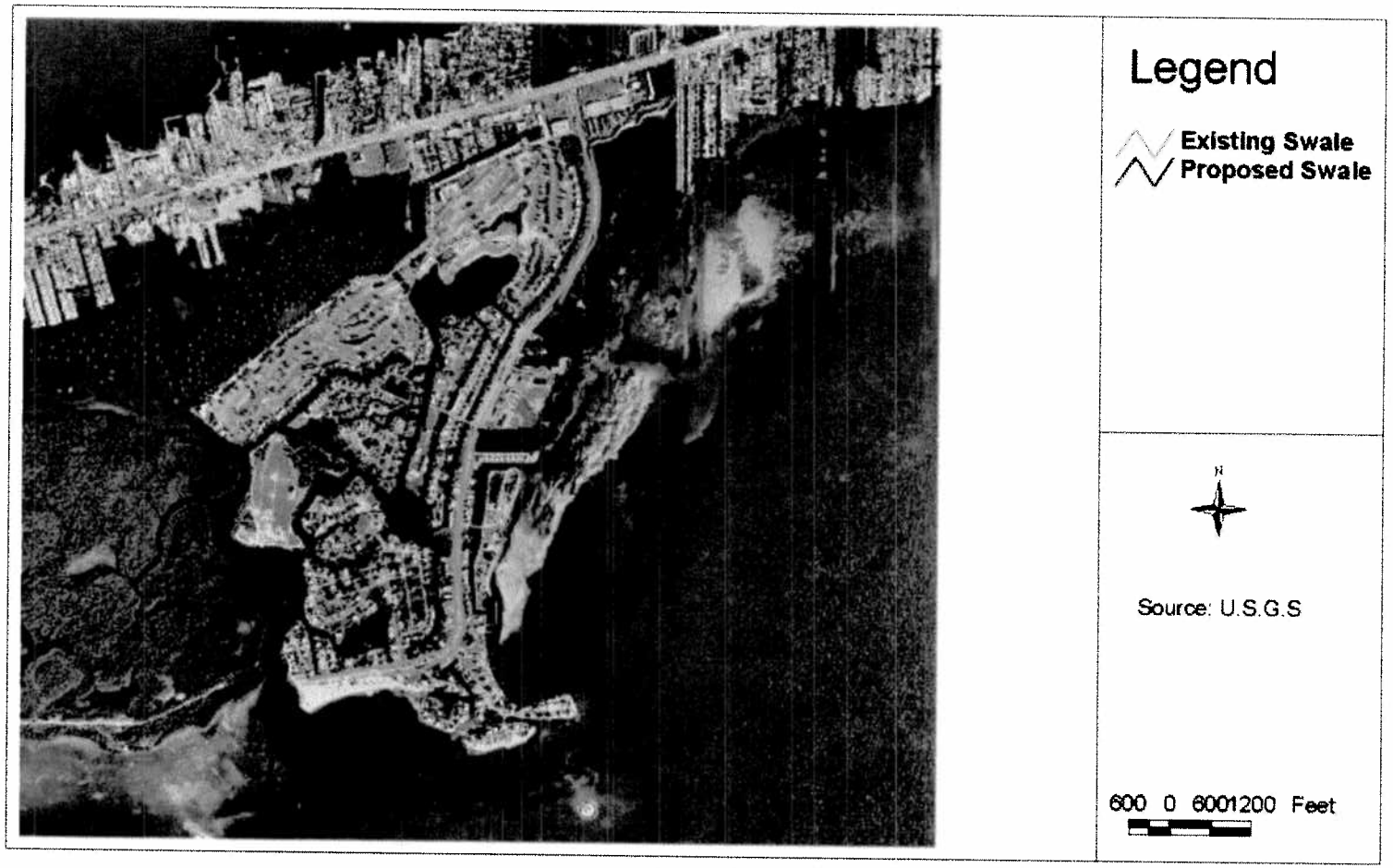
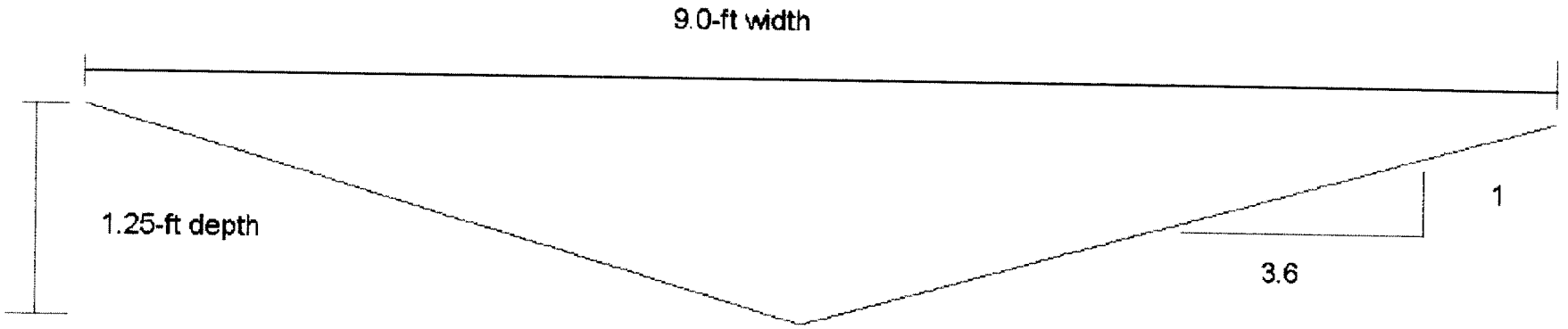


Figure1
Monroe County Stormwater Management Master Plan
RestorationProjects
Sombrero Beach Road FDOT- Marathon
Recommended Improvement Locations



Dimensions of swale along Sombrero Beach Road

Figure 2
Monroe County Stormwater Management Plan
Restoration Projects
Sombrero Beach Road
Swale Cross-Section

Monroe County Stormwater Master Plan
Capital Cost Summary
Sombrero Beach Road FDOT

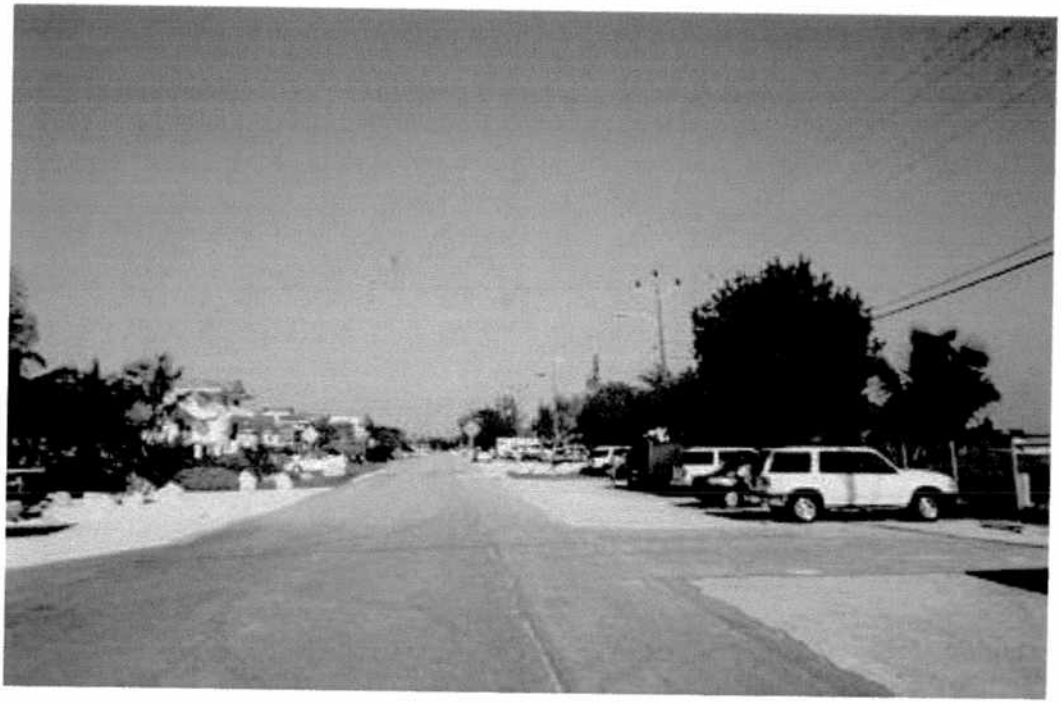
	Item	Units	Unit Cost	Quantity	Total Cost
1	Storm Sewer	Ft	Variable (5)	0	$0
2	Storm Inlets	Each	$2,500	0	$0
3	Swales (1) (2)	Ft	$25	14,350	$358,800
4	Road/Driveway Repair	Sq Yd	$20	0	$0
5	Excavation/Earthwork	Cu Yd	$12	0	$0
6	Curb Replacements/Installation	Ft	$10	0	$0
7	Exfiltration Trench	Ft	$250	0	$0
8	Water Quality Treatment Unit (6)	Each	$15,000	0	$0
9	Install/Repair Drain Well	Each	$5,000	0	$0
10	Roof Drain Treatment Areas	Each	$1,500	0	$0
11	Berm	Ft	$15	0	$0

Subtotal 1	$358,800
Contingency (30% of Subtotal 1) (3)	$107,600
Subtotal 2	$466,400
Engineering, Survey, & Permitting (15 % of Subtotal 2)	$70,000
TOTAL COST (4)	$536,400

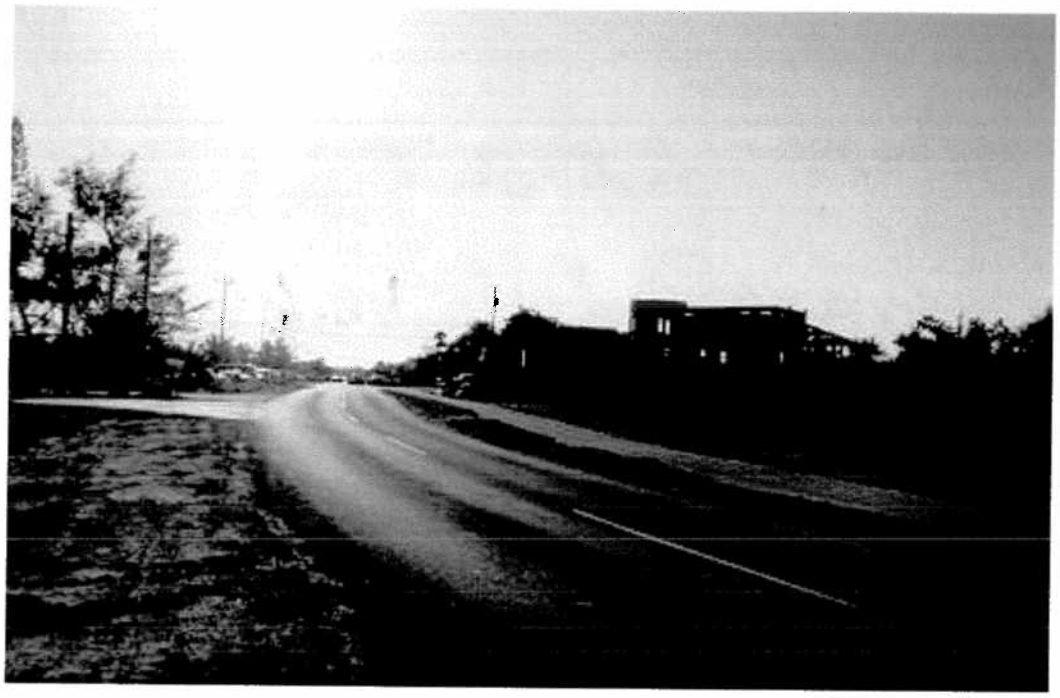
(1) Residential/Roadway swale costs include excavation, sod or landscaping. Commercial swale costs include excavation, inlets, pipes, barricades, and landscaping.
(2) This does not include land acquisition costs for swales not in existing rights-of-way.
(3) Includes contracor's overhead and profit as well as mobilization and standard contingencies.
(4) All costs are in 2001 dollars. Costs include only stormwater related infrastructure. Replacement or rehabilitation of non-stormwater infrastrucure is not included.
(5) Generally between $2.00 and $3.25/foot/in diameter depending on pipe size.
(6) Unit cost based upon sizing for tributary area of 10 acres or less.

Site Visit Photos

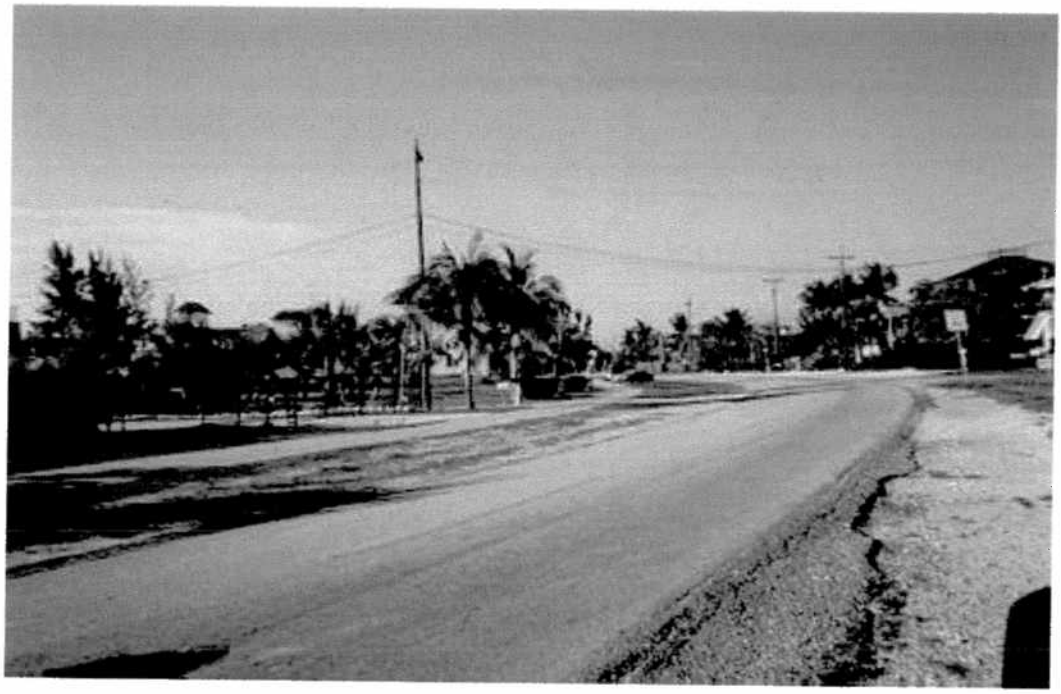
Picture 1 – Sombrero Beach Road, end of road at park area



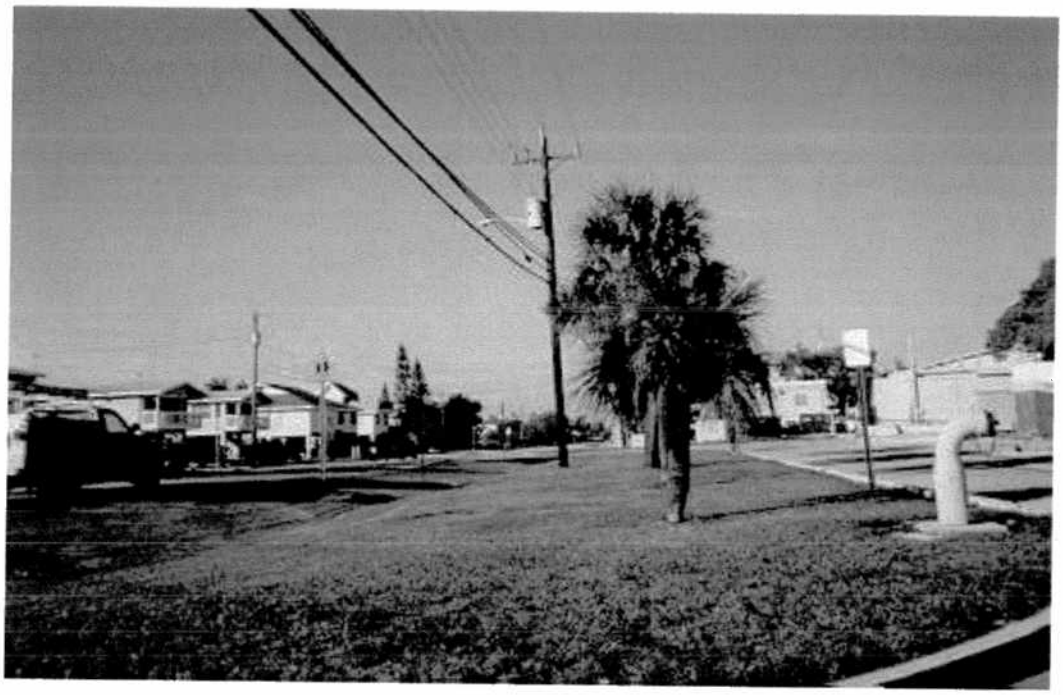
Picture 2 – Sombrero Beach Road, end of road looking east



Picture 3 – Sombrero Beach Road, SE end of road looking west



Picture 4 – Sombrero Beach Road, SE portion looking north

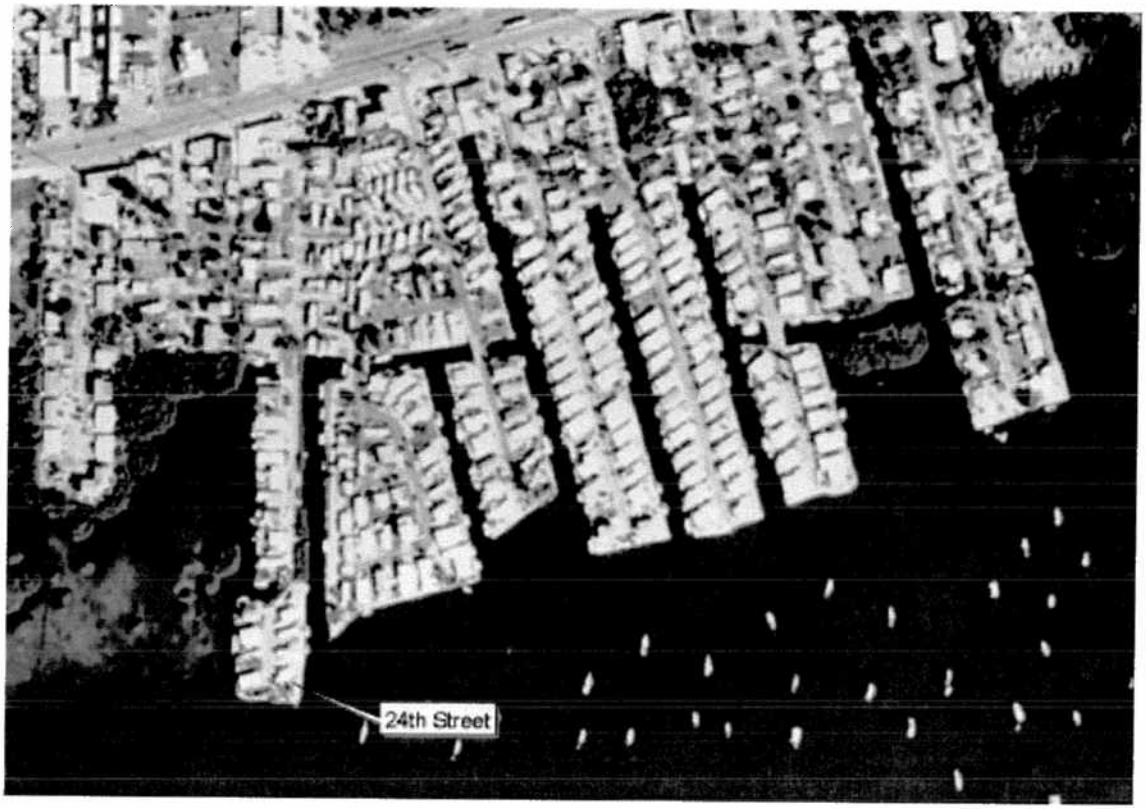


Picture 5 – Sombrero Beach Road, near school looking north

Picture 6 – Sombrero Beach Road, ½ mile south U.S. 1 looking north

Picture 7 – Sombrero Beach Road, ½ mile south of U.S.1 looking south

Retrofit Projects
24th Street – Marathon



Description of Problem Area

24th Street runs from the Overseas Highway (U.S. 1) in Marathon to the south for about 1,400-feet ending at Boot Key Harbor. The northern 600-feet has houses on both sides of the road, the southern 800-feet has houses on the west side and a 5 to 6-foot wide vegetated barrier adjacent to a waterway. Runoff generally flows from the west to east through the vegetated barrier, and into Boot Key Harbor. There are a couple of holes cut into the vegetated barrier where residents have boats tied up to the adjacent waterway. Pictures 1, 2, and 3 depict the area.

Recommended Action

The recommended improvements area:

- Construct a small berm at the opening in the vegetated barrier to prevent runoff from short-circuiting directly into the waterway.
- Construct a small swale to treat runoff from the northern 600-feet of the roadway prior to discharge to Boot Key Harbor.

The locations of the proposed improvements are presented in **Figure 1**. A typical swale section is presented in **Figure 2**. The estimated capital costs for the improvements are presented in **Table 1**.

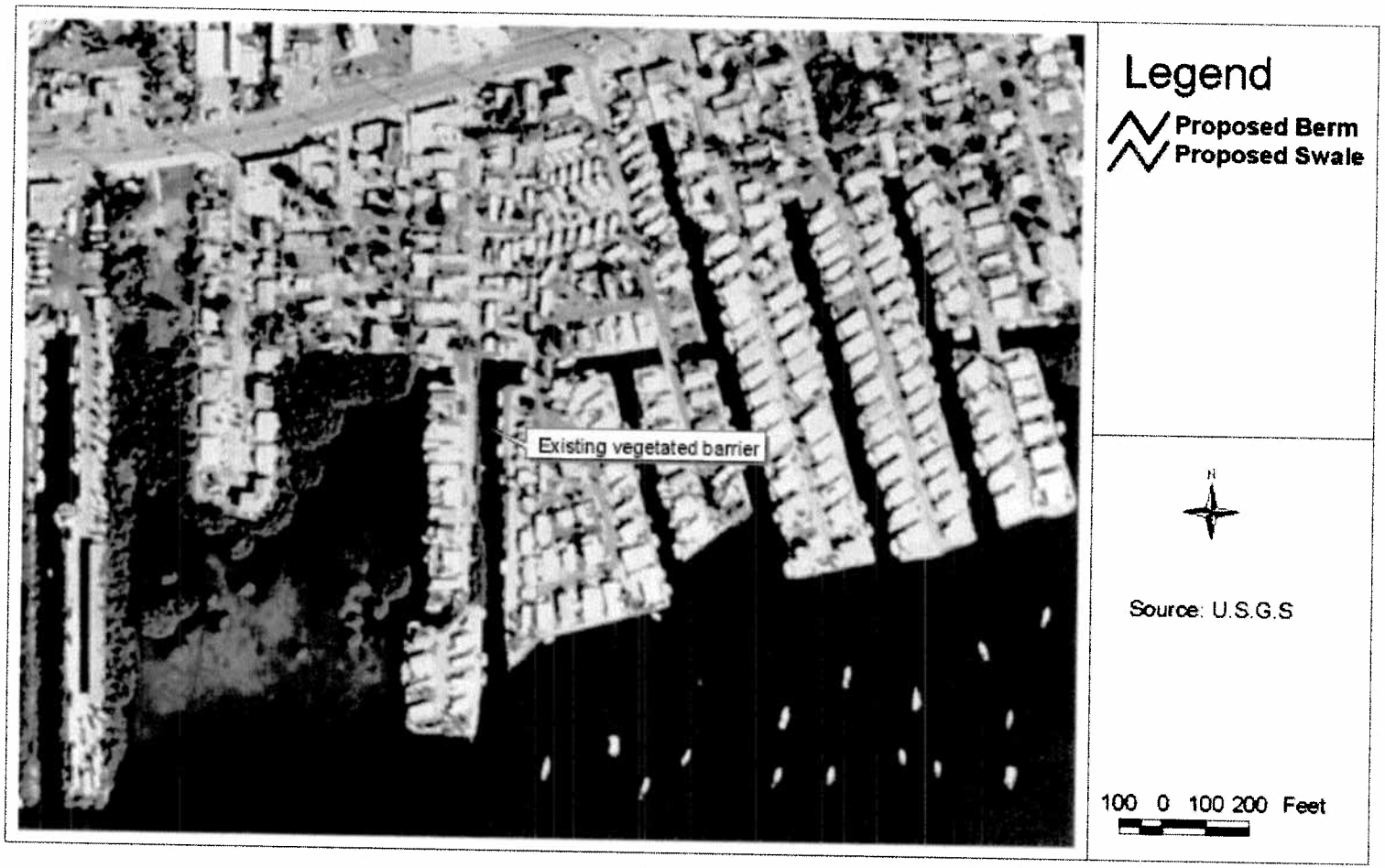


Figure1
Monroe County Stormwater Management Master Plan
RestorationProjects
24th Street - Marathon
Recommended Improvement Locations

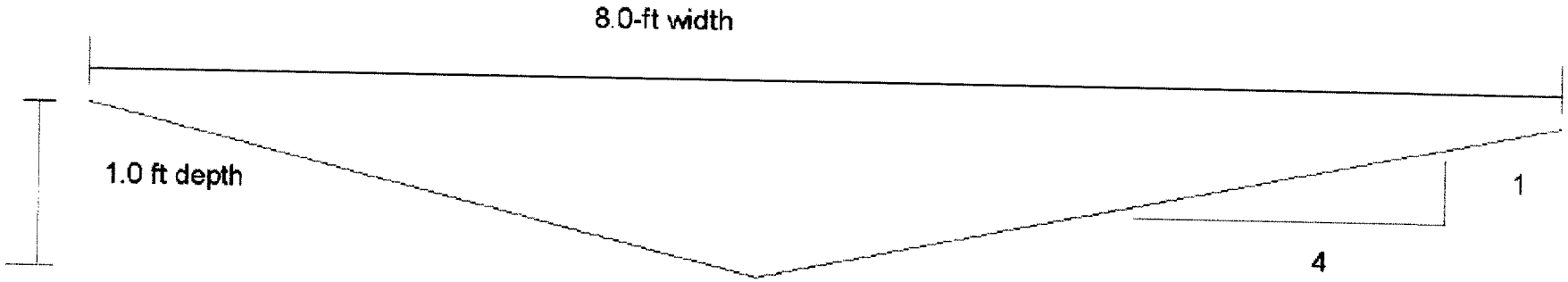


Figure 2
Monroe County Stormwater Management Plan
Restoration Projects
24th StreetSwale Cross-Section

Monroe County Stormwater Master Plan
Capital Cost Summary
24th Street - Boot Key Harbor -- Marathon

	Item	Units	Unit Cost	Quantity	Total Cost
1	Storm Sewer	Ft	Variable (5)	0	$0
2	Storm Inlets	Each	$2,500	0	$0
3	Swales (1) (2)	Ft	$25	0	$0
4	Road/Driveway Repair	Sq Yd	$20	75	$1,500
5	Excavation/Earthwork	Cu Yd	$12	0	$0
6	Curb Replacements/Installation	Ft	$10	0	$0
7	Exfiltration Trench	Ft	$250	0	$0
8	Water Quality Treatment Unit (6)	Each	$15,000	0	$0
9	Install/Repair Drain Well	Each	$5,000	0	$0
10	Roof Drain Treatment Areas	Each	$1,500	0	$0
11	Berm	Ft	$15	50	$800

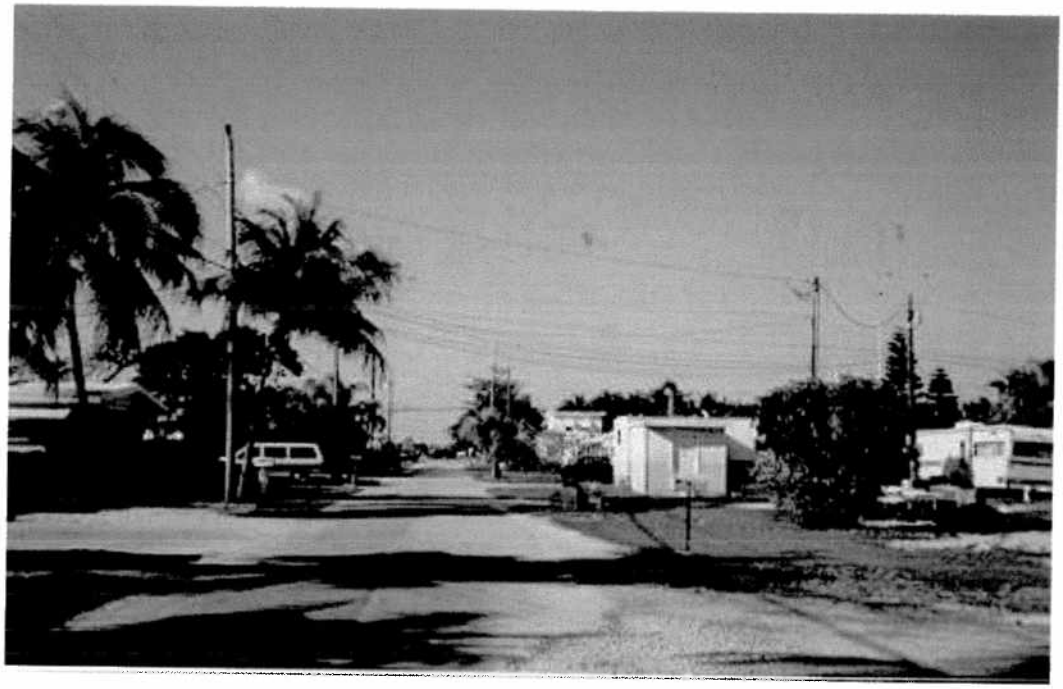
Subtotal 1	$2,300
Contingency (30% of Subtotal 1) (3)	$700
Subtotal 2	$3,000
Engineering, Survey, & Permitting (15 % of Subtotal 2)	$500
TOTAL COST (4)	$3,500

(1) Residential/Roadway swale costs include excavation, sod or landscaping. Commercial swale costs include excavation, inlets, pipes, barricades, and landscaping.
(2) This does not include land acquisition costs for swales not in existing rights-of-way.
(3) Includes contracor's overhead and profit as well as mobilization and standard contingencies.
(4) All costs are in 2001 dollars. Costs include only stormwater related infrastructure. Replacement or rehabilitation of non-stormwater infrastrucure is not included.
(5) Generally between $2.00 and $3.25/foot/in diameter depending on pipe size.
(6) Unit cost based upon sizing for tributary area of 10 acres or less.

Site Visit Photos

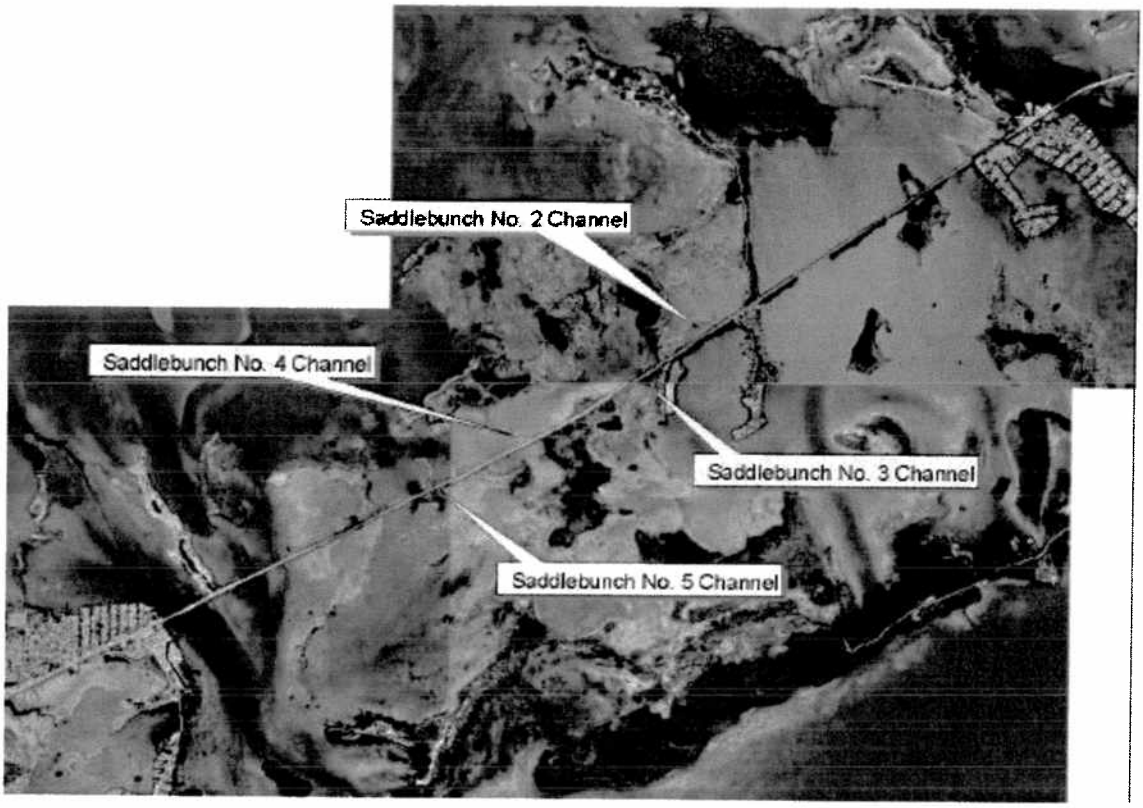
Picture 1 – 24th Street looking south at vegetated barrier

Picture 2 – 24th Street looking south



Picture 3 – 24th Street looking north

Retrofit Projects
Saddlebunch Bike Trail FDEP



Description of Problem Area

The Saddlebunch Bike Trail is a portion of the Florida Keys Overseas Heritage Trail. Two projects make up the Saddlebunch Keys portion of the Heritage Trail as described below.

- Big Coppitt Key from mile marker 11 to mile marker 15. This portion of the project has already been designed and as of 3/00 had an estimated construction cost of $885,263.
- Saddlebunch Key from mile marker 15 to mile marker 16.5. This portion of the trail has not been designed yet but on 3/00 had an estimated construction cost of $382,134.

Both sections of the trail are to be constructed on the Ocean side of the Overseas Highway according to the Heritage Trail Master Plan. There are several bridges along this section of the trail. The trail was originally designed to be 8-ft wide, but was recently increased to 12-ft wide.

Recommended Action

The following recommendations are made for this portion of the trail.

- As part of the design, FDEP is going to be constructing a swale on the south side of the bike trail for the Big Coppitt Key section. To provide a capture of 95 percent for just the new impervious area from the trail, ("C" = 0.95), a swale with a cross-sectional area of 2.5 ft^2/ft of length would be required. A shallow grassed swale 10-inches deep, with 3.6:1 side slopes, and 6-feet wide would provide the desired treatment. A swale this shallow should not be a hazard to bikers on the trail.
- The Saddlebunch Key section has yet not been designed; therefore it is recommended to provide retrofit treatment for the Overseas Highway in addition to treatment for the new bike trail where space permits. Of this 7,900-ft long section of the trail, about 1,400-ft of it is a bridge that will not be treated by a swale leaving 6,500 of this section to be swaled. Including the bike trail and the existing roadway, there will be about 6.7 acres of impervious area in the 6,500-foot section of the trail to be treated. To achieve 95 percent capture of pollutants, 1.4 ac-ft of treatment volume will be needed. Where space permits, the recommended swale configuration would be to construct a swale that is 1-ft deep, 5.5:1 side slopes, width of 11-ft between the Overseas Highway and the bike trail. It is estimated that about 3,800 feet of the bike trail may be able to support this swale. This swale configuration will provide for 0.95 ac-ft of treatment volume.

Additionally, a smaller swale should be constructed between the bike trail and the ocean along the entire 6,500 length. The smaller swale would have dimensions of 1-ft deep, 3:1 side slopes, width of 6-ft and provide for 0.45 ac-ft of treatment volume. Combined, the two swales will provide a full 2.5 inches of retrofit treatment for this section of the bike trail and the Overseas Highway.

The locations of the proposed improvements are presented in **Figure 1**. A typical swale section is presented in **Figure 2**. The estimated capital costs for the improvements are presented in **Table 1**.

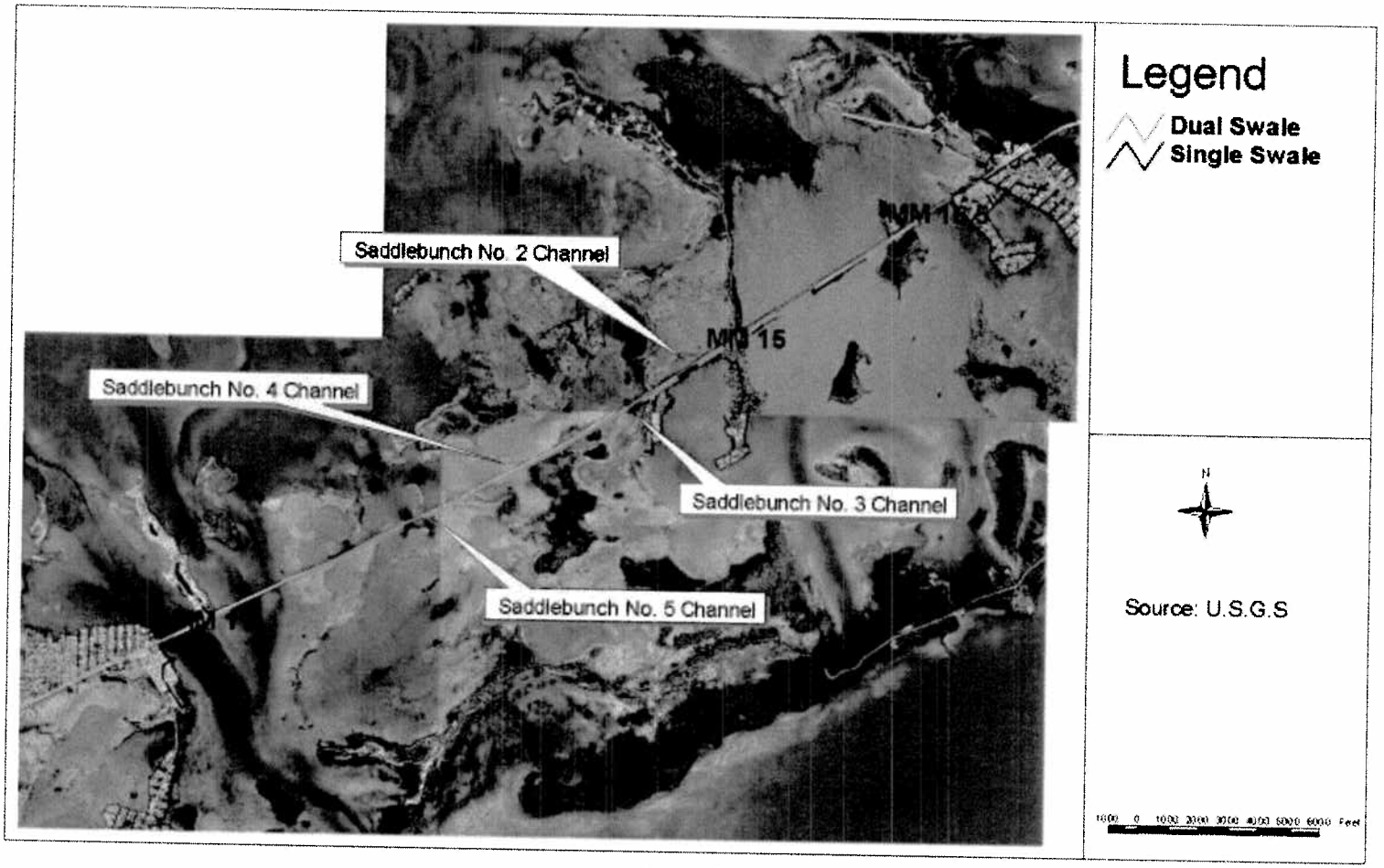


Figure1
Monroe County Stormwater Management Master Plan
RestorationProjects
Saddlebunch Bike Trail FDEP
Recommended Improvement Locations

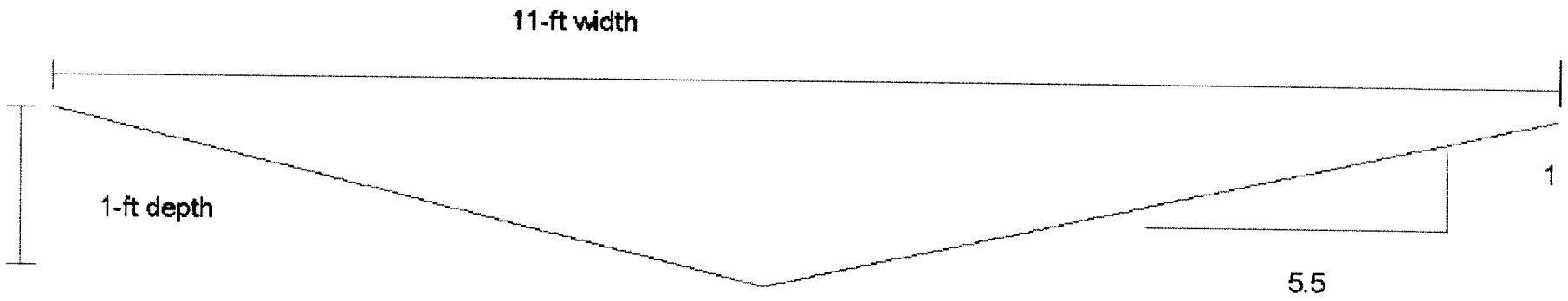


Figure 2
Monroe County Stormwater Management Plan
Restoration Projects
Saddlebunch Bike Trail Swale Cross-Section

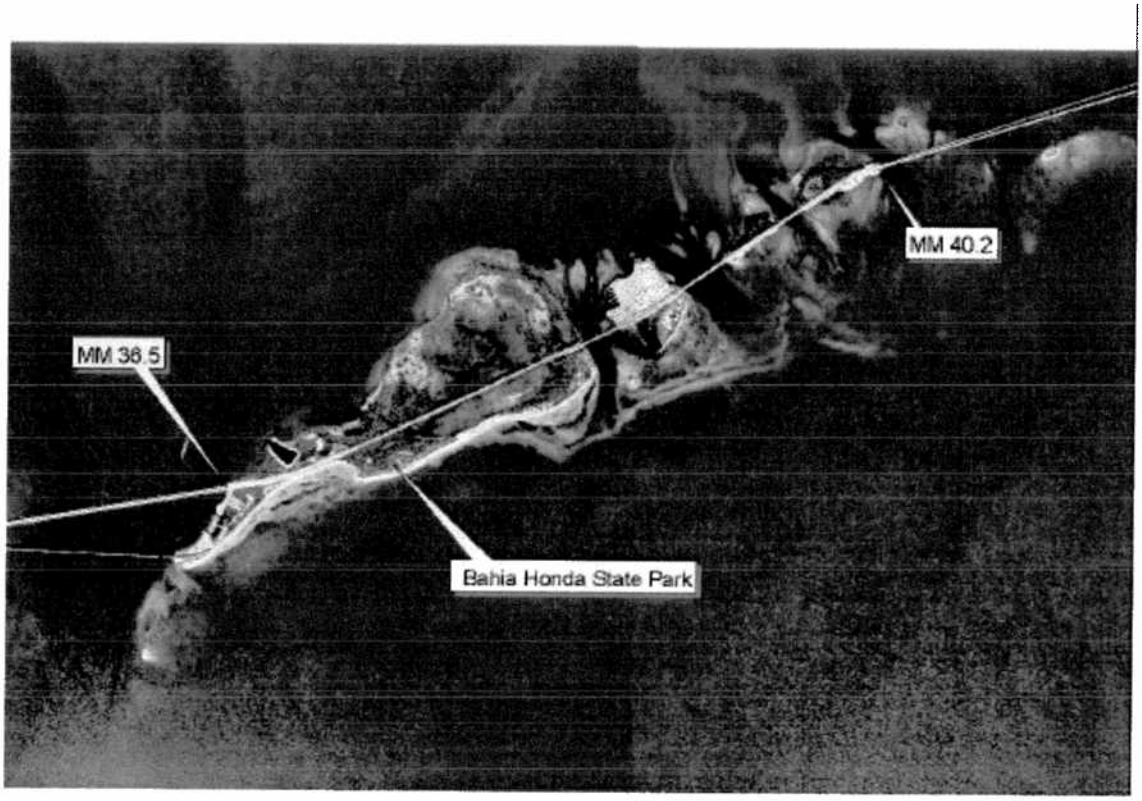
Monroe County Stormwater Master Plan
Capital Cost Summary
Saddlebunch Bike Trail - FDEP

	Item	Units	Unit Cost	Quantity	Total Cost
1	Storm Sewer	Ft	Variable (5)	0	$0
2	Storm Inlets	Each	$2,500	0	$0
3	Swales (1) (2)	Ft	$12	24,850	$298,200
4	Road/Driveway Repair	Sq Yd	$20	0	$0
5	Excavation/Earthwork	Cu Yd	$12	0	$0
6	Curb Replacements/Installation	Ft	$10	0	$0
7	Exfiltration Trench	Ft	$250	0	$0
8	Water Quality Treatment Unit (6)	Each	$15,000	0	$0
9	Install/Repair Drain Well	Each	$5,000	0	$0
10	Roof Drain Treatment Areas	Each	$1,500	0	$0
11	Porous Pavement	Sq Yd	$20	0	$0

Subtotal 1	$298,200
Contingency (30% of Subtotal 1) (3)	$89,500
Subtotal 2	$387,700
Engineering, Survey, & Permitting (15 % of Subtotal 2)	$58,200
TOTAL COST (4)	$445,900

(1) Residential/Roadway swale costs include excavation, sod or landscaping. Commercial swale costs include excavation, inlets, pipes, barricades, and landscaping.
(2) This does not include land acquisition costs for swales not in existing rights-of-way.
(3) Includes contracor's overhead and profit as well as mobilization and standard contingencies.
(4) All costs are in 2001 dollars. Costs include only stormwater related infrastructure. Replacement or rehabilitation of non-stormwater infrastrucure is not included.
(5) Generally between $2.00 and $3.25/foot/in diameter depending on pipe size.
(6) Unit cost based upon sizing for tributary area of 10 acres or less.

Retrofit Projects
Bahia Honda Bike Trail FDEP



Description of Problem Area

The Bahia Honda Bike Trail is a portion of the Florida Keys Overseas Heritage Trail and begins at the west end of Bahia Honda (MM 36.5) and continues to the east end of Little Duck Key (MM 40.2). The trail is to be constructed on the bay side of the Overseas Highway. Of this section of the trail, about 3,000-feet of it are comprised of bridges leaving about 16,500 of trail to provide treatment for. The trail will run along side Bahia Honda State Park and will be incorporated into it.

Recommended Action

The following recommendations are made for this portion of the trail to provide for retrofit treatment of the Overseas Highway and for treatment of the new bike trail.

- Including the bike trail and the existing roadway, there will be about 17.0 acres of impervious area ("C" factor of 0.95) in the 16,500 foot section of the trail to be treated. To achieve 95 percent capture of pollutants, 3.5 ac-ft of treatment volume will be needed. It is recommended to use a dual swale approach, with a roadside swale on the north side of the Overseas Highway (where space permits for about five sections with a total length of about 7,900-feet), and a smaller swale along the bay side of the entire trail length. The recommended roadside swale configuration is a swale 1-ft deep, 5.5:1 side slopes, width of 11-ft between the Overseas Highway and the bike trail. This swale configuration will provide for 2.0 ac-ft of treatment volume. The smaller bayside swale would have dimensions of 1-ft deep, 3:1 side slopes, width of 6-ft and provide for 1.5 ac-ft of treatment volume. Combined, the two swales will provide a full 2.5 inches of retrofit treatment for this section of the bike trail and the Overseas Highway.

The locations of the proposed improvements are presented in **Figure 1**. A typical swale section is presented in **Figure 2**. The estimated capital costs for the improvements are presented in **Table 1**.

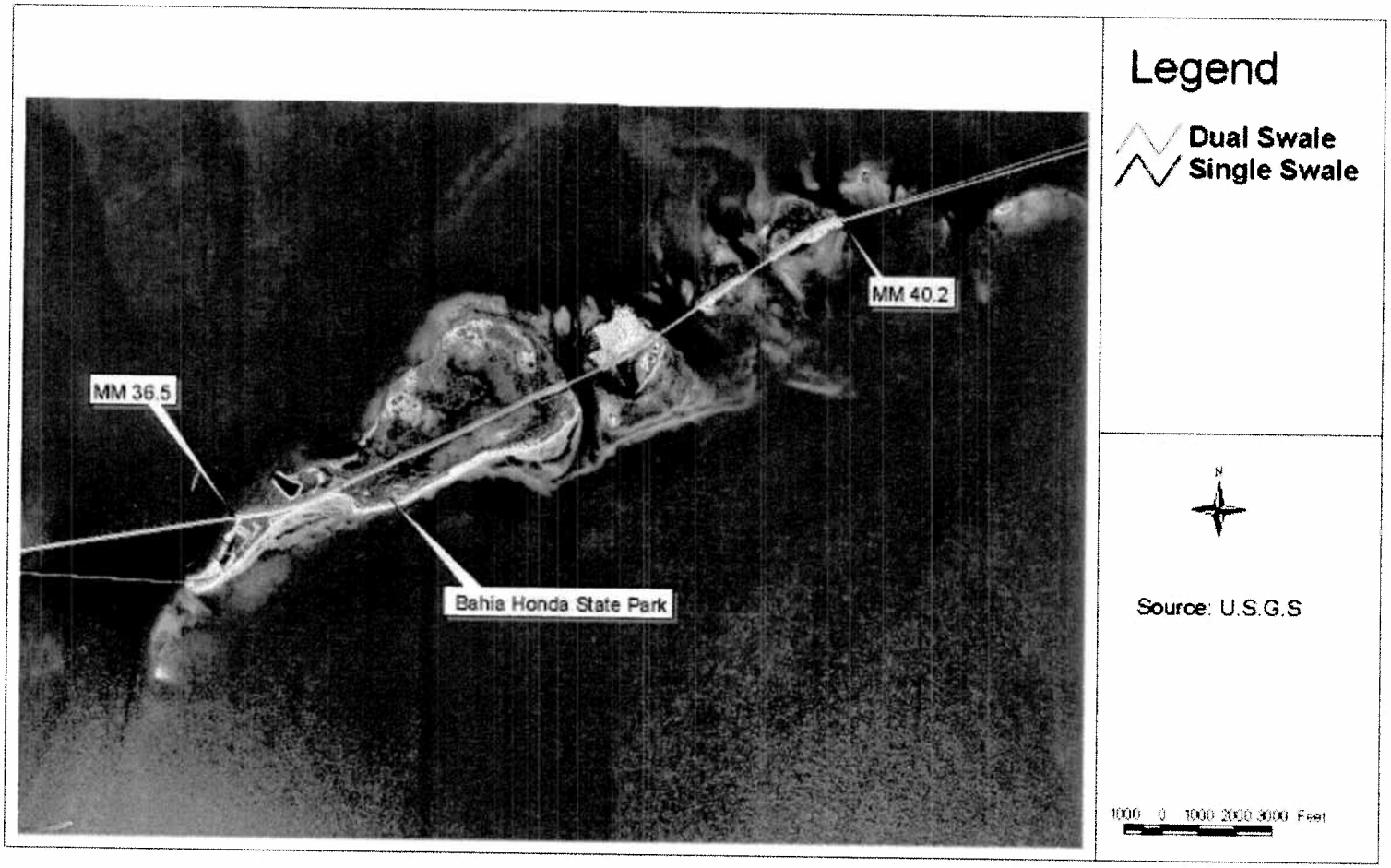
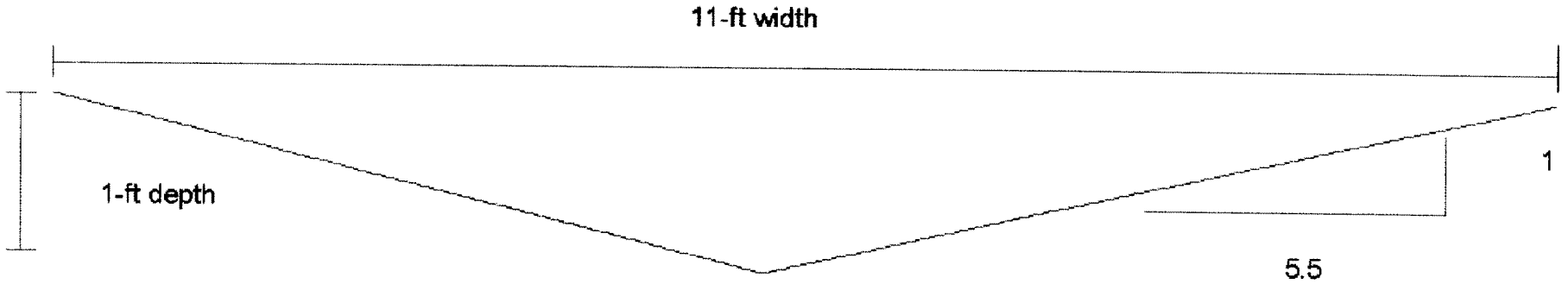
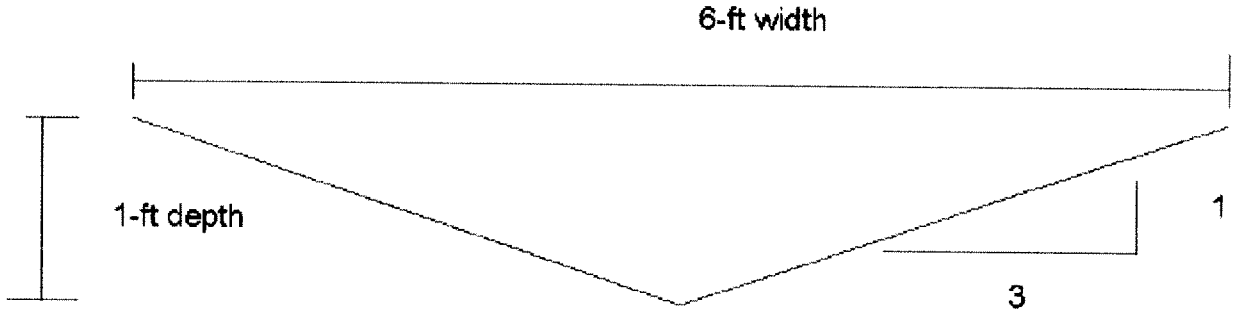


Figure1
Monroe County Stormwater Management Master Plan
RestorationProjects
Bahia Honda Bike Trail FDEP
Recommended Improvement Locations

CDM Camp Dresser & McKee



Roadside swale cross section



Bike trail swale cross section

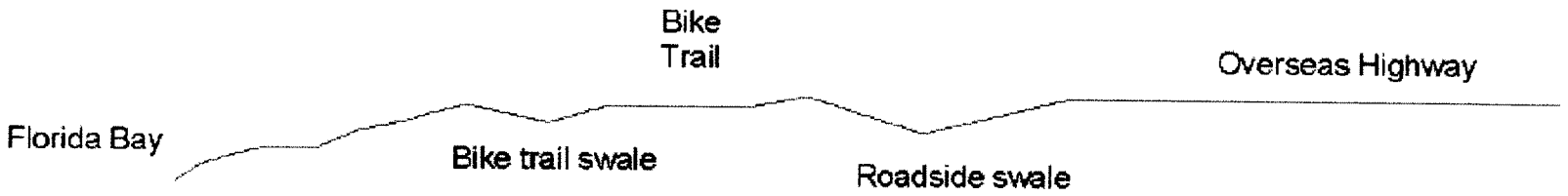


Figure 2
Monroe County Stormwater Management Plan
Restoration Projects
Bahia Honda Trail Swale Cross-Sections

Monroe County Stormwater Master Plan
Capital Cost Summary
Bahia Honda Bike Trail - FDEP

	Item	Units	Unit Cost	Quantity	Total Cost
1	Storm Sewer	Ft	Variable (5)	0	$0
2	Storm Inlets	Each	$2,500	0	$0
3	Swales (1) (2)	Ft	$12	24,400	$292,800
4	Road/Driveway Repair	Sq Yd	$20	0	$0
5	Excavation/Earthwork	Cu Yd	$12	0	$0
6	Curb Replacements/Installation	Ft	$10	0	$0
7	Exfiltration Trench	Ft	$250	0	$0
8	Water Quality Treatment Unit (6)	Each	$15,000	0	$0
9	Install/Repair Drain Well	Each	$5,000	0	$0
10	Roof Drain Treatment Areas	Each	$1,500	0	$0
11	Berm	Ft	$15	0	$0

Subtotal 1	$292,800
Contingency (30% of Subtotal 1) (3)	$87,800
Subtotal 2	$380,600
Engineering, Survey, & Permitting (15 % of Subtotal 2)	$57,100
TOTAL COST (4)	$437,700

(1) Residential/Roadway swale costs include excavation, sod or landscaping. Commercial swale costs include excavation, inlets, pipes, barricades, and landscaping.
(2) This does not include land acquisition costs for swales not in existing rights-of-way.
(3) Includes contracor's overhead and profit as well as mobilization and standard contingencies.
(4) All costs are in 2001 dollars. Costs include only stormwater related infrastructure. Replacement or rehabilitation of non-stormwater infrastrucure is not included.
(5) Generally between $2.00 and $3.25/foot/in diameter depending on pipe size.
(6) Unit cost based upon sizing for tributary area of 10 acres or less.

U.S. 1 RESURFACING
ROCKLAND CHANNEL TO SHARK CHANNEL

U.S. 1 RESURFACING - Rockland Channel to Shark Channel

Description of Problem Area

This section of the Overseas Highway is scheduled for resurfacing by the Florida Department of Transportation in 2003. The plans will include turn lanes. This section of the Overseas Highway is two lane, not divided with grassed shoulders and in some instances lime rock shoulders and a bike path or pedestrian path along the north side. In general, the roadway is higher than the surrounding areas. This section is approximately 1.3 miles in length and 686,400 s.f. in area of which 263,578 s.f. is impervious, resulting in a "C" factor of 0.43. Photos 6, 7, 8 & 9 depict the study area. Preliminary indication from FDOT is that turn lanes will be constructed, decreasing the existing pervious area.

Recommended Improvements

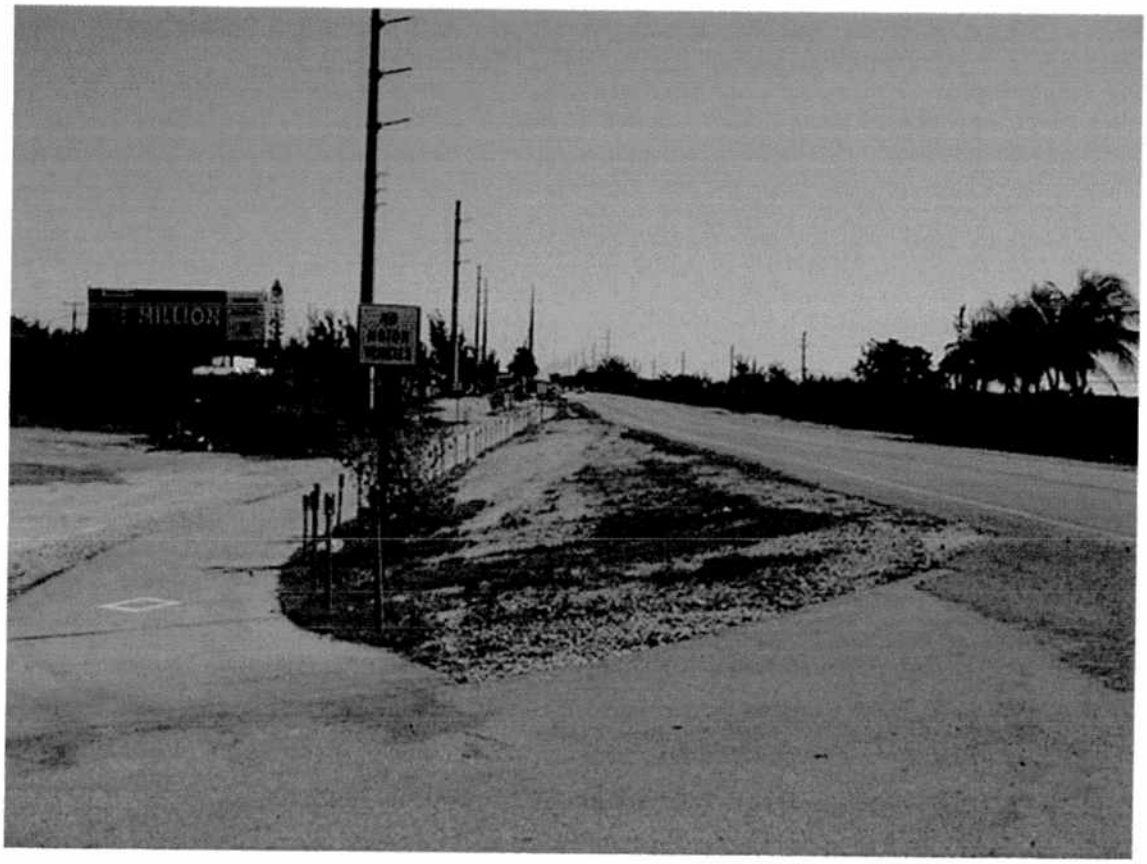
- Widen the paved shoulder to 6' to eliminate parking on the grass.
- Swale the shoulder at the edge of pavement. This should be a "V" shaped swale, 1' deep with 3:1 side slopes, right-of-way permitting. These swales will provide 1.89 ac.ft. of total storage.
- Sod the swale and remainder of the side slope.
- Use porous asphalt (Friction Course) for the resurfacing.
- Set a cross slope on the proposed turn lanes to drain to the swale above.

At the present time, there is a treatment volume required of 1.35 inches. The proposed improvements would provide a level of treatment to 1.03 inches and provide a 93% volume capture. The estimated capital cost of these improvements is presented in the Capital Cost Summary.

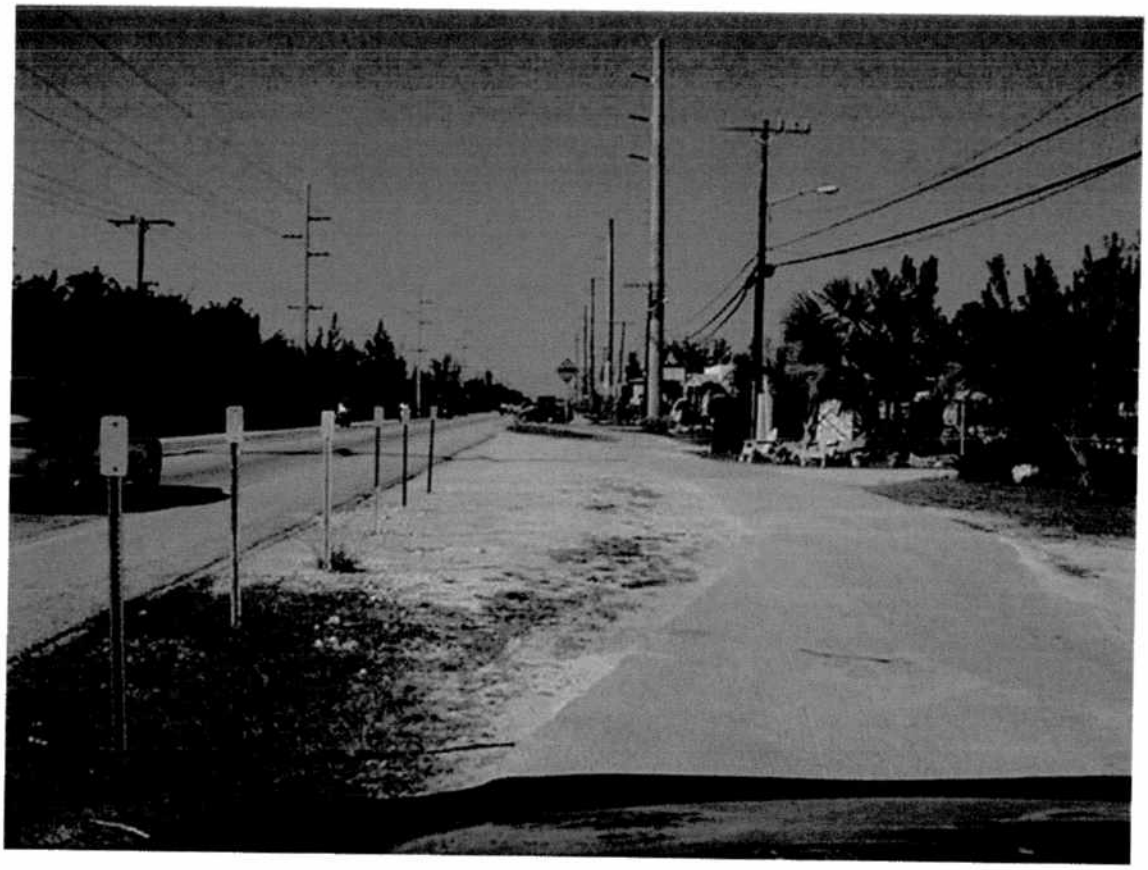
Monroe County Stormwater Master Plan
Capital Cost Summary
US1 Rockland Channel to Shark Channel

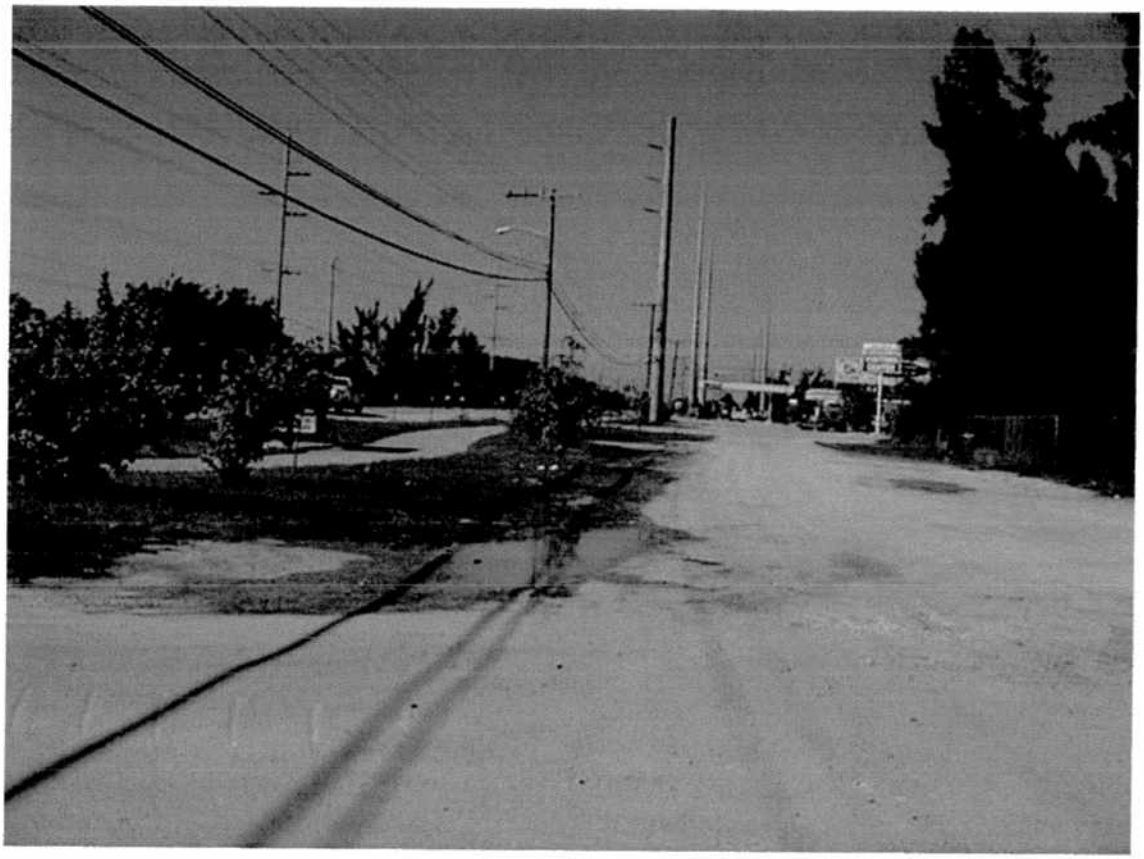
	Item	Units	Unit Cost	Quantity	Total Cost
1	Storm Sewer	Ft	Variable (5)	0	$0
2	Storm Inlets	Each	$2,500	0	$0
3	Swales (1) (2)	Ft	$25	13,728	$343,200
4	Road/Driveway Repair	Sq Yd	$20	0	$0
5	Excavation/Earthwork	Cu Yd	$12	0	$0
6	Curb Replacements/Installation	Ft	$10	0	$0
7	Exfiltration Trench	Ft	$250	0	$0
8	Water Quality Treatment Unit (6)	Each	$15,000	0	$0
9	Install/Repair Drain Well	Each	$5,000	0	$0
10	Roof Drain Treatment Areas	Each	$1,500	0	$0
11	Porous Pavement	Sq Yd	$20	1,017	$20,300
	Subtotal 1				$363,500
	Contingency (30% of Subtotal 1) (3)				$109,100
	Subtotal 2				$472,600
	Engineering, Survey, & Permitting (15 % of Subtotal 2)				$70,900
	TOTAL COST (4)				$543,500

(1) Residential/Roadway swale costs include excavation, sod or landscaping. Commercial swale costs include excavation, inlets, pipes, barricades, and landscaping.
(2) This does not include land acquisition costs for swales not in existing rights-of-way.
(3) Includes contracor's overhead and profit as well as mobilization and standard contingencies.
(4) All costs are in 2001 dollars. Costs include only stormwater related infrastructure. Replacement or rehabilitation of non-stormwater infrastrucure is not included.
(5) Generally between $2.00 and $3.25/foot/in diameter depending on pipe size.
(6) Unit cost based upon sizing for tributary area of 10 acres or less.

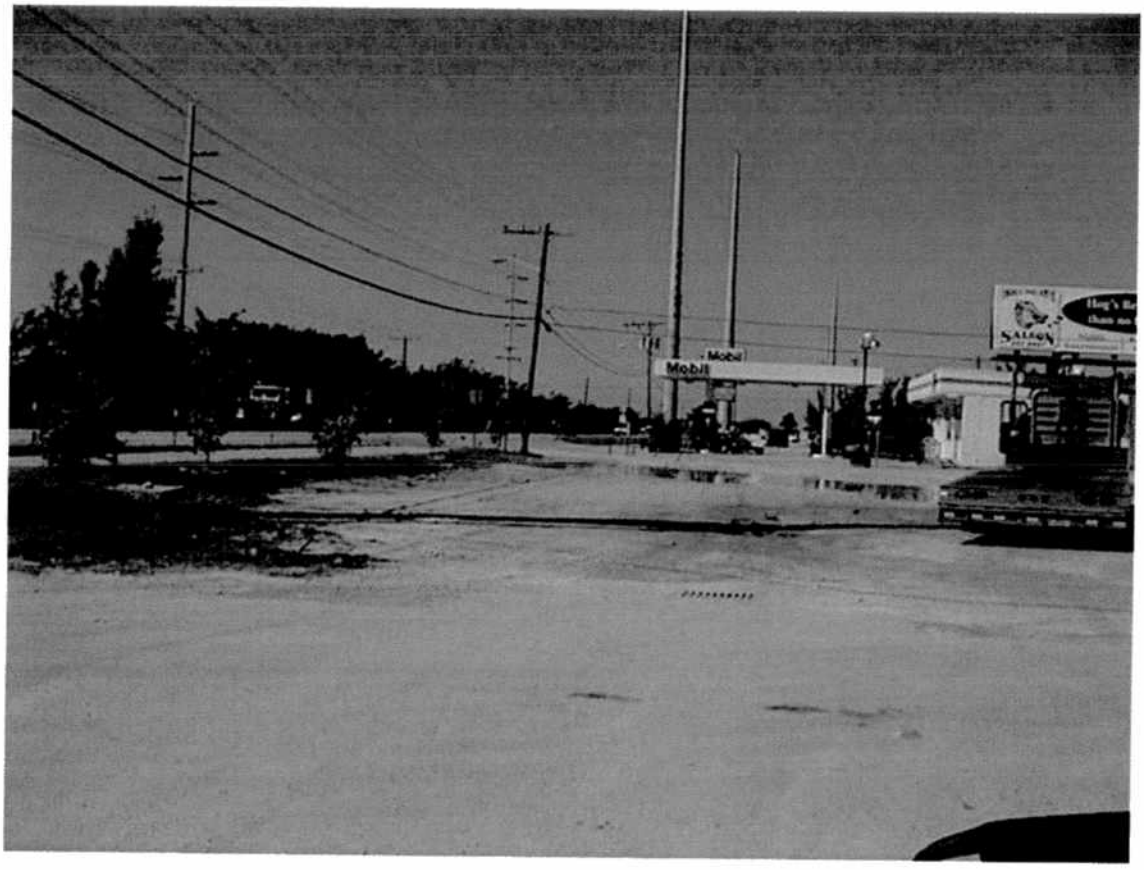


Rockland Channel to Shark Channel FDOT





Rockland Channel to Shark Channel FDOT



BOAT RAMP
MM 11 – OVERSEAS HIGHWAY

BOAT RAMP - MM 11 -Overseas Highway

Description of Problem Area

There is a boat ramp on the Ocean side of the Overseas Highway at Mile Mark 11. The ramp access is a paved road with concrete walls separating the road from the water, except at the center where the walls form the launching area together with sand bagged riprap. It comprises approximately 36,750 s.f. of area, of which 15,000 s.f is impervious, resulting in a "C" factor of 0.45. Photos 10, 11 & 12 depict the study area. The shoulder adjacent to the Overseas Highway is sodded (1"FDOT standard) and the slope to the ramp access road is exposed lime rock. Runoff from the Overseas Highway flows down the access road at both ends and over the lime rock slope to the access road and ultimately to the launching area where debris collects at the tide line.

Recommended Improvements

- The slope between the ramp access points should be shaped at the toe of the slope to provide a swale and berm to eliminate the possibility of debris reaching the launching area. This swale would be 2' deep with 2:1 side slopes and will provide 0.17 ac.ft. of storage.
- The slope above should be sodded, including the swale and the berm.
- A small asphalt berm should be constructed on each side of the launching area to catch debris that washes down the road at both access points.
- The road and the launching area should be subject to period maintenance to remove collected debris.

At the present time, there is a pollutant capture rate of 1.4 inches. The proposed improvements would increase the level of treatment to 1.7 inches and provide a 96% volume capture as well as eliminating the collection of debris a the launching ramp. The estimated cost of these improvements is presented in the Capital Cost Summary.

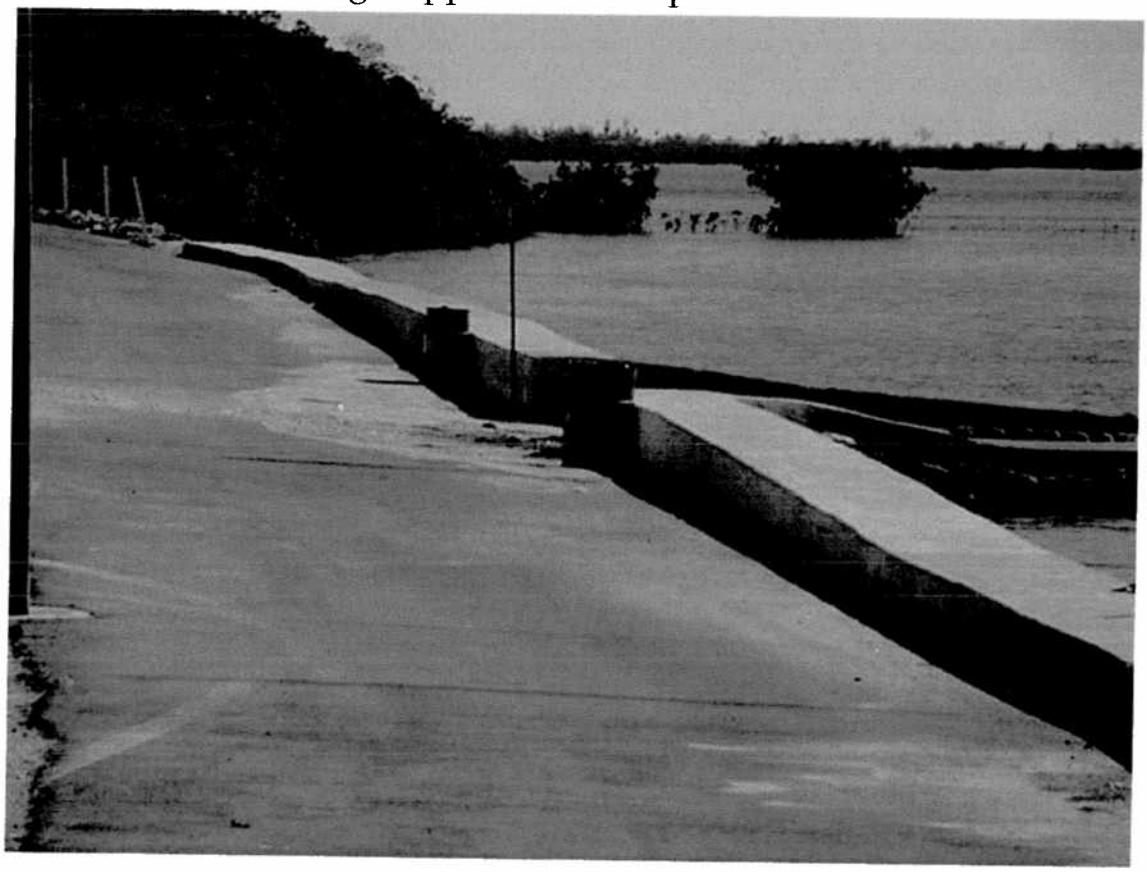
Monroe County Stormwater Master Plan
Capital Cost Summary
US1 Big Coppitt Boat Ramp

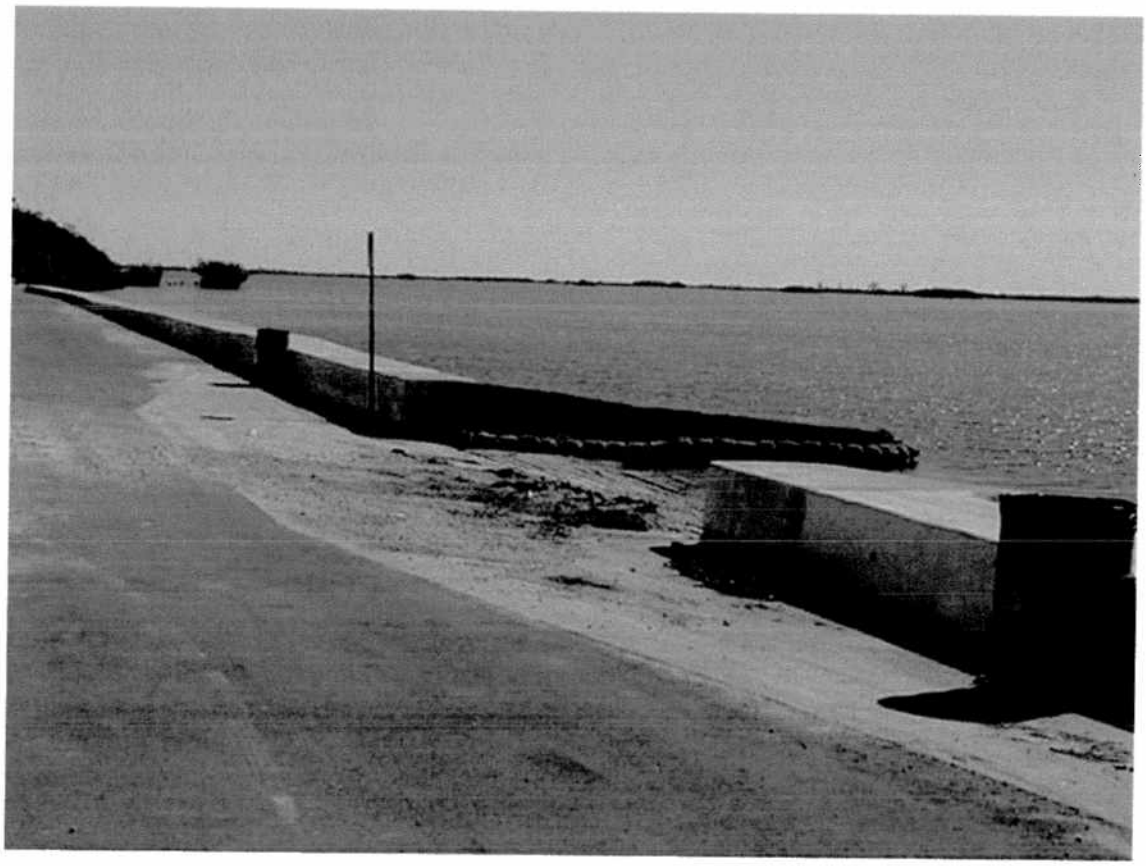
	Item	Units	Unit Cost	Quantity	Total Cost
1	Storm Sewer	Ft	Variable (5)	0	$0
2	Storm Inlets	Each	$2,500	0	$0
3	Swales (1) (2)	Ft	$25	450	$11,300
4	Road/Driveway Repair	Sq Yd	$20	816	$16,300
5	Excavation/Earthwork	Cu Yd	$12	100	$1,200
6	Curb Replacements/Installation	Ft	$10	0	$0
7	Exfiltration Trench	Ft	$250	0	$0
8	Water Quality Treatment Unit (6)	Each	$15,000	0	$0
9	Install/Repair Drain Well	Each	$5,000	0	$0
10	Roof Drain Treatment Areas	Each	$1,500	0	$0
11	Porous Pavement	Sq Yd	$20	0	$0

Subtotal 1	$28,800
Contingency (30% of Subtotal 1) (3)	$8,600
Subtotal 2	$37,400
Engineering, Survey, & Permitting (15 % of Subtotal 2)	$5,600
TOTAL COST (4)	$43,000

(1) Residential/Roadway swale costs include excavation, sod or landscaping. Commercial swale costs include excavation, inlets, pipes, barricades, and landscaping.
(2) This does not include land acquisition costs for swales not in existing rights-of-way.
(3) Includes contracor's overhead and profit as well as mobilization and standard contingencies.
(4) All costs are in 2001 dollars. Costs include only stormwater related infrastructure. Replacement or rehabilitation of non-stormwater infrastrucure is not included.
(5) Generally between $2.00 and $3.25/foot/in diameter depending on pipe size.
(6) Unit cost based upon sizing for tributary area of 10 acres or less.

Big Coppitt Boat Ramp FDOT





Big Coppitt Boat Ramp FDOT

U.S. 1 RESURFACING
BOCA CHICA CHANNEL TO ROCKLAND CHANNEL

U.S. 1 RESURFACING - Boca Chica Channel to Rockland Channel

Description of Problem Area

This section of the Overseas Highway is scheduled for re-surfacing by the Florida Department of Transportation in 2003. The highway is a four lane divided section with a grass median except on the flyover at the entrance to the Naval Air Station and is approximately 2.7 miles in length and 2,138,400 s.f. in area, of which 855,360 s.f. is impervious, resulting in a "C" factor of 0.44. Photos 1, 2, 3, 4 & 5 depict the study area. Assuming that the FDOT will perform the work in a manner similar to the highway recently resurfaced west of Boca Chica, the shoulders will not be swaled or grassed beyond the standard 2' strip of sod, the median will not be altered and the delineated shoulder on the pavement will not be widened.

Recommended Improvements

- Shape to median as a swale for its' entire length. The swale should be 3' deep with 3:1 side slopes.
- Widen the paved shoulder to 6' to eliminate parking on the grass.
- Swale the shoulder at the edge of pavement. This should be a "V" shaped swale, 1' deep with 3:1 side slopes. These swales will provide 3.93 ac.ft. of total storage.
- Sod the swale and remainder of the side slope.
- Use porous asphalt (Friction Course) for the new surface course.

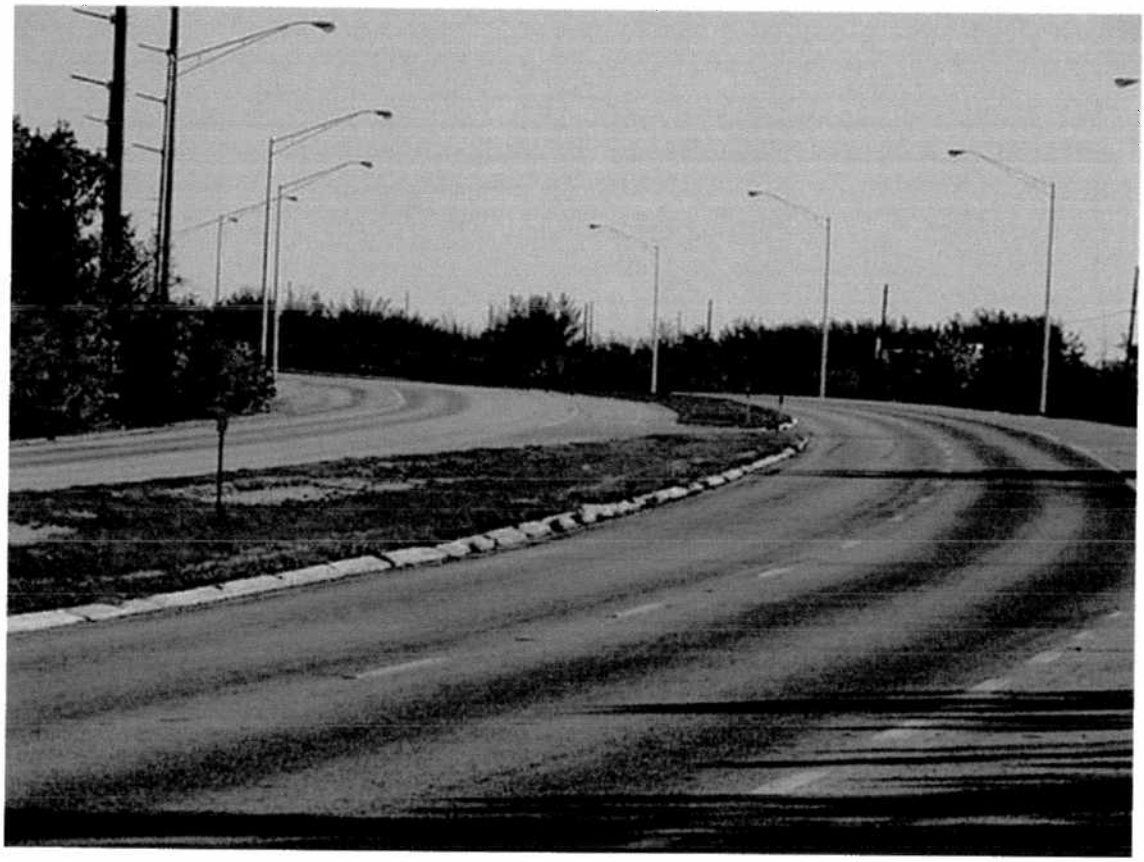
At the present time, there is a treatment volume required of 1.4 inches. The proposed improvements would provide a level of treatment of 0.96 inches and provide a 90%volume capture. The cross-section sketch below shows the proposed improvements. The estimated capital cost of these improvements is presented in the Capital Cost Summary.

Monroe County Stormwater Master Plan
Capital Cost Summary
US1 Boca Chica Channel to Rockland Channel

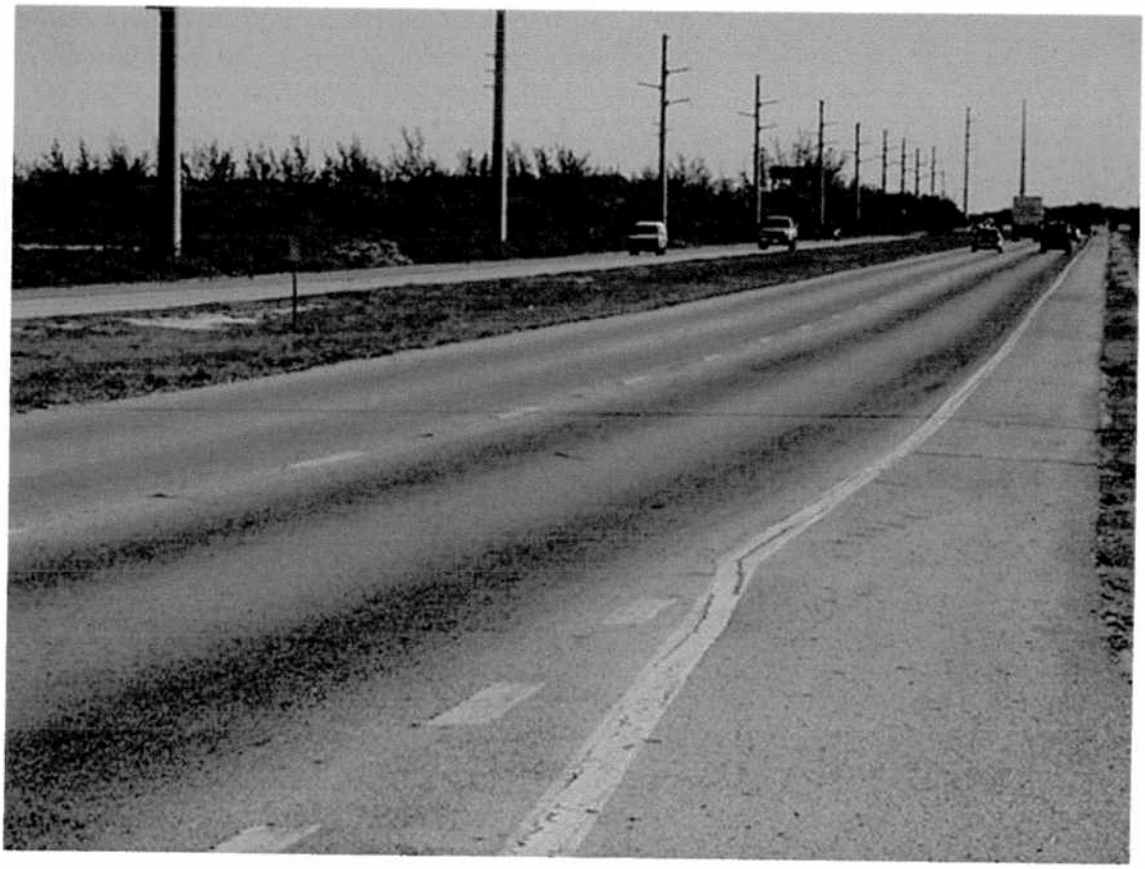
	Item	Units	Unit Cost	Quantity	Total Cost
1	Storm Sewer	Ft	Variable (5)	0	$0
2	Storm Inlets	Each	$2,500	0	$0
3	Swales (1) (2)	Ft	$25	28,512	$712,800
4	Road/Driveway Repair	Sq Yd	$20	0	$0
5	Excavation/Earthwork	Cu Yd	$12	0	$0
6	Curb Replacements/Installation	Ft	$10	0	$0
7	Exfiltration Trench	Ft	$250	0	$0
8	Water Quality Treatment Unit (6)	Each	$15,000	0	$0
9	Install/Repair Drain Well	Each	$5,000	0	$0
10	Roof Drain Treatment Areas	Each	$1,500	0	$0
11	Porous Pavement	Sq Yd	$20	2,112	$42,200

Subtotal 1	$755,000
Contingency (30% of Subtotal 1) (3)	$226,500
Subtotal 2	$981,500
Engineering, Survey, & Permitting (15 % of Subtotal 2)	$147,200
TOTAL COST (4)	$1,128,700

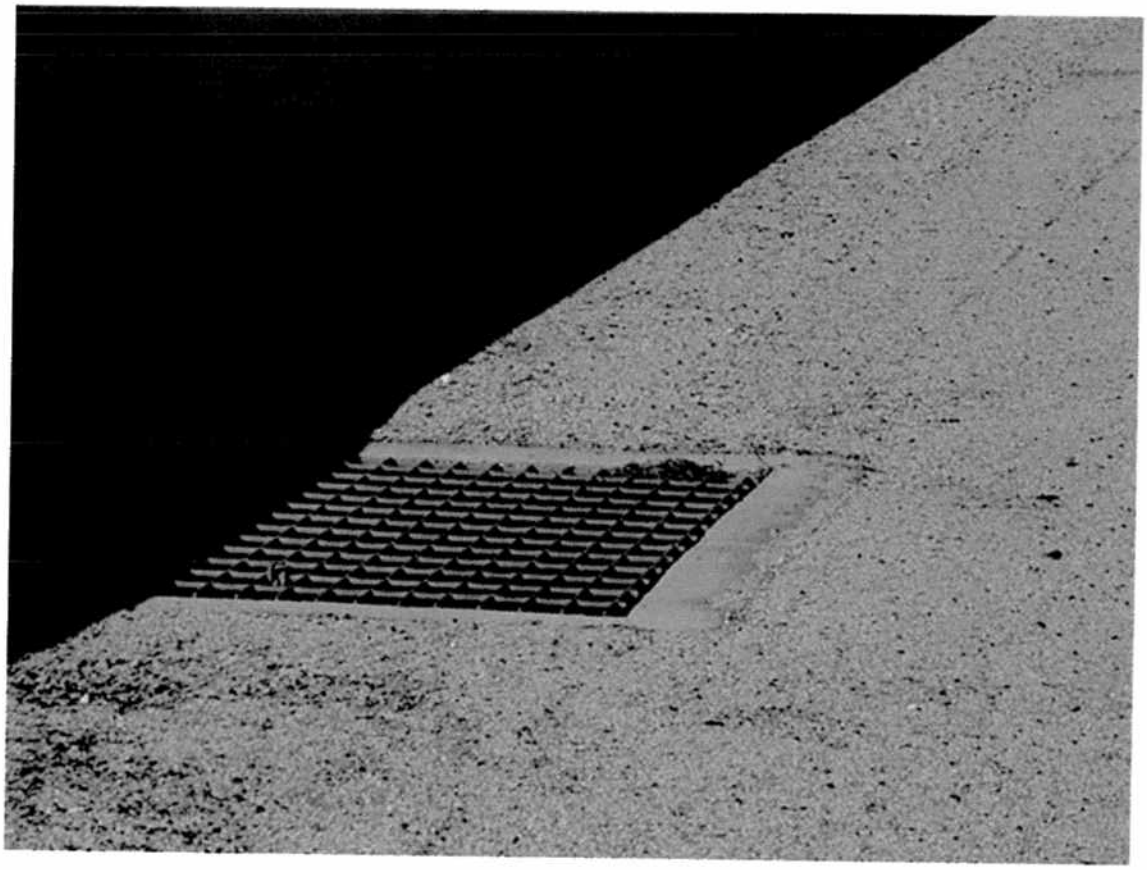
(1) Residential/Roadway swale costs include excavation, sod or landscaping. Commercial swale costs include excavation, inlets, pipes, barricades, and landscaping.
(2) This does not include land acquisition costs for swales not in existing rights-of-way.
(3) Includes contracor's overhead and profit as well as mobilization and standard contingencies.
(4) All costs are in 2001 dollars. Costs include only stormwater related infrastructure. Replacement or rehabilitation of non-stormwater infrastrucure is not included.
(5) Generally between $2.00 and $3.25/foot/in diameter depending on pipe size.
(6) Unit cost based upon sizing for tributary area of 10 acres or less.



Boca Chica Channel to Rockland Channel FDOT



Boca Chica Channel to Rockland Channel FDOT



Boca Chica Channel to Rockland Channel FDOT

OVERSEAS HIGHWAY
MM 66 – BAYSIDE PARKING AREA

OVERSEAS HIGHWAY - MM 66 - Bayside Parking Area

Description of Problem Area

This is a turnout and parking area, unpaved and separated from the Bay by a low wall. Water from the overseas Highway is trapped behind the wall and stagnates. Photo 18 depicts the study area. It appears that tidal water does not come over the wall. This area is approximately 31,500 s.f., of which 7,200 s.f. is impervious resulting in a "C" factor of 0.29. The side slopes from the Overseas Highway are for the most part, grassed, with the exception of an area between the shoulder strip of sod and the grass slopes. This area is exposed lime rock.

Recommended Improvements

- The area at the toe of highway slope should be filled to eliminate flooding.
- A small swale should be created at the toe of slope. This swale would be "V" shaped, 1' deep with 3:1 side slopes. This will provide 0.06 ac. ft. of total storage.
- Sod the area not used for drives and parking.

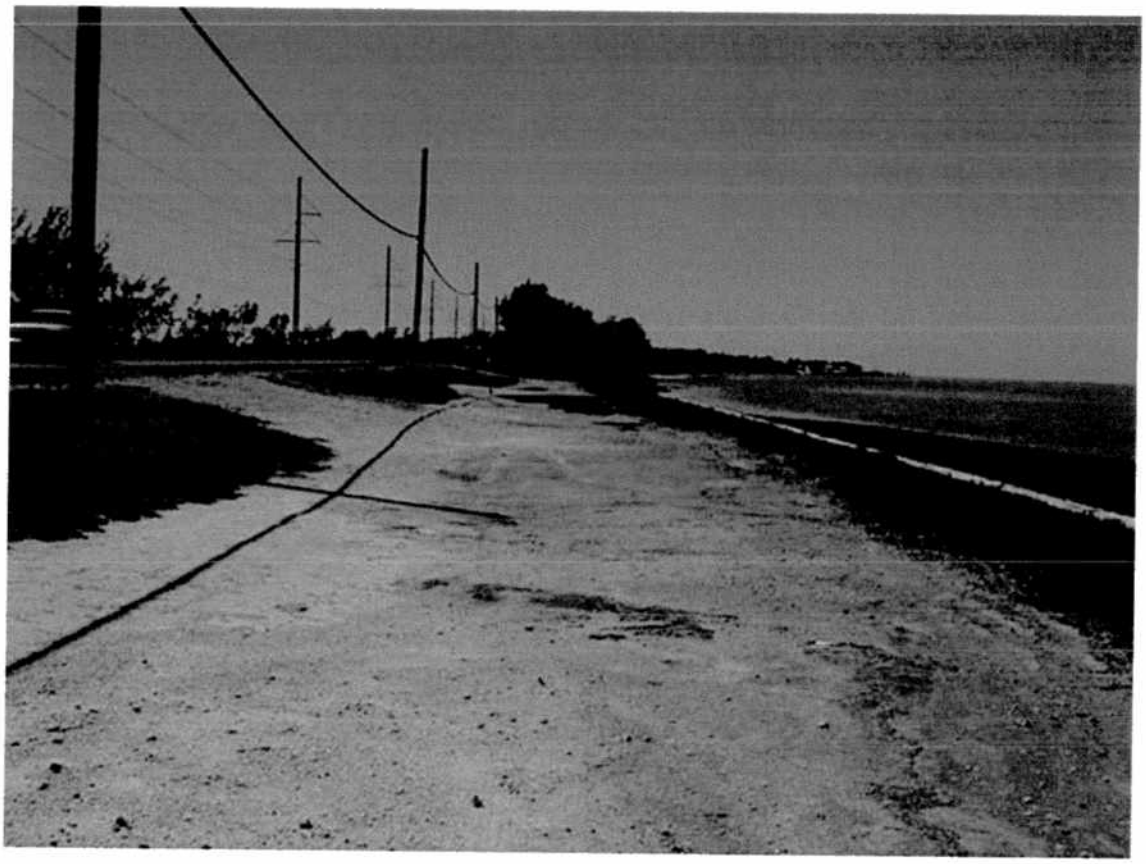
At the present time, there is a treatment volume required of 0.29 inches, The proposed improvements would provide a level of treatment of 0.87 inches and provide a 95% volume capture. The cross-section sketch below shows the proposed improvements. The estimated capital cost of these improvements is presented in the Capital Cost Summary.

Monroe County Stormwater Master Plan
Capital Cost Summary
US1 Bayside Parking Area at MM66

	Item	Units	Unit Cost	Quantity	Total Cost
1	Storm Sewer	Ft	Variable (5)	0	$0
2	Storm Inlets	Each	$2,500	0	$0
3	Swales (1) (2)	Ft	$25	450	$11,300
4	Road/Driveway Repair	Sq Yd	$20	0	$0
5	Excavation/Earthwork	Cu Yd	$12	0	$0
6	Curb Replacements/Installation	Ft	$10	0	$0
7	Exfiltration Trench	Ft	$250	0	$0
8	Water Quality Treatment Unit (6)	Each	$15,000	0	$0
9	Install/Repair Drain Well	Each	$5,000	0	$0
10	Roof Drain Treatment Areas	Each	$1,500	0	$0
11	Porous Pavement	Sq Yd	$20	0	$0

Subtotal 1	$11,300
Contingency (30% of Subtotal 1) (3)	$3,400
Subtotal 2	$14,700
Engineering, Survey, & Permitting (15 % of Subtotal 2)	$2,200
TOTAL COST (4)	$16,900

(1) Residential/Roadway swale costs include excavation, sod or landscaping. Commercial swale costs include excavation, inlets, pipes, barricades, and landscaping.
(2) This does not include land acquisition costs for swales not in existing rights-of-way.
(3) Includes contracor's overhead and profit as well as mobilization and standard contingencies.
(4) All costs are in 2001 dollars. Costs include only stormwater related infrastructure. Replacement or rehabilitation of non-stormwater infrastrucure is not included.
(5) Generally between $2.00 and $3.25/foot/in diameter depending on pipe size.
(6) Unit cost based upon sizing for tributary area of 10 acres or less.



US 1 @ MM 66 - Bay Side Parking Area

OVERSEAS HIGHWAY
MM 77.5 – OCEANSIDE & BAYSIDE PARKING AREAS

OVERSEAS HIGHWAY - MM 77.5 - Oceanside & Bayside Parking Areas

Description of Problem Area

These are partially paved areas adjacent to the overseas Highway where people picnic and sunbathe. Drainage from the Overseas Highway flows over these areas and what does not filter through the lime rock, flows into the Bay and Ocean through areas where there is not a berm and erosion has taken place. Photos 19, 20, 21, 22, 23 & 24 depict the study area. Rocks have been placed where the erosion has taken place but do not stop water flow. The area is approximately 207,500 s.f. of which 3,000 s.f. is impervious resulting in a "C" factor of 0.11.

Recommended Improvements

- A berm, approximately 2' high should be created along both the Bayside and Oceanside, using the existing rocks as a stabilized base. The side slopes of the berm should be established at a minimum of 3:1.
- The berm created should be sodded and/or landscaped to preserve its' integrity.

With the berm in place to eliminate any flow into either the Bay or Ocean, there will be 100& volume capture. The sketch below shows the proposed improvements. The estimated capital cost of these improvements is presented in the Capital Cost Summary.

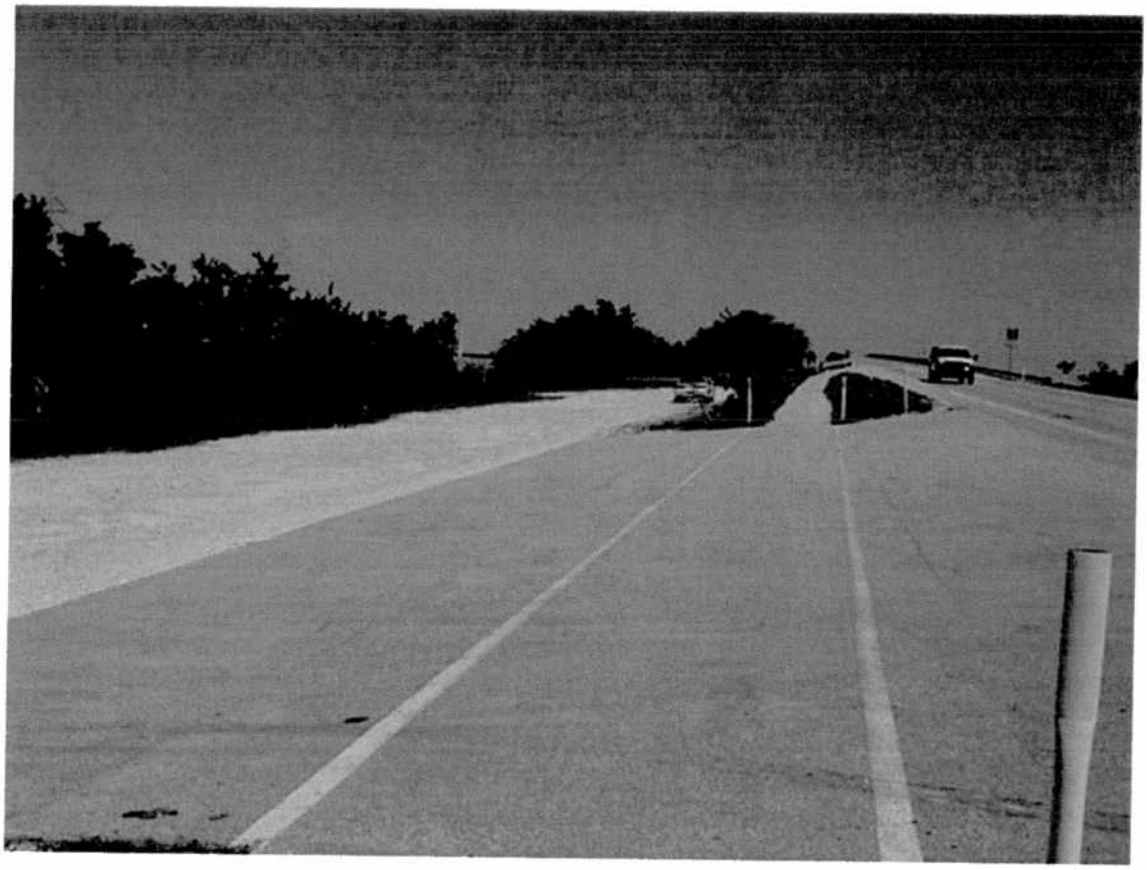
Monroe County Stormwater Master Plan
Capital Cost Summary
US1 Oceanside and Bayside Parking Areas at MM 77.5

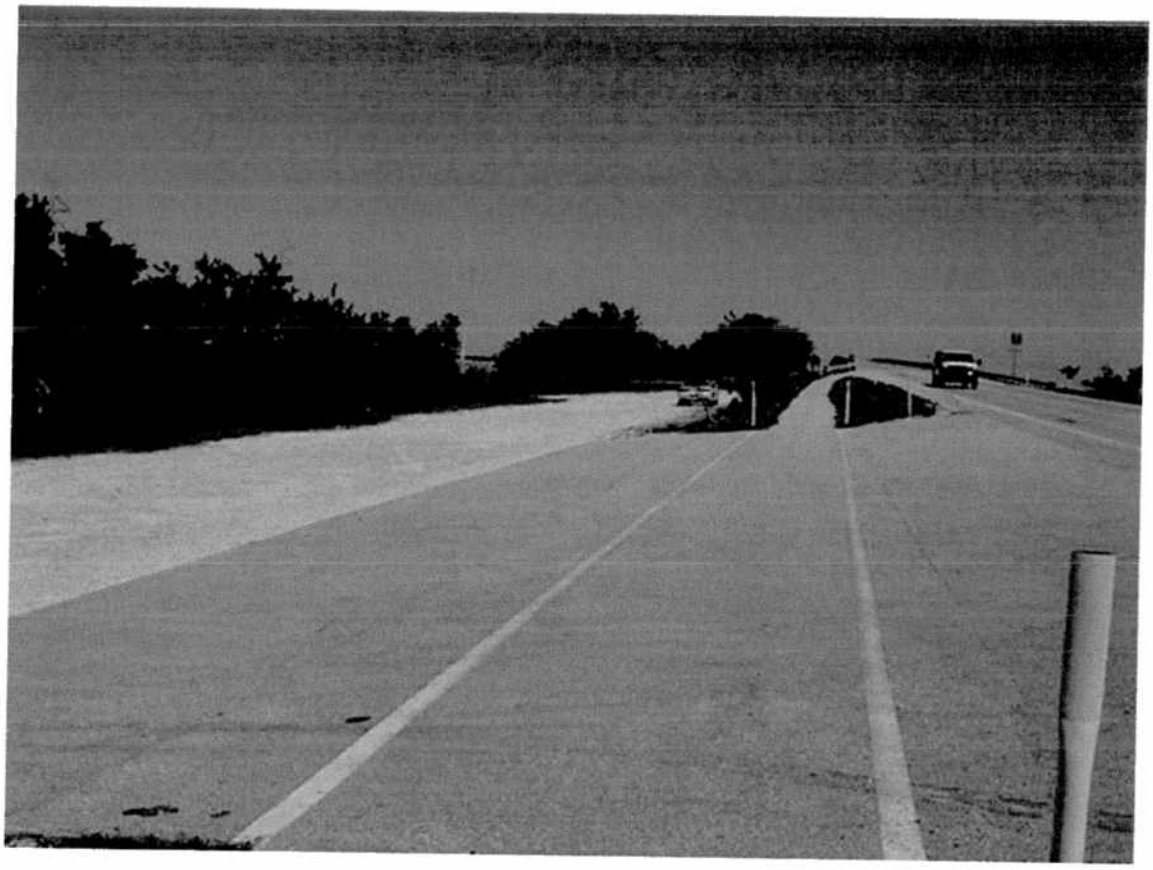
	Item	Units	Unit Cost	Quantity	Total Cost
1	Storm Sewer	Ft	Variable (5)	0	$0
2	Storm Inlets	Each	$2,500	0	$0
3	Swales (1) (2)	Ft	$25	0	$0
4	Road/Driveway Repair	Sq Yd	$20	0	$0
5	Excavation/Earthwork	Cu Yd	$12	150	$1,800
6	Curb Replacements/Installation	Ft	$10	0	$0
7	Exfiltration Trench	Ft	$250	0	$0
8	Water Quality Treatment Unit (6)	Each	$15,000	0	$0
9	Install/Repair Drain Well	Each	$5,000	0	$0
10	Roof Drain Treatment Areas	Each	$1,500	0	$0
11	Porous Pavement	Sq Yd	$20	0	$0

Subtotal 1	$1,800
Contingency (30% of Subtotal 1) (3)	$500
Subtotal 2	$2,300
Engineering, Survey, & Permitting (15 % of Subtotal 2)	$300
TOTAL COST (4)	$2,600

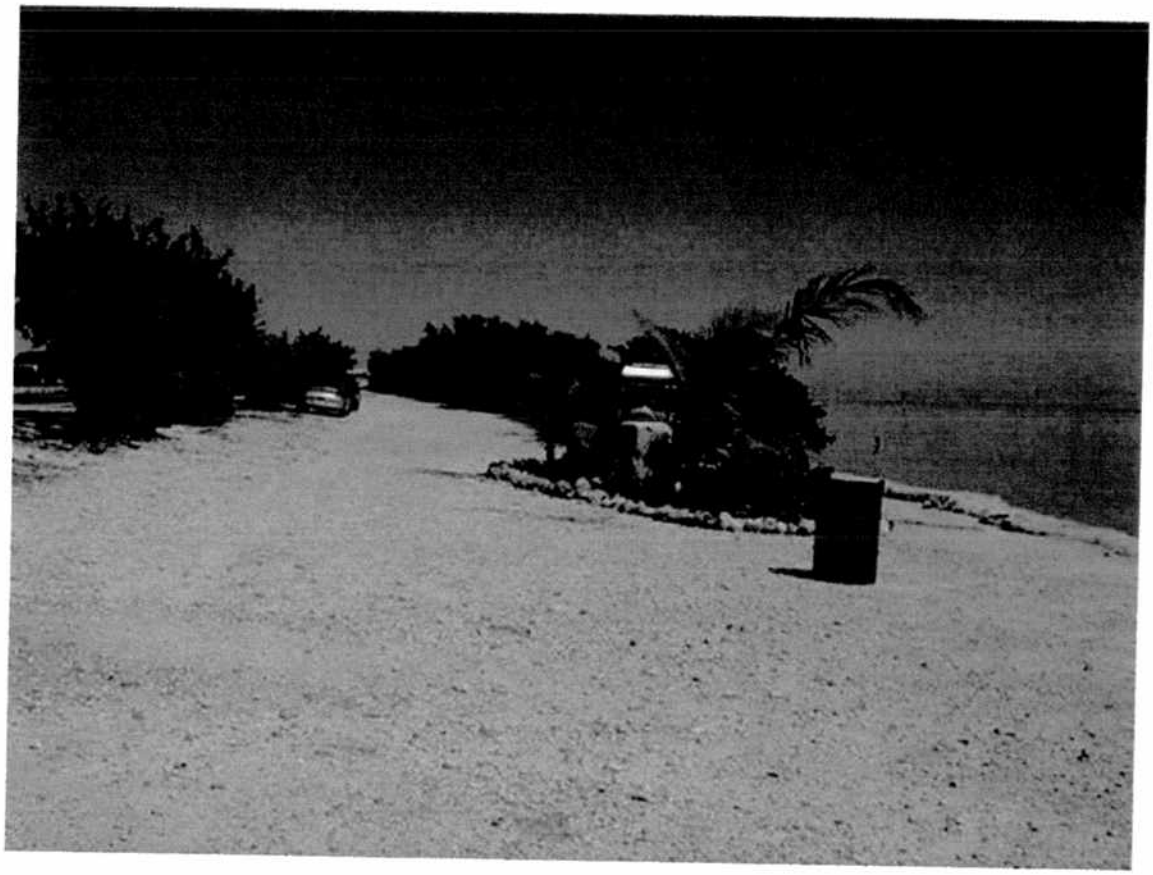
(1) Residential/Roadway swale costs include excavation, sod or landscaping. Commercial swale costs include excavation, inlets, pipes, barricades, and landscaping.
(2) This does not include land acquisition costs for swales not in existing rights-of-way.
(3) Includes contracor's overhead and profit as well as mobilization and standard contingencies.
(4) All costs are in 2001 dollars. Costs include only stormwater related infrastructure. Replacement or rehabilitation of non-stormwater infrastrucure is not included.
(5) Generally between $2.00 and $3.25/foot/in diameter depending on pipe size.
(6) Unit cost based upon sizing for tributary area of 10 acres or less.

US 1 @ MM 77.5 - Ocean Side and Bay Side Parking Areas





US 1 @ MM 77.5 - Ocean Side and Bay Side Parking Areas



US 1 @ MM 77.5 - Ocean Side and Bay Side Parking Areas

U.S. 1 RESURFACING
NORTH HARRIS CHANNEL TO PARK CHANNEL

U. S. 1 - RESURFACING - North Harris Channel to Park Channel

Description of Problem Area

This section of the Overseas Highway is scheduled for resurfacing by the Florida Department of Transportation in 2003. The highway is a two lane, not divided section with a substantial mangrove growth on either side of the highway. It is approximately one mile in length and 528,000 s.f in area, of which 232,320 s.f. is impervious, resulting in a "C" factor of 0.47. Photos 13, 14 & 15 depict the study area. It is assumed that the FDOT will perform the work in the same manner as current resurfacing projects, i.e., with a 2' grass strip adjacent to the pavement and a 4' striped asphalt shoulder. No sodding will be placed on the side slopes. The roadway shoulders in this area have been repaired with millings from previous projects and form an impervious surface.

Recommended Improvements

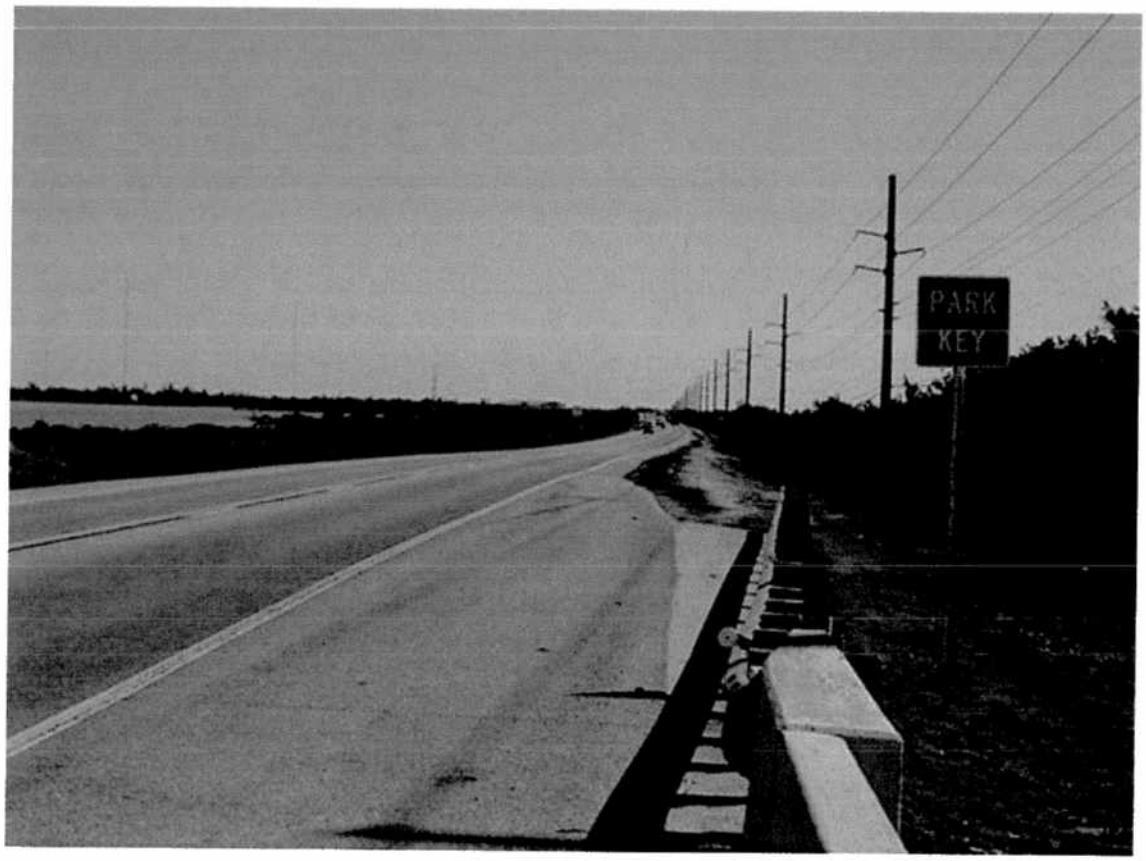
- Widen the paved shoulder to 6' to eliminate parking on the grass.
- Swale the shoulder at the edge of pavement. This should be a "V" shaped swale, 1' deep with 3:1 side slopes, right-of-way permitting. These swales will provide 1.45 ac. ft. of total storage.
- Remove all milling material and replace with lime rock.
- Sod the swales and the side slopes where grass is missing.
- Use porous asphalt (Friction Course) for the new surface.

At the present time, there is a treatment volume required of 1.4 inches. The proposed improvements would provide a level of treatment of 1.45 inches and provide a 96% volume capture. The cross-section sketch below shows the proposed improvements. The estimated capital cost of these improvements is presented in the Capital Cost Summary.

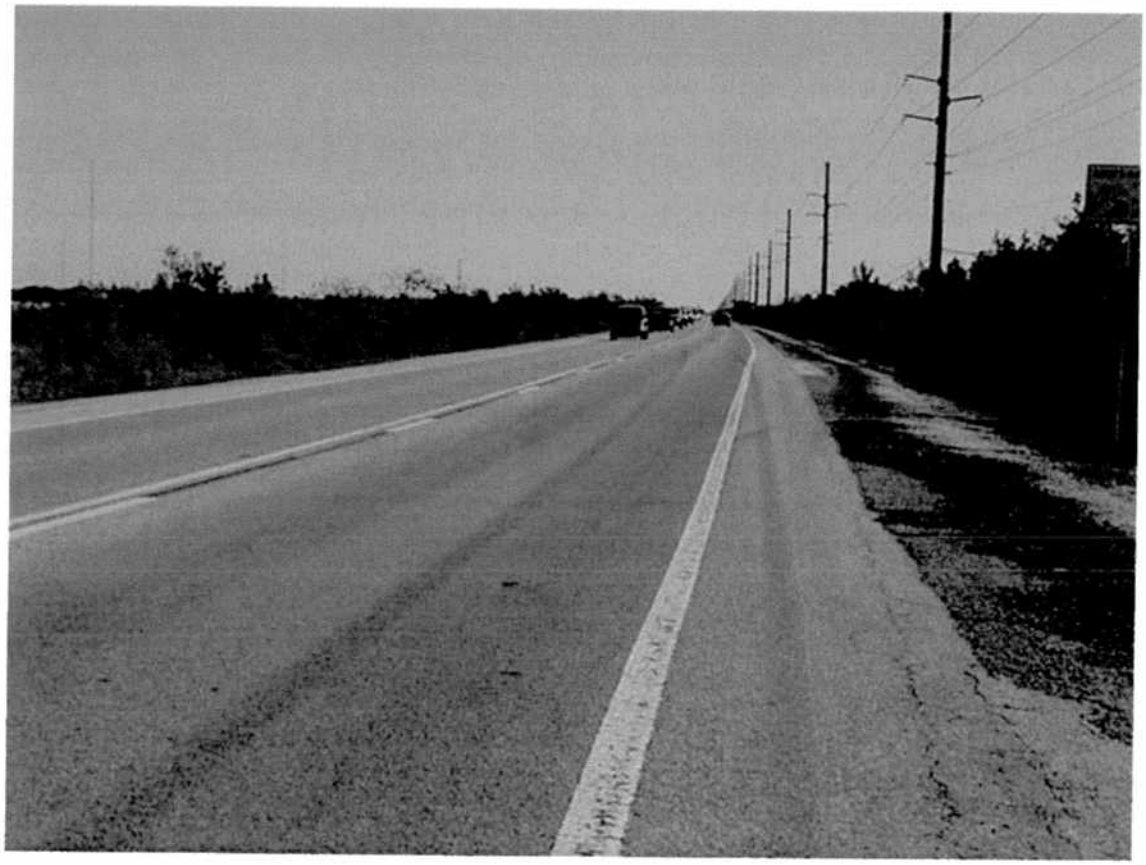
Monroe County Stormwater Master Plan
Capital Cost Summary
US1 North Harris Channel to Park Channel

	Item	Units	Unit Cost	Quantity	Total Cost
1	Storm Sewer	Ft	Variable (5)	0	$0
2	Storm Inlets	Each	$2,500	0	$0
3	Swales (1) (2)	Ft	$25	10,560	$264,000
4	Road/Driveway Repair	Sq Yd	$20	0	$0
5	Excavation/Earthwork	Cu Yd	$12	0	$0
6	Curb Replacements/Installation	Ft	$10	0	$0
7	Exfiltration Trench	Ft	$250	0	$0
8	Water Quality Treatment Unit (6)	Each	$15,000	0	$0
9	Install/Repair Drain Well	Each	$5,000	0	$0
10	Roof Drain Treatment Areas	Each	$1,500	0	$0
11	Porous Pavement	Sq Yd	$20	782	$15,600
	Subtotal 1				$279,600
	Contingency (30% of Subtotal 1) (3)				$83,900
	Subtotal 2				$363,500
	Engineering, Survey, & Permitting (15 % of Subtotal 2)				$54,500
	TOTAL COST (4)				$418,000

(1) Residential/Roadway swale costs include excavation, sod or landscaping. Commercial swale costs include excavation, inlets, pipes, barricades, and landscaping.
(2) This does not include land acquisition costs for swales not in existing rights-of-way.
(3) Includes contracor's overhead and profit as well as mobilization and standard contingencies.
(4) All costs are in 2001 dollars. Costs include only stormwater related infrastructure. Replacement or rehabilitation of non-stormwater infrastrucure is not included.
(5) Generally between $2.00 and $3.25/foot/in diameter depending on pipe size.
(6) Unit cost based upon sizing for tributary area of 10 acres or less.



North Harris Channel to Park Channel FDOT



North Harris Channel to Park Channel FDOT

U.S. 1 RESURFACING
BOW CHANNEL TO EAST SIDE OF CUDJOE KEY

U. S. 1 - RESURFACING - Bow Channel to East side of Cudjoe Key

Description of problem Area

This section of the Overseas Highway is scheduled for resurfacing by the Florida Department of Transportation in 2003. The highway is a two lane, not divided section with substantial mangrove growth along the bay side. It is approximately 2.5 miles in length and 1,980,000 s.f. in area, of which 844,800 s.f. is impervious resulting in a "C" factor of 0.46. Photos 16 & 17 depict the study area. It is assumed that the FDOT will perform the work in the same manner as current resurfacing projects, i.e., with a 2' grass strip adjacent to the pavement and a 4' striped asphalt shoulder. No sodding will be placed on the side slopes. The roadway shoulders in this area have been repaired with milling s from previous projects and form an impervious surface.

Recommended Improvements

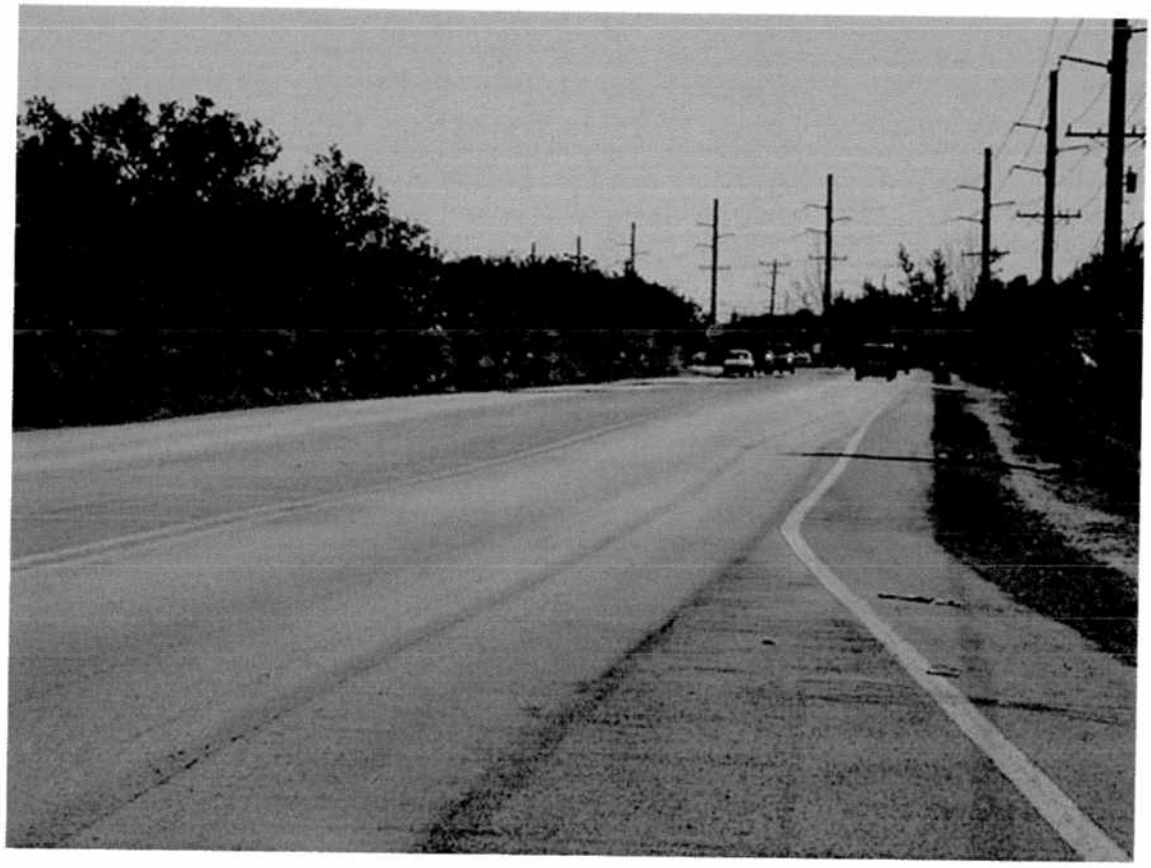
- Widen the paved shoulder to 6' to eliminate parking on the grass.
- Swale the shoulder at the edge of pavement. This should be a "V" shaped swale, 1' deep with 3:1 side slopes, right-of-way permitting. These swells will provide 3.64 ac. ft. of total storage.
- Remove all milling material and replace with lime rock.
- Sod the swale and side slopes where grass is missing.
- Use porous asphalt (Friction Course) for the new surface.

At the present time, there is a treatment volume required of 1.46 inches. The proposed improvements would provide a level of treatment of 0.96 inches and provide a 96% volume capture. The cross-section sketch below shows the proposed improvements. The estimated capital cost of these improvements is presented in the Capital Cost Summary.

Monroe County Stormwater Master Plan
Capital Cost Summary
US1 Bow Channel to East Side of Cudjoe Key

	Item	Units	Unit Cost	Quantity	Total Cost
1	Storm Sewer	Ft	Variable (5)	0	$0
2	Storm Inlets	Each	$2,500	0	$0
3	Swales (1) (2)	Ft	$25	26,400	$660,000
4	Road/Driveway Repair	Sq Yd	$20	0	$0
5	Excavation/Earthwork	Cu Yd	$12	0	$0
6	Curb Replacements/Installation	Ft	$10	0	$0
7	Exfiltration Trench	Ft	$250	0	$0
8	Water Quality Treatment Unit (6)	Each	$15,000	0	$0
9	Install/Repair Drain Well	Each	$5,000	0	$0
10	Roof Drain Treatment Areas	Each	$1,500	0	$0
11	Porous Pavement	Sq Yd	$20	1,956	$39,100
	Subtotal 1				$699,100
	Contingency (30% of Subtotal 1) (3)				$209,700
	Subtotal 2				$908,800
	Engineering, Survey, & Permitting (15 % of Subtotal 2)				$136,300
	TOTAL COST (4)				$1,045,100

(1) Residential/Roadway swale costs include excavation, sod or landscaping. Commercial swale costs include excavation, inlets, pipes, barricades, and landscaping.
(2) This does not include land acquisition costs for swales not in existing rights-of-way.
(3) Includes contracor's overhead and profit as well as mobilization and standard contingencies.
(4) All costs are in 2001 dollars. Costs include only stormwater related infrastructure. Replacement or rehabilitation of non-stormwater infrastrucure is not included.
(5) Generally between $2.00 and $3.25/foot/in diameter depending on pipe size.
(6) Unit cost based upon sizing for tributary area of 10 acres or less.



Bow Channel to Kemp Channel (east side of Cudjoe Key)

OVERSEAS HIGHWAY
INDIAN KEY FILL

OVERSEAS HIGHWAY - Indian Key Fill

Description of Problem Area

This is a similar situation to the one at MM 77.5 that exists on the Bayside of the Overseas Highway. There is a large, 269,750 s.f lime rock area, 3,000 s.f of which is impervious that is used for parking, picnicking and sunbathing. Photos 25 & 26 depict the study area. The resulting "C" factor is 0.16. Flow across this area has eroded the edge along the Bay and washed away the grass that existed.

Recommended Improvements

- A berm should be created along the shoreline, 2' in height, with 3:1 side slopes.
- The berm should be sodded and/or landscaped.

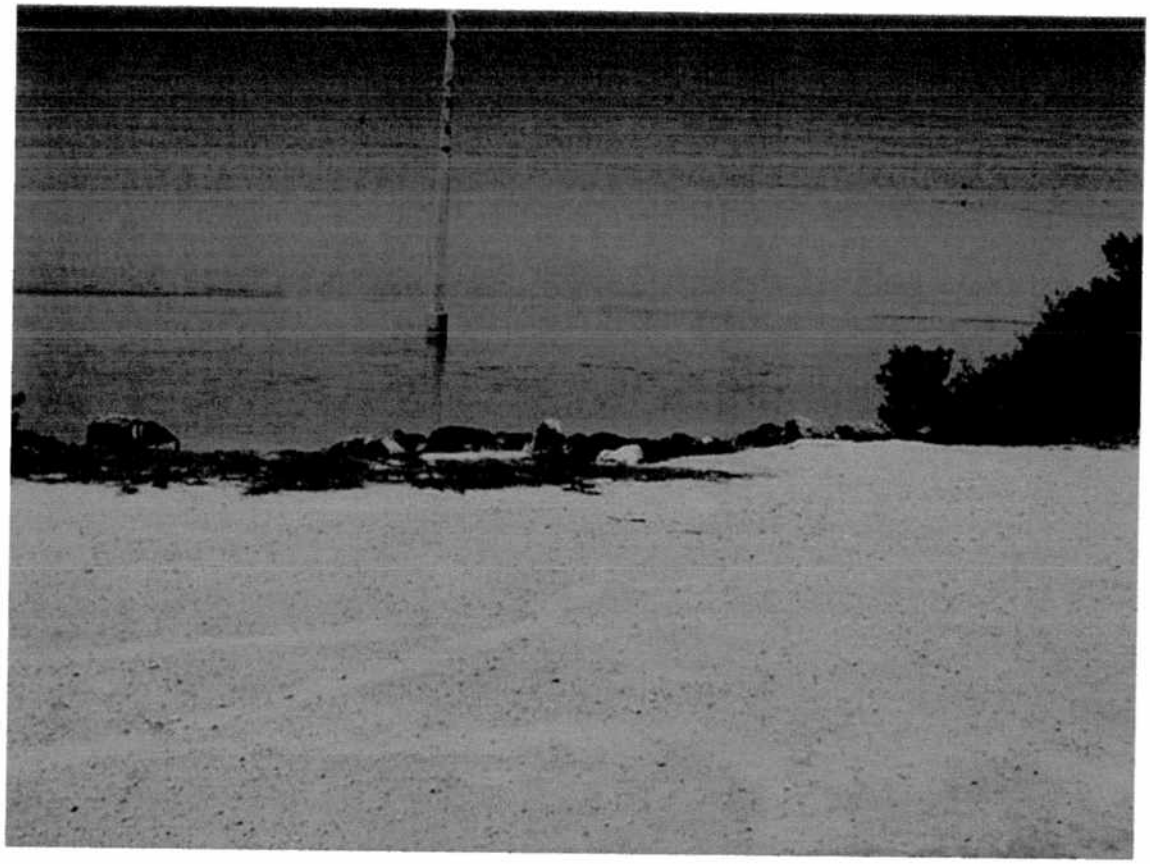
With the berm in place to eliminate any flow into the Bay, there will be 100% volume capture. The sketch below shows the proposed improvements. The estimated capital cost of these improvements is presented in the Capital Cost Summary.

Monroe County Stormwater Master Plan
Capital Cost Summary
US1 Indian Key - Bayside Parking Area at MM 78

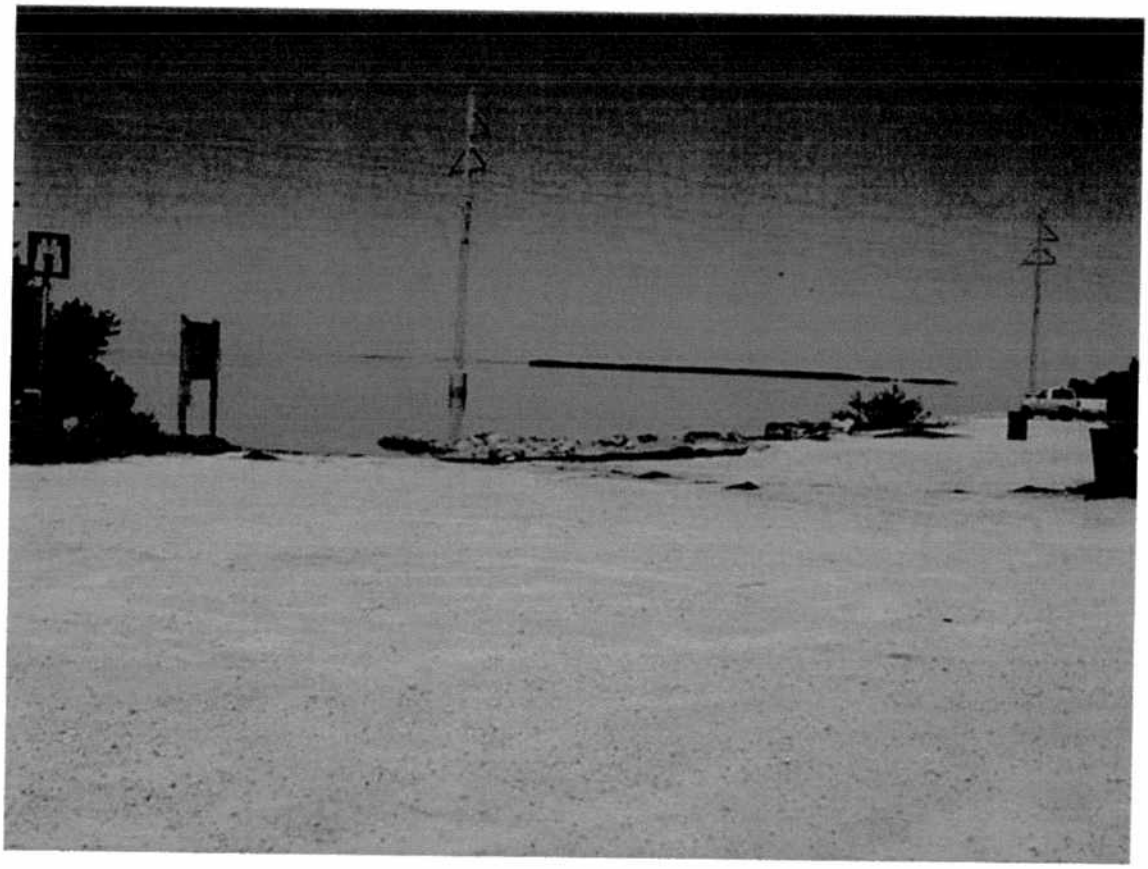
	Item	Units	Unit Cost	Quantity	Total Cost
1	Storm Sewer	Ft	Variable (5)	0	$0
2	Storm Inlets	Each	$2,500	0	$0
3	Swales (1) (2)	Ft	$25	0	$0
4	Road/Driveway Repair	Sq Yd	$20	0	$0
5	Excavation/Earthwork	Cu Yd	$12	119	$1,400
6	Curb Replacements/Installation	Ft	$10	0	$0
7	Exfiltration Trench	Ft	$250	0	$0
8	Water Quality Treatment Unit (6)	Each	$15,000	0	$0
9	Install/Repair Drain Well	Each	$5,000	0	$0
10	Roof Drain Treatment Areas	Each	$1,500	0	$0
11	Porous Pavement	Sq Yd	$20	0	$0

Subtotal 1	$1,400
Contingency (30% of Subtotal 1) (3)	$400
Subtotal 2	$1,800
Engineering, Survey, & Permitting (15 % of Subtotal 2)	$300
TOTAL COST (4)	$2,100

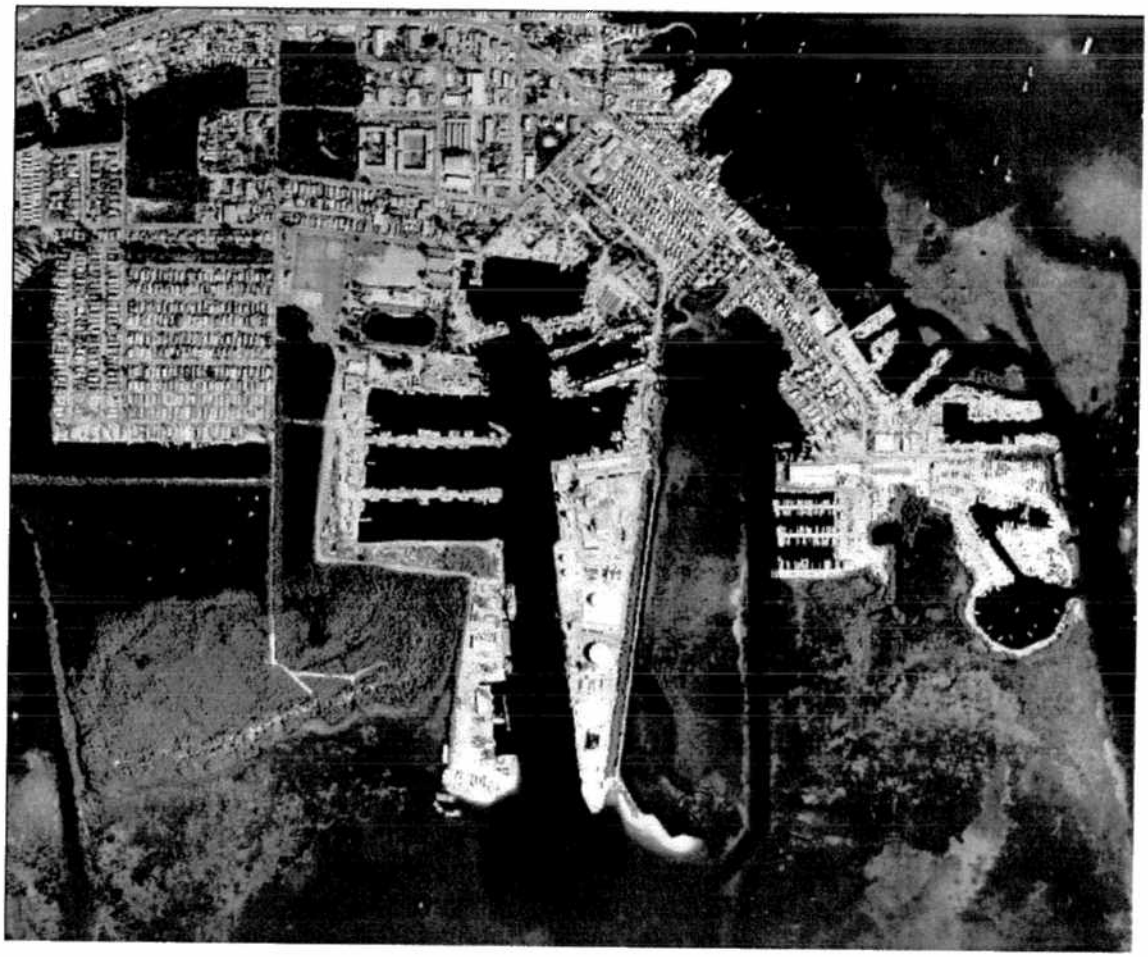
(1) Residential/Roadway swale costs include excavation, sod or landscaping. Commercial swale costs include excavation, inlets, pipes, barricades, and landscaping.
(2) This does not include land acquisition costs for swales not in existing rights-of-way.
(3) Includes contracor's overhead and profit as well as mobilization and standard contingencies.
(4) All costs are in 2001 dollars. Costs include only stormwater related infrastructure. Replacement or rehabilitation of non-stormwater infrastrucure is not included.
(5) Generally between $2.00 and $3.25/foot/in diameter depending on pipe size.
(6) Unit cost based upon sizing for tributary area of 10 acres or less.



Indian Key Fill Bay Side Parking @ MM 78



Retrofit Projects
Safe Harbor



Description of Problem Area

Safe Harbor is located on the southern portion of Stock Island near the end of the lower Keys. It is one of the few deep-water harbors in the entire Keys. Safe harbor is bounded on the north by 5th Avenue, on the east by Front Street, and the west by Shrimp Road and comprises about 71 acres, which are not served by any drainage facilities. Currently, runoff sheet flows to the nearby water bodies without any treatment. The land uses are: several marinas throughout the harbor, an electric generating facility in the southeast, trap storage in the north, shrimp piers in the west, a diesel repair facility in the north west, and a junkyard in the southwest. The parking areas are primarily compacted pea gravel with some of the areas paved with concrete. The 71-acre area is about 80% impervious for an overall "C" factor for Safe Harbor of about 0.78. For 95% treatment capture, this would require a treatment volume of 2.5 inches over the tributary area, or about 14.8 acre-ft of treatment volume. The primary stormwater pollution problems involve wash off of pollutants that accumulate on the paved/impervious surfaces, wash off of debris from the fishing/shrimping operations, and polluted runoff from the junkyard. Photos 1 to 14 show the general problem areas.

Recommended Action

Stormwater control for this area will involve both source controls and structural controls as described below.

Source Controls:

- Alex's Junkyard is located on a two-acre area in the southwest part of the Safe Harbor area. The area is strewn with junk cars and scrap metal as shown in pictures 1, 2, 3, 4, and 5 that are potential sources of leach metals and other pollutants into the nearby waters. If possible, this junkyard should be cleaned up and the debris removed from the area to eliminate a potential source of pollutants.
- The trap yards should have policies instituted (if not already in place) to prevent debris from the trapping operations cannot wash off directly into the water, but would be collected and disposed of properly.
- The fishing/shrimping piers should also have policies instituted (if not already in place) to prevent debris from the fishing/shrimping operations washing off directly into the water. The debris should be collected and disposed of properly.
- The diesel repair facility should have policies in place to prevent pollutants such as waste oil etc. from being able to wash off into the harbor. Oil/water separators should be considered.

Structural Controls:

- A 1000-foot east-west section of Shrimp Road, south of Alex's Junkyard is recommended to have a shallow landscaped swale constructed on the south side of the street. The existing topography already has runoff sheet flowing to the south. The proposed swale would have 3:1 side slopes, be 12 feet wide and 1000 feet long, and provide 0.28 ac-ft of treatment storage capacity. The tributary area

to this swale would be about 4.8 acres most of which is comprised of either the junkyard or open area, or roadway. Including the roadway and the junk piles, the tributary area has about 2 acres of impervious area resulting in a "C" factor of about 0.45. The swale would provide a percent annual capture of about 86% of the pollutants. Overflow from the swale would flow over a marshy area about 1000 feet wide prior to entering the ocean.

- A shallow landscaped swale is proposed for the western side of the southern 1,450-foot section of Shrimp Road. The area appears to be a marina but the land use could not be confirmed during a field visit due to a closed gate. The proposed swale dimensions area 2.5 feet deep, 3:1 side slopes, with of 15 feet, and a length of 1,450 feet, which will provide for 0.62 ac-ft of storage area. The tributary area is about 10.3 acres of which about 80% is impervious resulting in a "C" factor of 0.79. The swale would provide a percent annual capture of about 69% of the pollutants. Overflow from the northern half of the swale would flow over a marshy area prior to discharge to the ocean.
- A shallow landscaped swale is proposed for the western portion of Shrimp Road south of 5th Avenue. The 8.7-acre tributary area houses several fishing/shrimping operations, Safe Harbor Marina, and Safe Harbor Diesel Repair. There is insuffient room on the west side of the road to construct the swale, so it would need to be on the east side of the road using a portion of the gravel parking area. The gravel parking area is large enough to provide a swale with the following dimensions, depth of 2.5 feet, side slopes of 4:1, and a width of 20 feet. The swale length would be 1,550 feet along the roadside with four additional 250 foot sections spaced throughout the parking area for a total swale length of 2,550 feet which provides for about 1.46 ac-ft of storage area. The tributary area is about 80% impervious resulting in a "C" factor of 0.78. The swale would provide a percent annual capture of about 92% of the pollutants. Additionally, the roof drains from the buildings should discharge to depressed graveled areas to provide for additional storage and treatment. There would need to be several swale-crossing areas constructed in the 1,550-foot section of swale so that vehicles could easily access the parking area.
- A shallow landscaped swale is recommended for the east side of Front Street alongside the Stock Island Electric Generating Facility. The swale dimensions would be 2.5-feet deep, 3:1 side slopes, width of 15-feet, and a length of 1,970-feet that will provide about 0.85 ac-ft of treatment volume. The electric generating facility is estimated to be about 65% impervious that will result in a "C" factor of 0.65. The swale would provide a percent annual capture of about 69% of the pollutants.
- A shallow landscaped swale is proposed for the northern half of Front Street. The swale dimensions would be 2.5-feet deep, 3:1 side slopes, width of 15-feet, and a length of 2,350-feet that will provide about 1.01 ac-ft of treatment volume. The land use for the 12.9 –acre tributary area is primarily marinas and some open spaces. The average percent imperviousness is about 50% resulting in a "C" factor of about 0.53. The swale would provide a percent annual capture of about 87% of the pollutants.

Figure 1 presents the locations of the proposed improvements, **Figure 2** presents a typical parking lot improvement, and **Figure 3** presents a typical swale section. The estimated capital cost for these improvements is presented in **Table 1**.

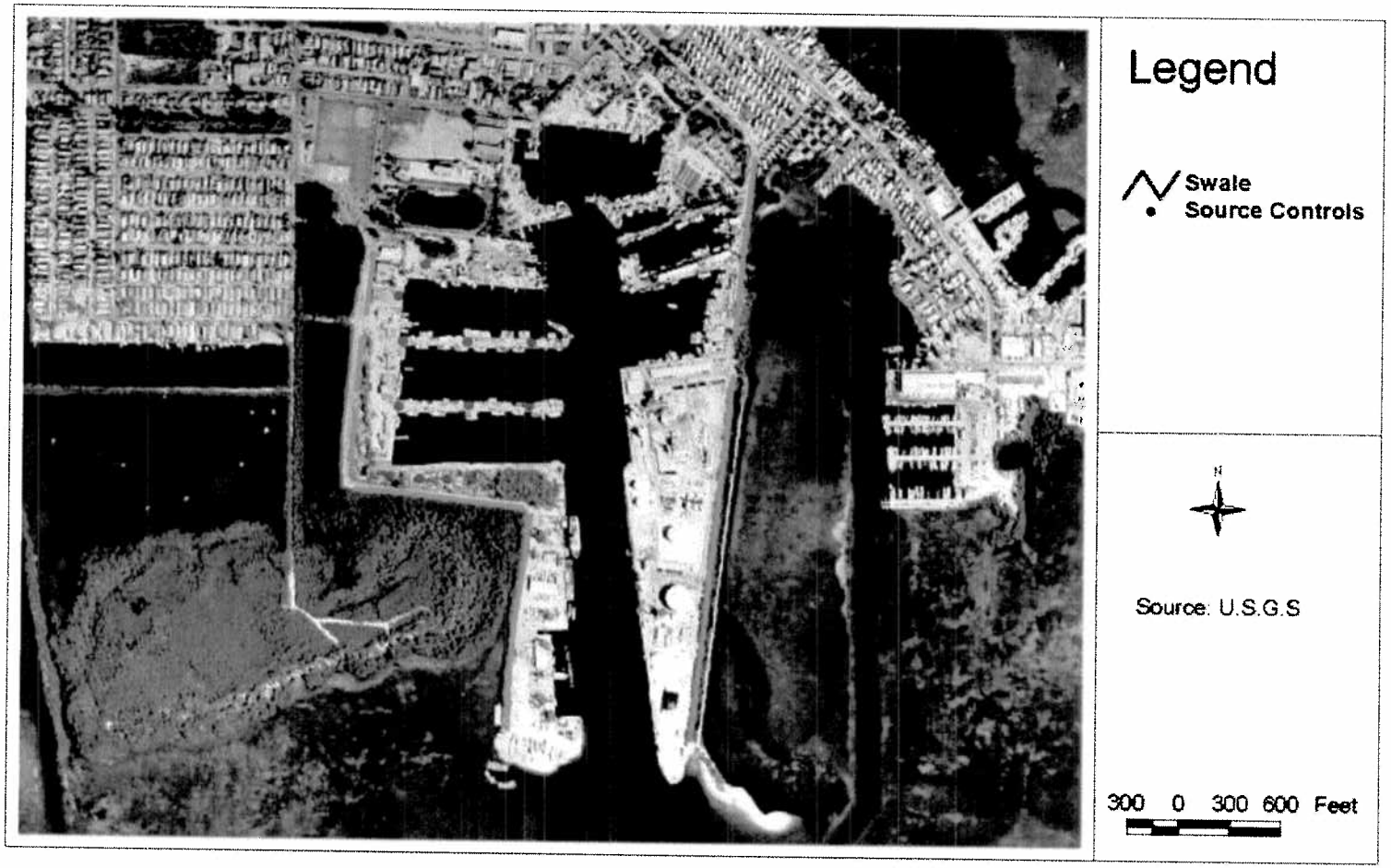
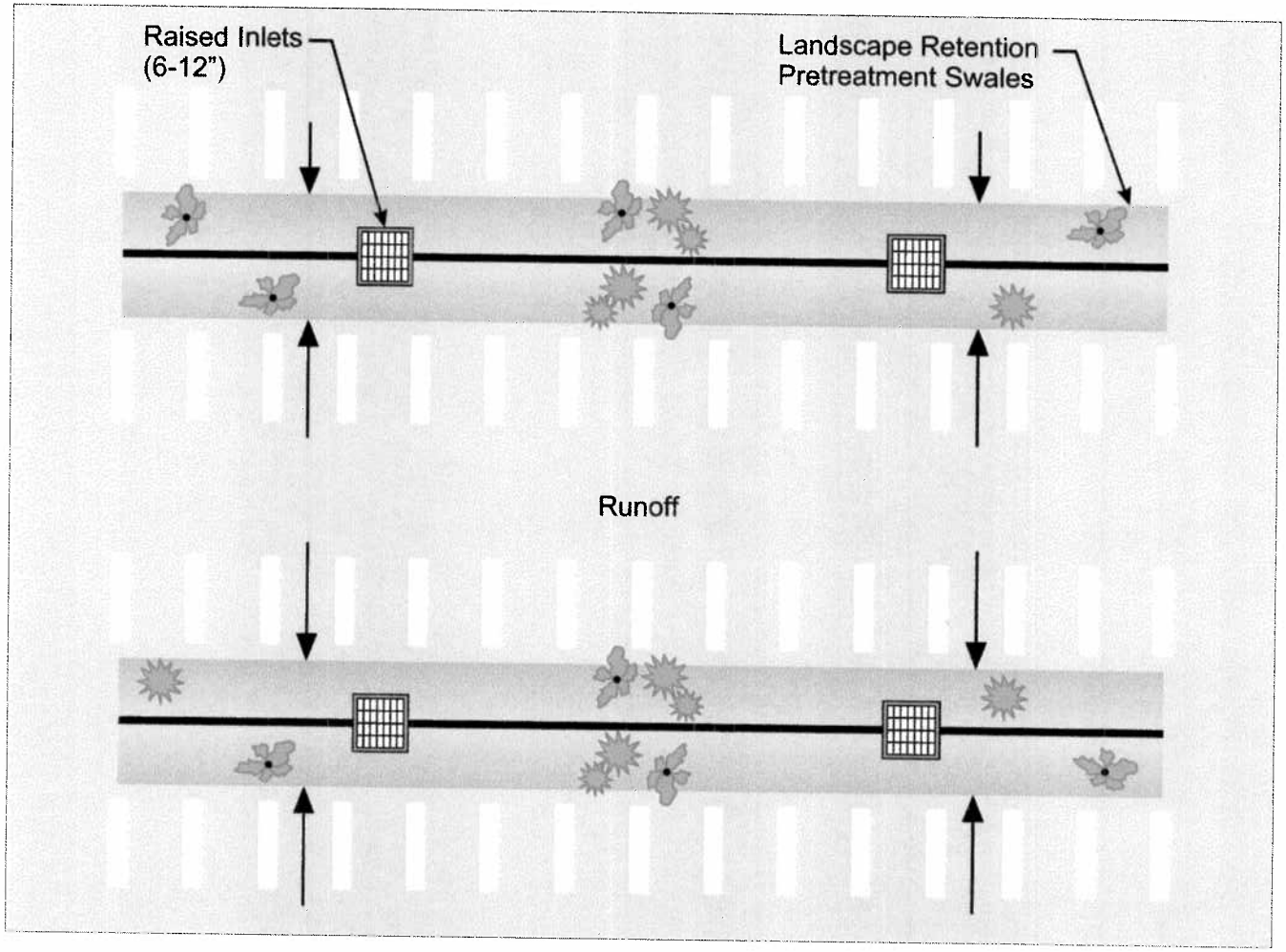


Figure1
Monroe County Stormwater Management Master Plan
Restoration Projects
Safe Harbor - Stock Island
Recommended Improvement Locations

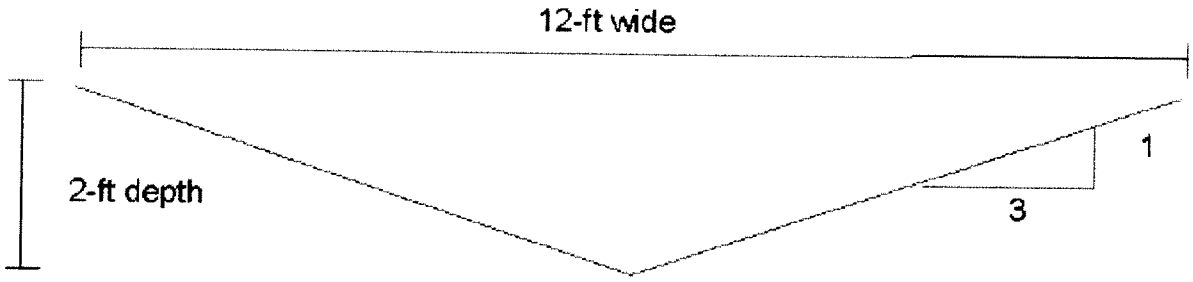
CDM Camp Dresser & McKee

n:\figure\monroeco_figure0001a_032301.cdr 3/23/01 petermanrr

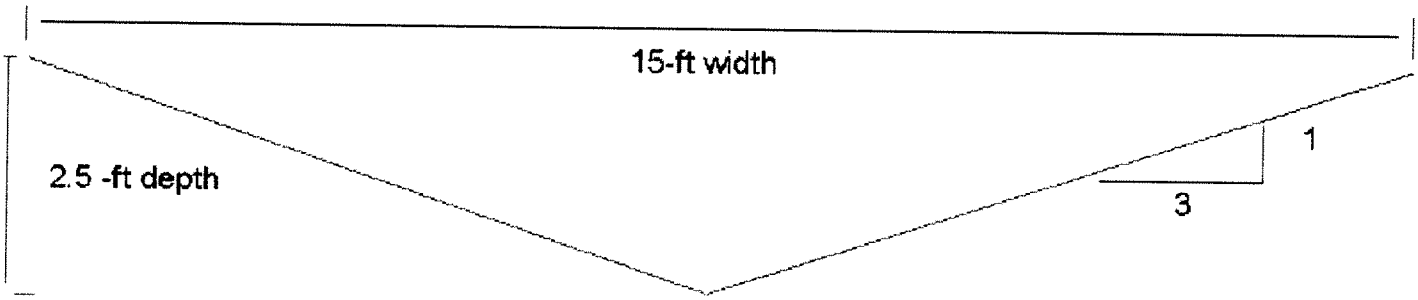


Monroe County Stormwater Management Master Plan
Landscaped Retention Pretreatment Swales with Raised Inlets
Plan View

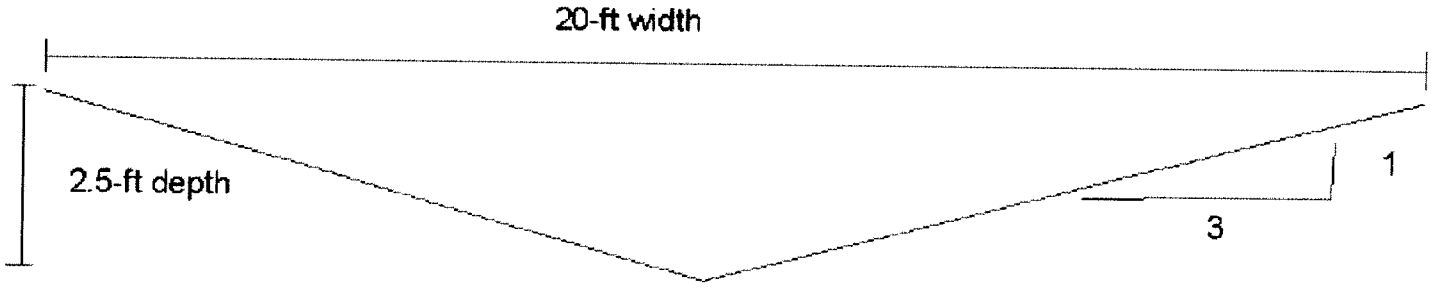
CDM Camp Dresser & McKee Inc.



Dimensions for 1000-ft swale section south of Alex's Junkyard



Dimensions for 1,450 swale section along southern portion Shrimp Road, 1,970-ft swale section on Front Strret by Generating Facility, and 2,350-ft section on northern half of Front Street



Dimensions for 2,550-ft swale section along western part of Shrimp Road.

Figure 3
Monroe County Stormwater Management Plan
Restoration Projects
Safe Horbor - Stock Island
Swale Cross-Sections

Monroe County Stormwater Master Plan
Capital Cost Summary
Safe Harbor - Stock Island

	Item	Units	Unit Cost	Quantity	Total Cost
1	Storm Sewer	Ft	Variable (5)	0	$0
2	Storm Inlets	Each	$2,500	0	$0
3	Swales (1) (2)	Ft	$25	9,300	$232,500
4	Road/Driveway Repair	Sq Yd	$20	0	$0
5	Excavation/Earthwork	Cu Yd	$12	0	$0
6	Curb Replacements/Installation	Ft	$10	0	$0
7	Exfiltration Trench	Ft	$250	0	$0
8	Water Quality Treatment Unit (6)	Each	$15,000	0	$0
9	Install/Repair Drain Well	Each	$5,000	0	$0
10	Roof Drain Treatment Areas	Each	$1,500	6	$9,000
11	Berm	Ft	$15	0	$0
	Subtotal 1				$241,500
	Contingency (30% of Subtotal 1) (3)				$72,500
	Subtotal 2				$314,000
	Engineering, Survey, & Permitting (15 % of Subtotal 2)				$47,100
	TOTAL COST (4)				$361,100

(1) Residential/Roadway swale costs include excavation, sod or landscaping. Commercial swale costs include excavation, inlets, pipes, barricades, and landscaping.
(2) This does not include land acquisition costs for swales not in existing rights-of-way.
(3) Includes contracor's overhead and profit as well as mobilization and standard contingencies.
(4) All costs are in 2001 dollars. Costs include only stormwater related infrastructure. Replacement or rehabilitation of non-stormwater infrastrucure is not included.
(5) Generally between $2.00 and $3.25/foot/in diameter depending on pipe size.
(6) Unit cost based upon sizing for tributary area of 10 acres or less.

Site Visit Photos

Picture 1 – Safe Harbor, SE corner Shrimp Road looking east

Picture 2 – Safe Harbor, SE corner looking west

Picture 3 – Safe Harbor, SW corner looking east

Picture 4 – Safe Harbor, SW corner looking west

Picture 5 – Safe Harbor, SW corner looking north

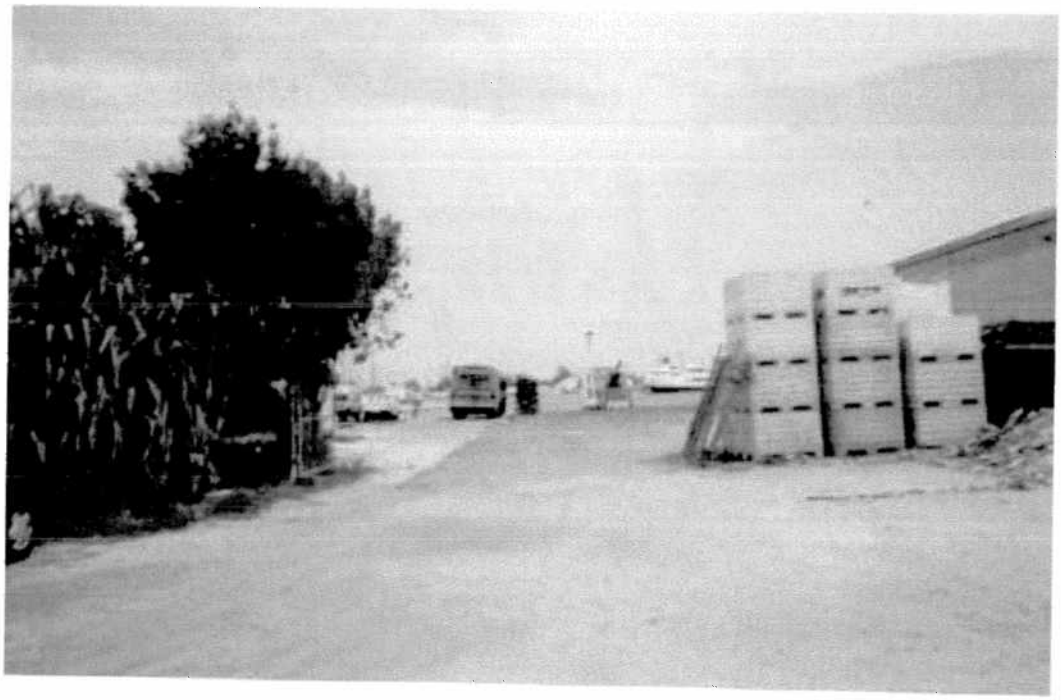
Picture 6, Safe Harbor, SW corner looking north

Picture 7 – Safe Harbor, west side looking east towards shrimping facility

Picture 8 – Safe Harbor, Westside looking east towards marina

Picture 9 – Safe Harbor, west side looking south

Picture 10 – Safe Harbor, west side looking north



Picture 11 – Safe Harbor, west side looking east

Picture 12 – Safe Harbor, west side looking east towards Safe Harbor Marina

Picture 13 – Safe Harbor, north side looking south

Picture 14 – Safe Harbor, north side looking east

Appendix 4.0-C

Stormwater Rehabilitation Projects

Card Sound Road (SR 905A)
Burton Drive @ US1
Jo-Jean Way @ Community Harbor
Veterans Park in Little Duck Key
52nd Street - Marathon
Marathon Government Center
Key Largo Trailer Park (example - private residential rehabilitation)
K-Mart Store - Marathon (example - private commercial rehabilitation

CARD SOUND ROAD
S.R. 905A

CARD SOUND ROAD, S.R. 905A

Description of Problem Area

Card Sound Road from S.R. 905 to the Monroe County/Miami-Dade County line is scheduled for resurfacing by the Florida Department of Transportation in 32002. It is a two-lane road with minimal shoulders. The study area is depicted on photos 39, 40, 41, 42, 43, 44 & 45. The road was elevated under a Monroe County contract in 1994 to provide an alternate evacuation route in the event of a hurricane. This should are very narrow and consist mainly of lime rock with little or no sod. Unfortunately there is insufficient area for creation of roadside swales to receive the roadway drainage prior to that water entering the lakes and creeks adjacent to the road. There are several areas where vehicle may park and people may picnic or fish. These areas are lime rock and roadway drainage flows over them to the creeks and lakes. The area west of the Card Sound Bridge is populated with numerous fishing shacks and a restaurant. Crab pots are washed and stored on the Right-of-Way. There is no evidence of good management practices to eliminate contamination of the canals on both sides of the roadway.

Recommended Improvements

- Sod the shoulders to filter roadway drainage.
- Create berms at the toe of slope of the parking areas to obstruct flow into the canals, creeks and lakes. Sod these berms to eliminate erosion.
- Since parking is prohibited along the roadway, sod the shoulders to increase filtering of roadway water.
- Establish good management practices for the area west of the Bridge. Recommendations for areas similar to this apply.

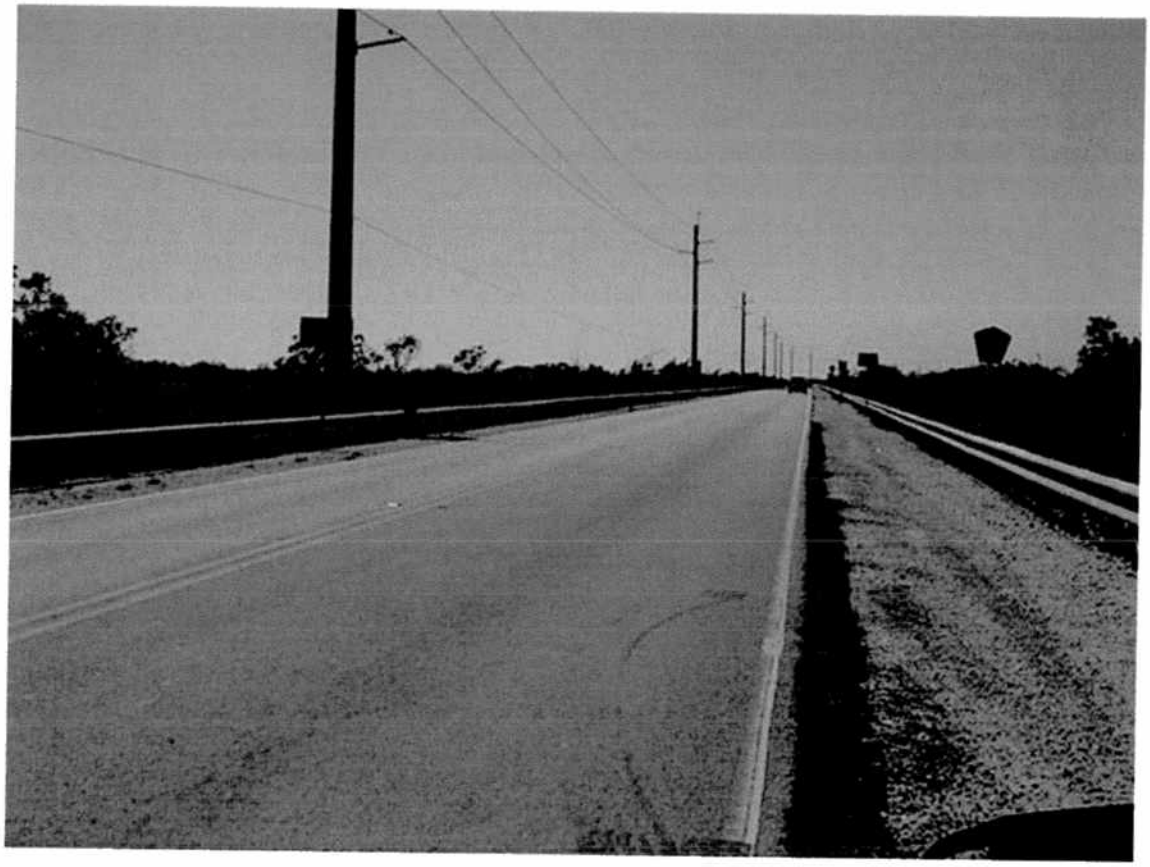
The estimated capital cost of these improvements is presented in the Capital Cost Summary.

Monroe County Stormwater Master Plan
Capital Cost Summary
Card Sound Road (SR 905A)

	Item	Units	Unit Cost	Quantity	Total Cost
1	Storm Sewer	Ft	Variable (5)	0	$0
2	Storm Inlets	Each	$2,500	0	$0
3	Swales (1) (2)	Ft	$25	0	$0
4	Road/Driveway Repair	Sq Yd	$20	0	$0
5	Excavation/Earthwork	Cu Yd	$12	0	$0
6	Curb Replacements/Installation	Ft	$10	0	$0
7	Exfiltration Trench	Ft	$250	0	$0
8	Water Quality Treatment Unit (6)	Each	$15,000	4	$60,000
9	Install/Repair Drain Well	Each	$5,000	0	$0
10	Roof Drain Treatment Areas	Each	$1,500	0	$0
11	Porous Pavement	Sq Yd	$20	0	$0

Subtotal 1	$60,000
Contingency (30% of Subtotal 1) (3)	$18,000
Subtotal 2	$78,000
Engineering, Survey, & Permitting (15 % of Subtotal 2)	$11,700
TOTAL COST (4)	$89,700

(1) Residential/Roadway swale costs include excavation, sod or landscaping. Commercial swale costs include excavation, inlets, pipes, barricades, and landscaping.
(2) This does not include land acquisition costs for swales not in existing rights-of-way.
(3) Includes contracor's overhead and profit as well as mobilization and standard contingencies.
(4) All costs are in 2001 dollars. Costs include only stormwater related infrastructure. Replacement or rehabilitation of non-stormwater infrastrucure is not included.
(5) Generally between $2.00 and $3.25/foot/in diameter depending on pipe size.
(6) Unit cost based upon sizing for tributary area of 10 acres or less.



Card Sound Road

Card Sound Road

Card Sound Road

Card Sound Road

BURTON DRIVE AT U.S. 1
TAVERNIER

BURTON DRIVE at U. S. 1 -Tavernier

Description of Problem

Water ponds along the southeast corner of Burton Drive and U.S. 1. The study area is depicted on photos 35, 36, 37 & 38. The plans for the reconstruction of U.S. 1 in Tavernier, prepared by the Florida Department of Transportation, show the grading at the intersection of Burton Drive and U.S. 1 to direct the flow of surface water north along the east side of U.S. 1, around the corner and northeast along the south side of Burton Drive. However, it appears that a portion of the lot at the southeast corner has been filled and the edge of pavement on Burton Drive is not well defined and the flow is impeded. There is no swale in this area and no grass verge to pick up any surface flow. The entire southeast corner, with little exception, is paved and surface flow is directed to the corner.

Recommended improvements

- Create a swale adjacent to U.S. 1 on the east side and Burton Drive on the south side. This swale should be 6" deep with 3:1 side slopes.
- Sod the swale above and sod the remainder of the right-of-way on both roads.

The estimated capital cost of these improvements is presented in the Capital Cost Summary.

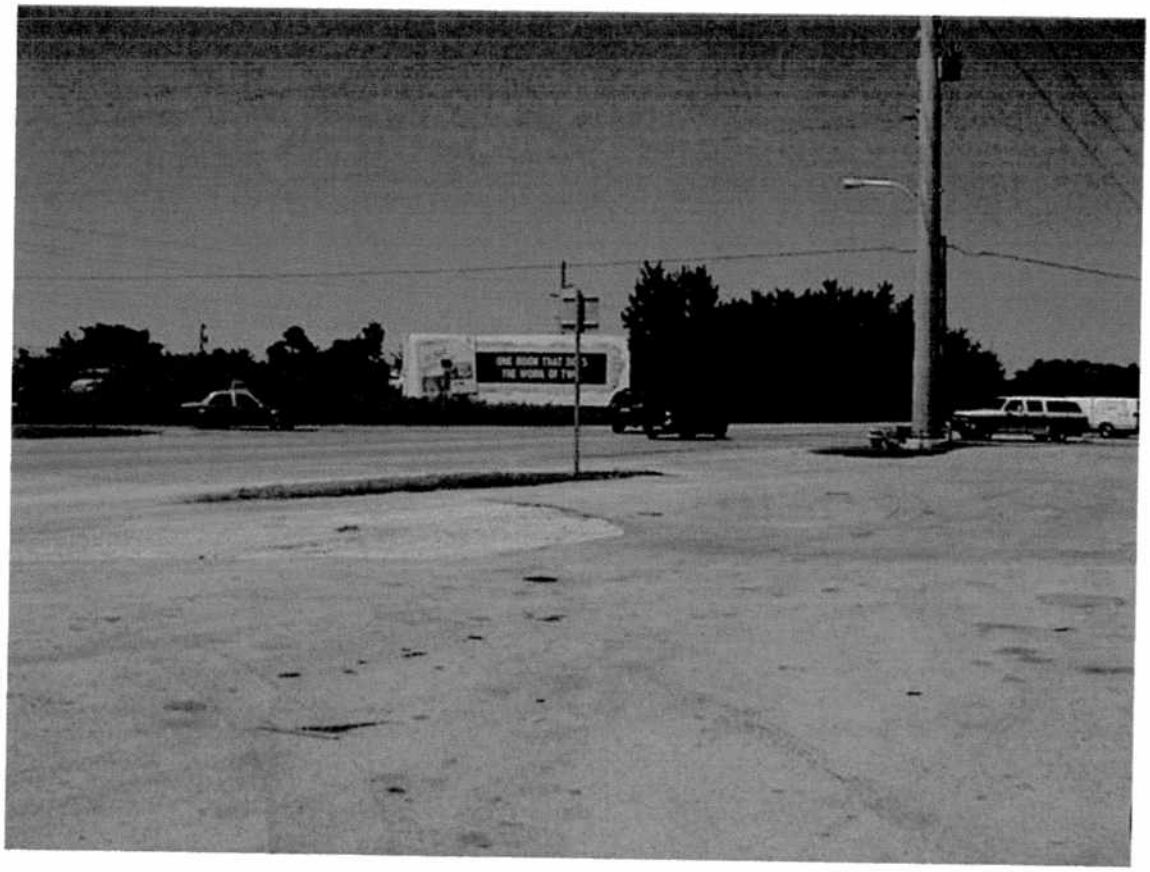
Monroe County Stormwater Master Plan
Capital Cost Summary
Burton Drive at US1 in Tavernier

	Item	Units	Unit Cost	Quantity	Total Cost
1	Storm Sewer	Ft	Variable (5)	0	$0
2	Storm Inlets	Each	$2,500	0	$0
3	Swales (1) (2)	Ft	$25	300	$7,500
4	Road/Driveway Repair	Sq Yd	$20	0	$0
5	Excavation/Earthwork	Cu Yd	$12	0	$0
6	Curb Replacements/Installation	Ft	$10	0	$0
7	Exfiltration Trench	Ft	$250	0	$0
8	Water Quality Treatment Unit (6)	Each	$15,000	0	$0
9	Install/Repair Drain Well	Each	$5,000	0	$0
10	Roof Drain Treatment Areas	Each	$1,500	0	$0
11	Porous Pavement	Sq Yd	$20	0	$0

Subtotal 1	$7,500
Contingency (30% of Subtotal 1) (3)	$2,300
Subtotal 2	$9,800
Engineering, Survey, & Permitting (15 % of Subtotal 2)	$1,500
TOTAL COST (4)	$11,300

(1) Residential/Roadway swale costs include excavation, sod or landscaping. Commercial swale costs include excavation, inlets, pipes, barricades, and landscaping.
(2) This does not include land acquisition costs for swales not in existing rights-of-way.
(3) Includes contracor's overhead and profit as well as mobilization and standard contingencies.
(4) All costs are in 2001 dollars. Costs include only stormwater related infrastructure. Replacement or rehabilitation of non-stormwater infrastrucure is not included.
(5) Generally between $2.00 and $3.25/foot/in diameter depending on pipe size.
(6) Unit cost based upon sizing for tributary area of 10 acres or less.

Burton Drive at US 1



Burton Drive at US 1

JO JEAN WAY
TAVERNIER

JO JEAN WAY - TAVERNIER

Description of Problem Area

At the end of Jo Jean Way and Community Harbor in Tavernier, there is a 36" outfall pipe that conveys drainage from the Overseas Highway. Photos 33 & 34 depict the study area. This pipe is the outfall for the Florida Department of Transportation positive drainage and drains approximately 31.5 acres, of which approximately 15.75 is impervious. There are sumps in the FDOT catch basins, but none in the outfall pipe. Other than the catch basin sumps, there is no water quality control.

Recommended Improvements

- Construct a "baffle box" at the end of the 36" outfall. This box would be 32' in length and have baffles at 3' intervals to precipitate solids from the drainage prior to discharge to the Harbor.

The estimated capital cost of this improvement is presented in the Capital Cost Summary.

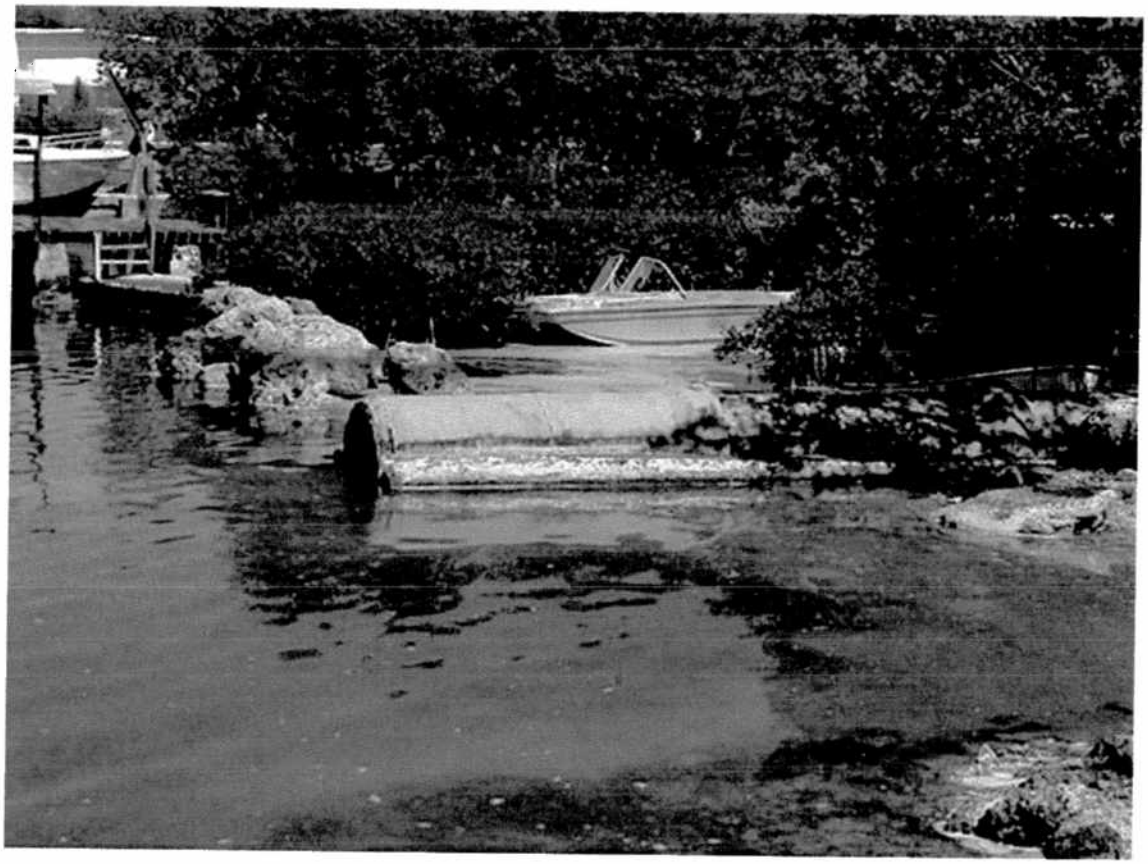
It should be noted that the baffle box needs to be maintained periodically. Sediment collected in the box should be vacuumed out or otherwise removed frequently during the rainy season. At a minimum, the box should be inspected after each storm event.

Monroe County Stormwater Master Plan
Capital Cost Summary
Jo-Jean Way in Tavernier

	Item	Units	Unit Cost	Quantity	Total Cost
1	Storm Sewer	Ft	Variable (5)	0	$0
2	Storm Inlets	Each	$2,500	0	$0
3	Swales (1) (2)	Ft	$25	0	$0
4	Road/Driveway Repair	Sq Yd	$20	0	$0
5	Excavation/Earthwork	Cu Yd	$12	0	$0
6	Curb Replacements/Installation	Ft	$10	0	$0
7	Exfiltration Trench	Ft	$250	0	$0
8	Water Quality Treatment Unit (6)	Each	$15,000	1	$15,000
9	Install/Repair Drain Well	Each	$5,000	1	$5,000
10	Roof Drain Treatment Areas	Each	$1,500	0	$0
11	Porous Pavement	Sq Yd	$20	0	$0

Subtotal 1	$20,000
Contingency (30% of Subtotal 1) (3)	$6,000
Subtotal 2	$26,000
Engineering, Survey, & Permitting (15 % of Subtotal 2)	$3,900
TOTAL COST (4)	$29,900

(1) Residential/Roadway swale costs include excavation, sod or landscaping. Commercial swale costs include excavation, inlets, pipes, barricades, and landscaping.
(2) This does not include land acquisition costs for swales not in existing rights-of-way.
(3) Includes contracor's overhead and profit as well as mobilization and standard contingencies.
(4) All costs are in 2001 dollars. Costs include only stormwater related infrastructure. Replacement or rehabilitation of non-stormwater infrastrucure is not included.
(5) Generally between $2.00 and $3.25/foot/in diameter depending on pipe size.
(6) Unit cost based upon sizing for tributary area of 10 acres or less.



Jo Jean Way

VETERAN'S PARK
LITTLE DUCK KEY

VETERAN'S PARK - LITTLE DUCK KEY

Description of Problem Area

Veteran's Park is located on the Oceanside of Little Duck key and consists of parking, picnic shelters, and rest room facilities. The drive and parking areas are 70% paved. The park comprises approximately 98,000 s.f. of which 6,000 s.f. is impervious, resulting in a "C" factor of 0.15. Photos 27, 28, 29, 30. 31 & 32 depict the study area. Water flowing from the Overseas Highway has partially eroded the grassed bank. There is a shallow swale at the toe of the bank and at the north edge of the asphalt drive that retains water from the Highway. However, water flowing from the Highway, down the entrance/exit drive, flows over a small grass area and directly into the Ocean.

Recommended Improvements

- A berm and swale should be constructed along the south side of the parking area to prevent water from the entrance/exit ramp from flowing to the Ocean.
- Sod should be placed on the slope from the highway to prevent further erosion.
- Establish plantings to fill the gaps in the growth along the highway shoulder to prevent further erosion.

With the berm and swale in place to eliminate flow into the Ocean, there will be 100% volume capture. The sketch below shows the proposed improvements. The estimated cost of these improvements is presented in Capital Cost Summary.

Monroe County Stormwater Master Plan
Capital Cost Summary
Veterans Park in Little Duck Key

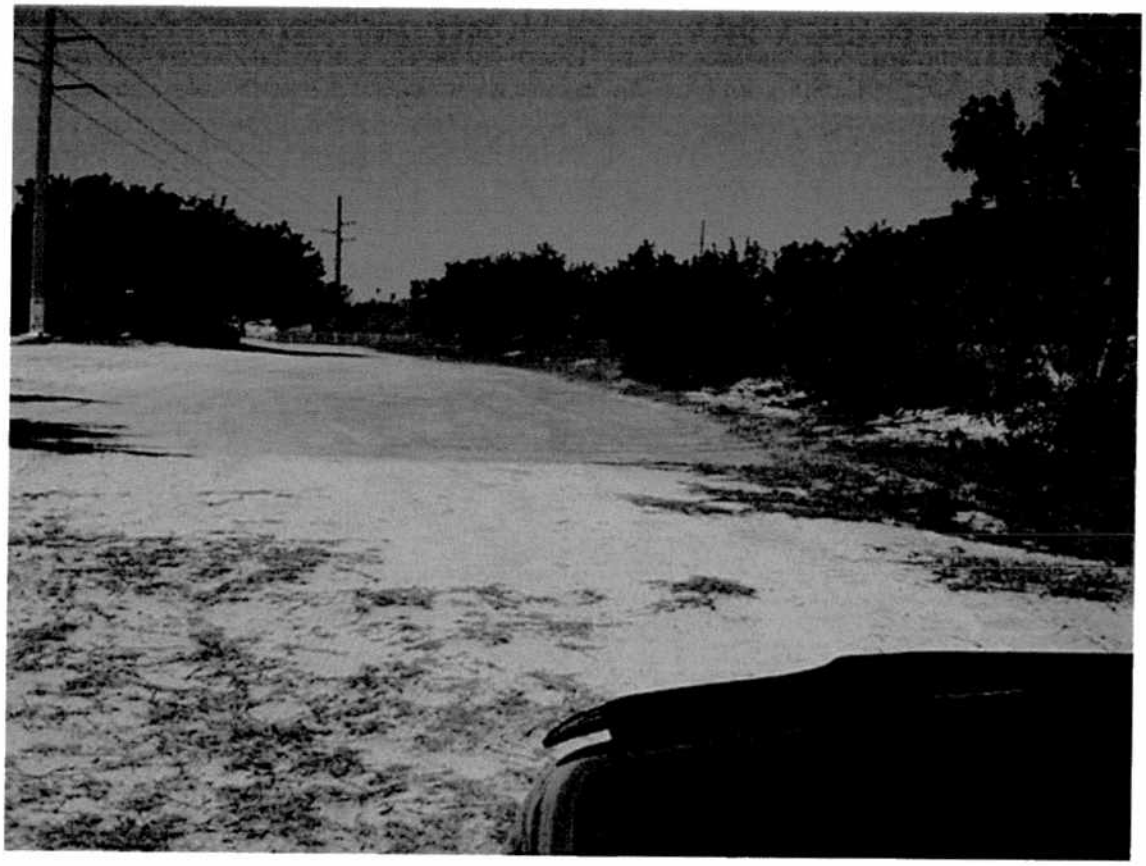
	Item	Units	Unit Cost	Quantity	Total Cost
1	Storm Sewer	Ft	Variable (5)	0	$0
2	Storm Inlets	Each	$2,500	0	$0
3	Swales (1) (2)	Ft	$25	0	$0
4	Road/Driveway Repair	Sq Yd	$20	0	$0
5	Excavation/Earthwork	Cu Yd	$12	193	$2,300
6	Curb Replacements/Installation	Ft	$10	0	$0
7	Exfiltration Trench	Ft	$250	0	$0
8	Water Quality Treatment Unit (6)	Each	$15,000	0	$0
9	Install/Repair Drain Well	Each	$5,000	0	$0
10	Roof Drain Treatment Areas	Each	$1,500	0	$0
11	Porous Pavement	Sq Yd	$20	0	$0

Subtotal 1	$2,300
Contingency (30% of Subtotal 1) (3)	$700
Subtotal 2	$3,000
Engineering, Survey, & Permitting (15 % of Subtotal 2)	$500
TOTAL COST (4)	$3,500

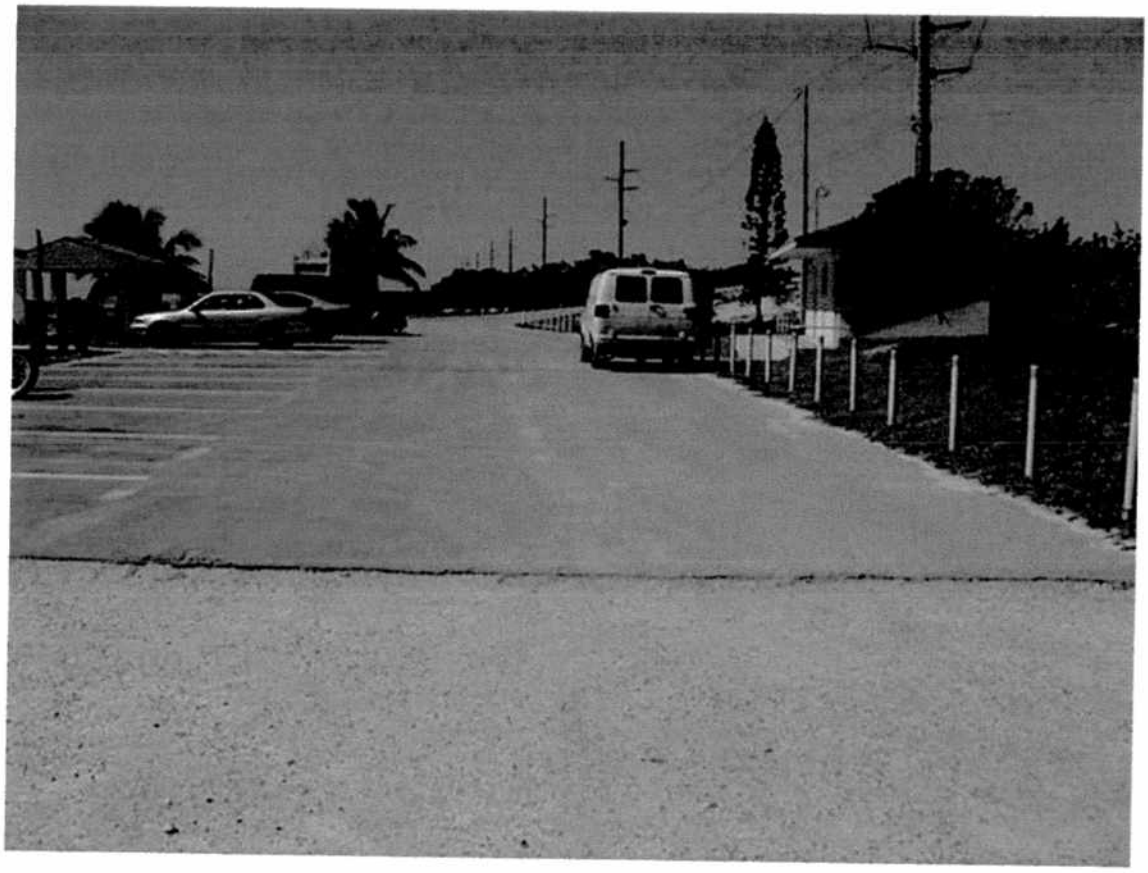
(1) Residential/Roadway swale costs include excavation, sod or landscaping. Commercial swale costs include excavation, inlets, pipes, barricades, and landscaping.
(2) This does not include land acquisition costs for swales not in existing rights-of-way.
(3) Includes contracor's overhead and profit as well as mobilization and standard contingencies.
(4) All costs are in 2001 dollars. Costs include only stormwater related infrastructure. Replacement or rehabilitation of non-stormwater infrastrucure is not included.
(5) Generally between $2.00 and $3.25/foot/in diameter depending on pipe size.
(6) Unit cost based upon sizing for tributary area of 10 acres or less.

Veteran's Park

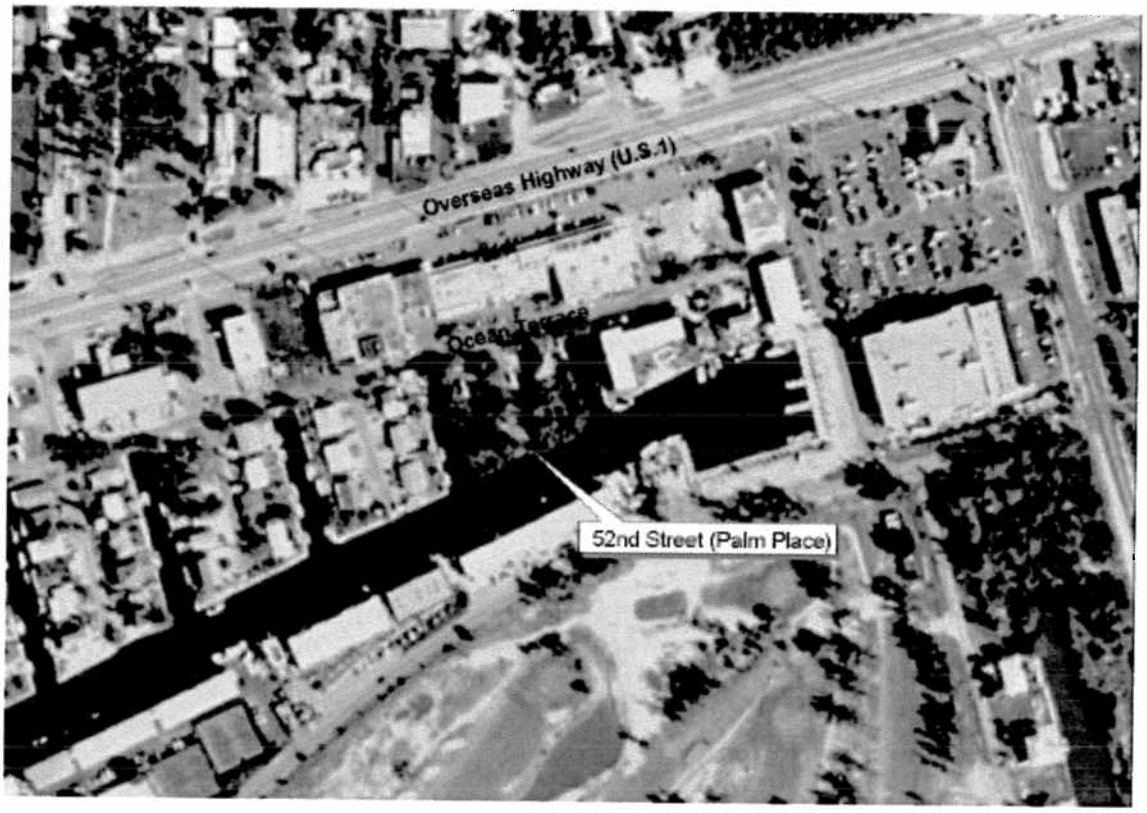
Veteran's Park



Veteran's Park



Rehabilitation Projects
52nd Street (Palm Place) – Marathon



Description of problem Area

52nd Street (Palm Place) runs from Ocean Terrace to the south for about 380-feet and ends at Boot Key Harbor and has a drainage area of about 1.9 acres. Photos 1 and 2 show the area during a recent site visit. Currently, runoff flows to the south and discharges untreated into the harbor.

Recommended Action

The area is residential with an average percent imperviousness of about 25% resulting in a "C" factor of 0.31. The recommended solution is described below.

- A small treatment device such as manufactured by CDS or Vortechnics should be installed to remove sediments prior to discharge to the harbor.

The proposed location of the recommended improvement is presented in **Figure 1**. A typical plan/profile of a treatment device is presented in **Figure 2**. The estimated capital costs for the recommended improvements are presented in **Table 1**.

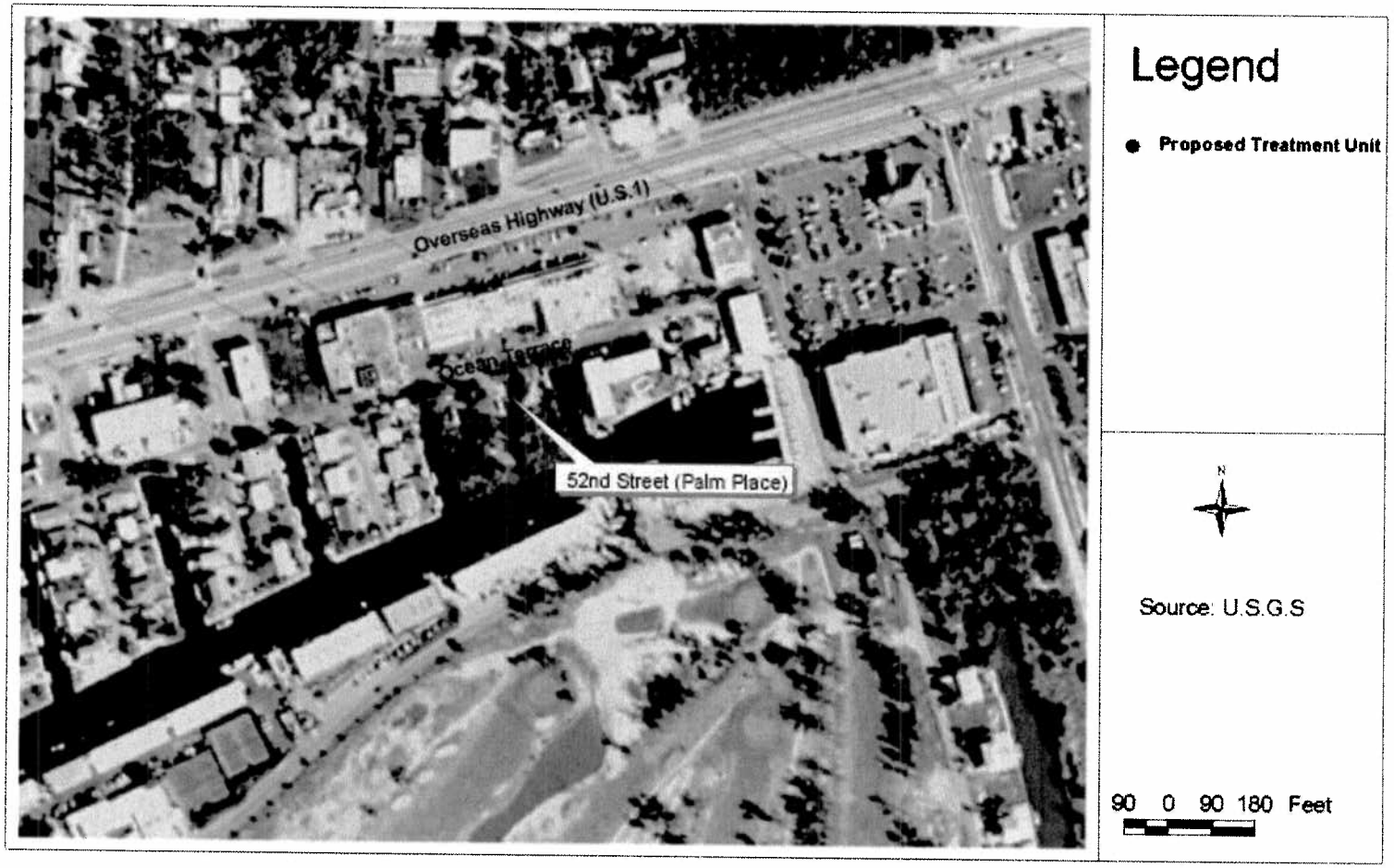
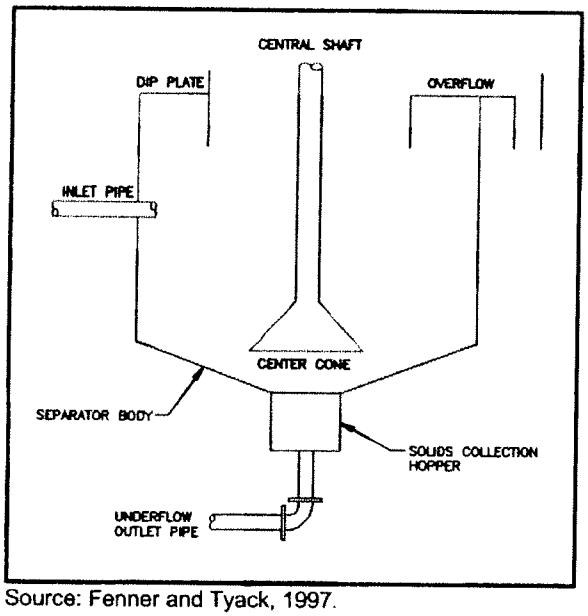


Figure1
Monroe County Stormwater Management Master Plan
RestorationProjects
52nd Street (Palm Place)- Marathon
Recommended Improvement Locations

Figure 2 – Vortechnics and CDS Treatment Device



Source: Fenner and Tyack, 1997.

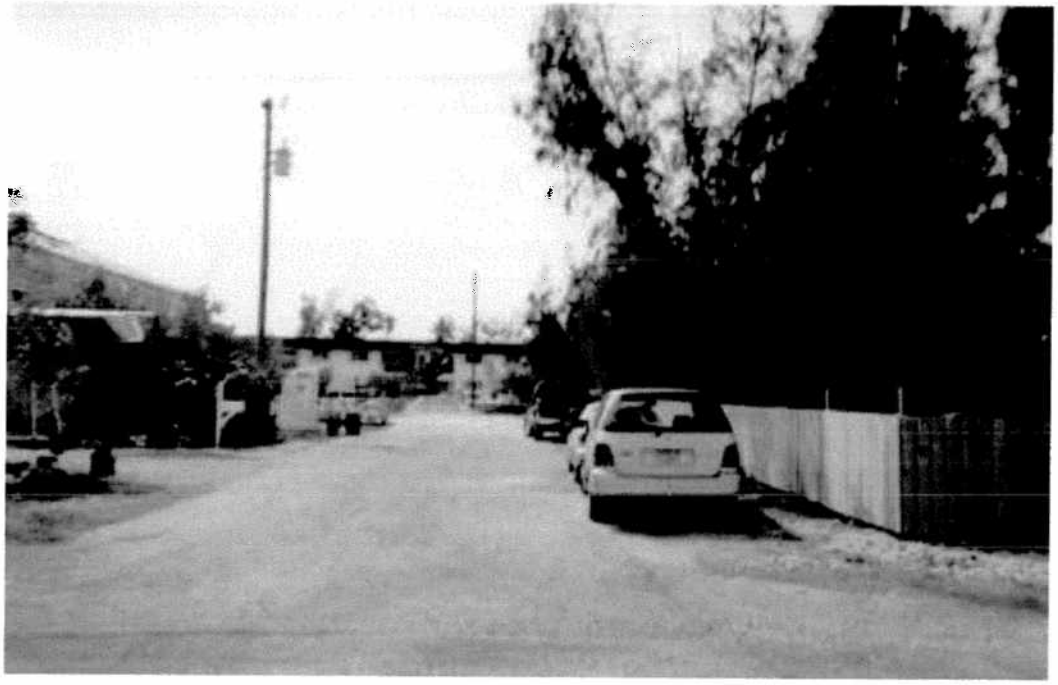
Monroe County Stormwater Master Plan
Capital Cost Summary
52nd Street (Palm Place) - Boot Key Harbor - Marathon

	Item	Units	Unit Cost	Quantity	Total Cost
1	Storm Sewer	Ft	Variable (5)	0	$0
2	Storm Inlets	Each	$2,500	0	$0
3	Swales (1) (2)	Ft	$25	0	$0
4	Road/Driveway Repair	Sq Yd	$20	0	$0
5	Excavation/Earthwork	Cu Yd	$12	0	$0
6	Curb Replacements/Installation	Ft	$10	0	$0
7	Exfiltration Trench	Ft	$250	0	$0
8	Water Quality Treatment Unit (6)	Each	$15,000	1	$15,000
9	Install/Repair Drain Well	Each	$5,000	0	$0
10	Roof Drain Treatment Areas	Each	$1,500	0	$0
11	Berm	Ft	$15	0	$0

Subtotal 1	$15,000
Contingency (30% of Subtotal 1) (3)	$4,500
Subtotal 2	$19,500
Engineering, Survey, & Permitting (15 % of Subtotal 2)	$2,900
TOTAL COST (4)	$22,400

(1) Residential/Roadway swale costs include excavation, sod or landscaping. Commercial swale costs include excavation, inlets, pipes, barricades, and landscaping.
(2) This does not include land acquisition costs for swales not in existing rights-of-way.
(3) Includes contracor's overhead and profit as well as mobilization and standard contingencies.
(4) All costs are in 2001 dollars. Costs include only stormwater related infrastructure. Replacement or rehabilitation of non-stormwater infrastrucure is not included.
(5) Generally between $2.00 and $3.25/foot/in diameter depending on pipe size.
(6) Unit cost based upon sizing for tributary area of 10 acres or less.

Site Visit Photos



Picture 1 – 52nd Street (Palm Place) at Ocean Terrace looking south

Picture 2 - 52nd Street (Palm Place) at outfall to waterway

MONROE GOVERNMENT CENTER

MONROE GOVERNMENT CENTER

Description of Problem Area

The Marathon Government Center is located in the city of Marathon on the north side of the Overseas Highway at MM 48.6. It comprises approximately 4,14 acres of which 3.71 acres is impervious resulting in a "C" factor of 0.86. Drainage is presently treated through a system of exfiltration trenches and one well that the central parking area exfiltration trenches are connected to. The central area floods during moderate rainfall. The pavement is an inverted crown with minimal landscape areas between stalls, allowing no storage. The site is designed to hold the 25-year, 3-day storm on site with no off-site discharge.

Recommended Improvements

- Clean the sumps in the catch basins.
- Flush the pipes in the exfiltration trenches.
- Rehabilitate the existing well and install a device to remove sediment before it enters the well.

The estimated capital cost of these improvements is presented in the Capital Cost Summary.

Monroe County Stormwater Master Plan
Capital Cost Summary
Marathon Government Center

	Item	Units	Unit Cost	Quantity	Total Cost
1	Storm Sewer	Ft	Variable (5)	0	$0
2	Storm Inlets	Each	$2,500	0	$0
3	Swales (1) (2)	Ft	$25	0	$0
4	Road/Driveway Repair	Sq Yd	$20	0	$0
5	Excavation/Earthwork	Cu Yd	$12	0	$0
6	Curb Replacements/Installation	Ft	$10	0	$0
7	Exfiltration Trench	Ft	$250	0	$0
8	Water Quality Treatment Unit (6)	Each	$15,000	1	$15,000
9	Install/Repair Drain Well	Each	$5,000	1	$5,000
10	Roof Drain Treatment Areas	Each	$1,500	0	$0
11	Porous Pavement	Sq Yd	$20	0	$0
	Subtotal 1				$20,000
	Contingency (30% of Subtotal 1) (3)				$6,000
	Subtotal 2				$26,000
	Engineering, Survey, & Permitting (15 % of Subtotal 2)				$3,900
	TOTAL COST (4)				$29,900

(1) Residential/Roadway swale costs include excavation, sod or landscaping. Commercial swale costs include excavation, inlets, pipes, barricades, and landscaping.
(2) This does not include land acquisition costs for swales not in existing rights-of-way.
(3) Includes contracor's overhead and profit as well as mobilization and standard contingencies.
(4) All costs are in 2001 dollars. Costs include only stormwater related infrastructure. Replacement or rehabilitation of non-stormwater infrastrucure is not included.
(5) Generally between $2.00 and $3.25/foot/in diameter depending on pipe size.
(6) Unit cost based upon sizing for tributary area of 10 acres or less.

KEY LARGO TRAILER VILLAGE

KEY LARGO TRAILER VILLAGE

Description of Problem Area

This is a 61.6-acre trailer park with boat canals connected to Tarpon Basin. Approximately 25.34 acres is impervious resulting in a "C" factor of 0.48.There is no positive drainage system and all water flows overland to the Tarpon Basin. Numerous low areas in the roads collect water and it stands until evaporation takes place. The shoulders adjacent to the roads are lime rock with no vegetation.

Recommended Improvements

- Fill the low spots.
- Construct and sod small swales at the pavement edge to collect the drainage from the roadways. These roadways have established grades and swale drainage should follow the roadway grades.

The estimated capital cost of these improvements is presented in the Capital Cost Summary.

Monroe County Stormwater Master Plan
Capital Cost Summary
Key Largo Trailer Village

	Item	Units	Unit Cost	Quantity	Total Cost
1	Storm Sewer	Ft	Variable (5)	0	$0
2	Storm Inlets	Each	$2,500	0	$0
3	Swales (1) (2)	Ft	$25	6,720	$168,000
4	Road/Driveway Repair	Sq Yd	$20	0	$0
5	Excavation/Earthwork	Cu Yd	$12	0	$0
6	Curb Replacements/Installation	Ft	$10	0	$0
7	Exfiltration Trench	Ft	$250	0	$0
8	Water Quality Treatment Unit (6)	Each	$15,000	0	$0
9	Install/Repair Drain Well	Each	$5,000	0	$0
10	Roof Drain Treatment Areas	Each	$1,500	0	$0
11	Porous Pavement	Sq Yd	$20	0	$0
	Subtotal 1				$168,000
	Contingency (30% of Subtotal 1) (3)				$50,400
	Subtotal 2				$218,400
	Engineering, Survey, & Permitting (15 % of Subtotal 2)				$32,800
	TOTAL COST (4)				$251,200

(1) Residential/Roadway swale costs include excavation, sod or landscaping. Commercial swale costs include excavation, inlets, pipes, barricades, and landscaping.
(2) This does not include land acquisition costs for swales not in existing rights-of-way.
(3) Includes contracor's overhead and profit as well as mobilization and standard contingencies.
(4) All costs are in 2001 dollars. Costs include only stormwater related infrastructure. Replacement or rehabilitation of non-stormwater infrastrucure is not included.
(5) Generally between $2.00 and $3.25/foot/in diameter depending on pipe size.
(6) Unit cost based upon sizing for tributary area of 10 acres or less.

Rehabilitation Projects
KMART – Marathon

Description of Problem Area

The KMART shopping center is located at the east side of the intersection of Sombrero Beach Road and the Overseas Highway (U.S. 1). It comprises about 9.0 acres of area, 99% of which is impervious resulting in a runoff "C" factor of 0.95. Photos 1, 2, 3, 4, and 5 depict the study area. Previously, excess runoff would drain to the north towards U.S. 1; however, U.S. 1 was raised by several feet the last time it was resurfaced. This effectively blocked discharge from the KMART parking lot. There have been at least 37 drain wells permitted for the area, but only five were found during a site visit, and they are reported to functioning poorly. It appears that as a well starts to lose function, it is paved over and a new well constructed. Generally, runoff now gradually flows towards the middle of the relatively flat parking lot where it ponds significantly during rain events. For one event, runoff ponded almost up to the building elevation. This parking lot also is used by the County School Buses as a "staging area." It would benefit both the County and the land owner to address this problem area.

Recommended Improvements

The following improvements are recommended to improve water quality and reduce flooding.

- Construct a landscaped swale with a total length of about 800-feet running from the east to the west in the middle on the parking area where the existing drain wells are located. About 75-feet of the length will be used by automobile crossing areas. The recommended swale dimensions are 2.5-feet deep, 30-feet wide, with 6:1 side slopes providing 37.5 ft^2 of storage area per foot of length for a total storage volume of 0.62 ac-ft. Shade trees should be planted in the swale for aesthetics and to promote evapotranspiration.
- Construct a 300-foot long swale on the east side of the parking area south of the McDonalds restaurant. The recommended swale dimensions are 1.5-feet deep, 12-feet wide, with 4:1 side slopes providing 9.0 ft^2 of storage area per foot of length for a total storage volume of 0.06 ac-ft.
- Construct an 800-foot long swale on south side of the building. The recommended swale dimensions are 1.0-feet deep, 6-feet wide, with 3:1 side slopes providing 9.0 ft^2 of storage area per foot of length for a total storage volume of 0.06 ac-ft.
- Rehabilitate the existing drain wells and install raised inlets to provide detention in the swales. This will remove sediment before runoff enters the well.
- Install porous pavement for a 25-foot wide section along the northern 500-foot part of the parking lot that borders U.S. 1.
- The parking configuration will need to be adjusted to accommodate the swale.

The proposed swales would provide a percent annual capture of about 72% of the average annual rainfall. The porous parking and rehabilitated drain wells would increase this percent capture. **Figure 1** presents the locations of the proposed improvements, and **Figures 2** and **3** present plan and profile views of the improvements. The estimated capital cost for the improvements is presented in **Table 1**.

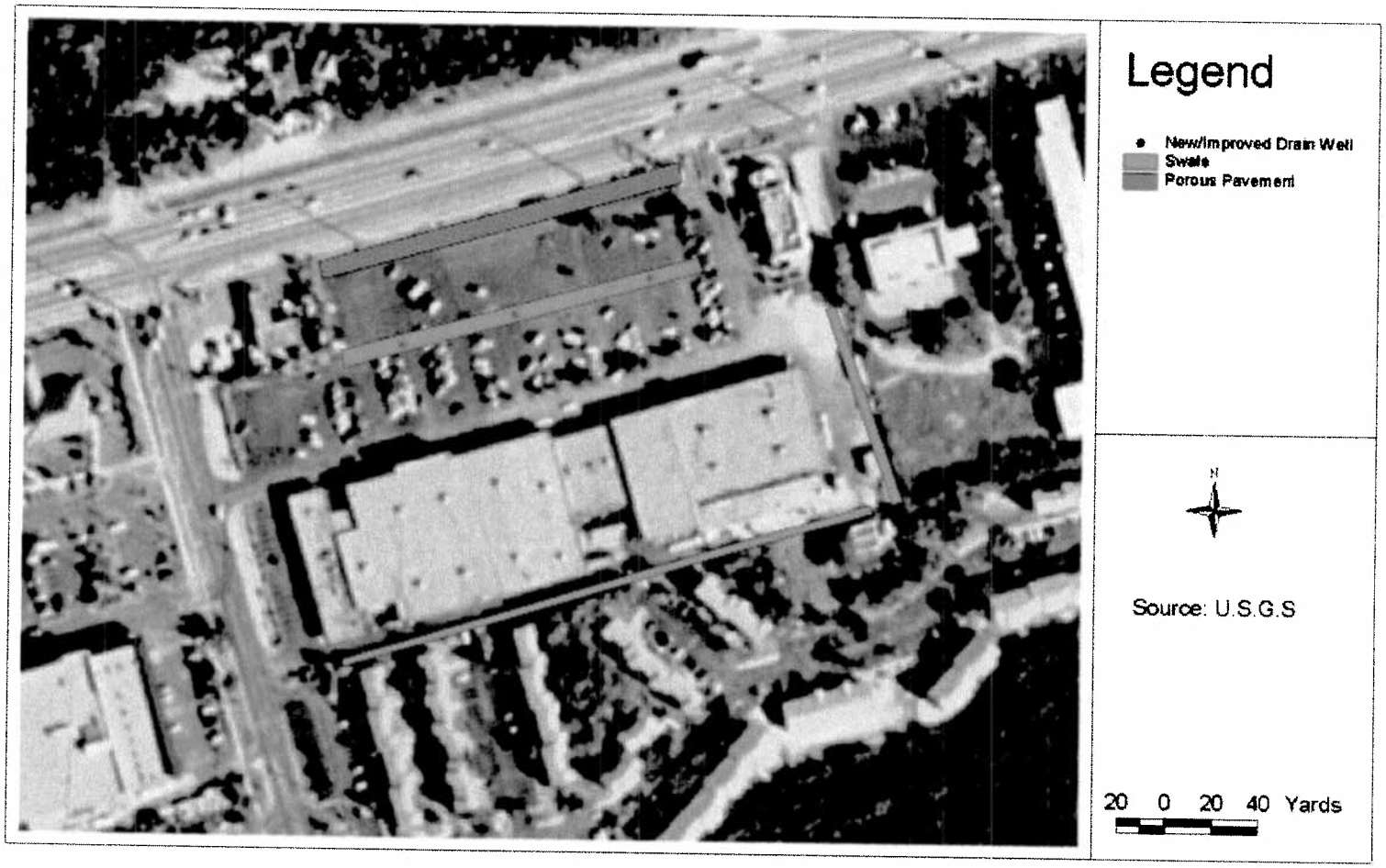
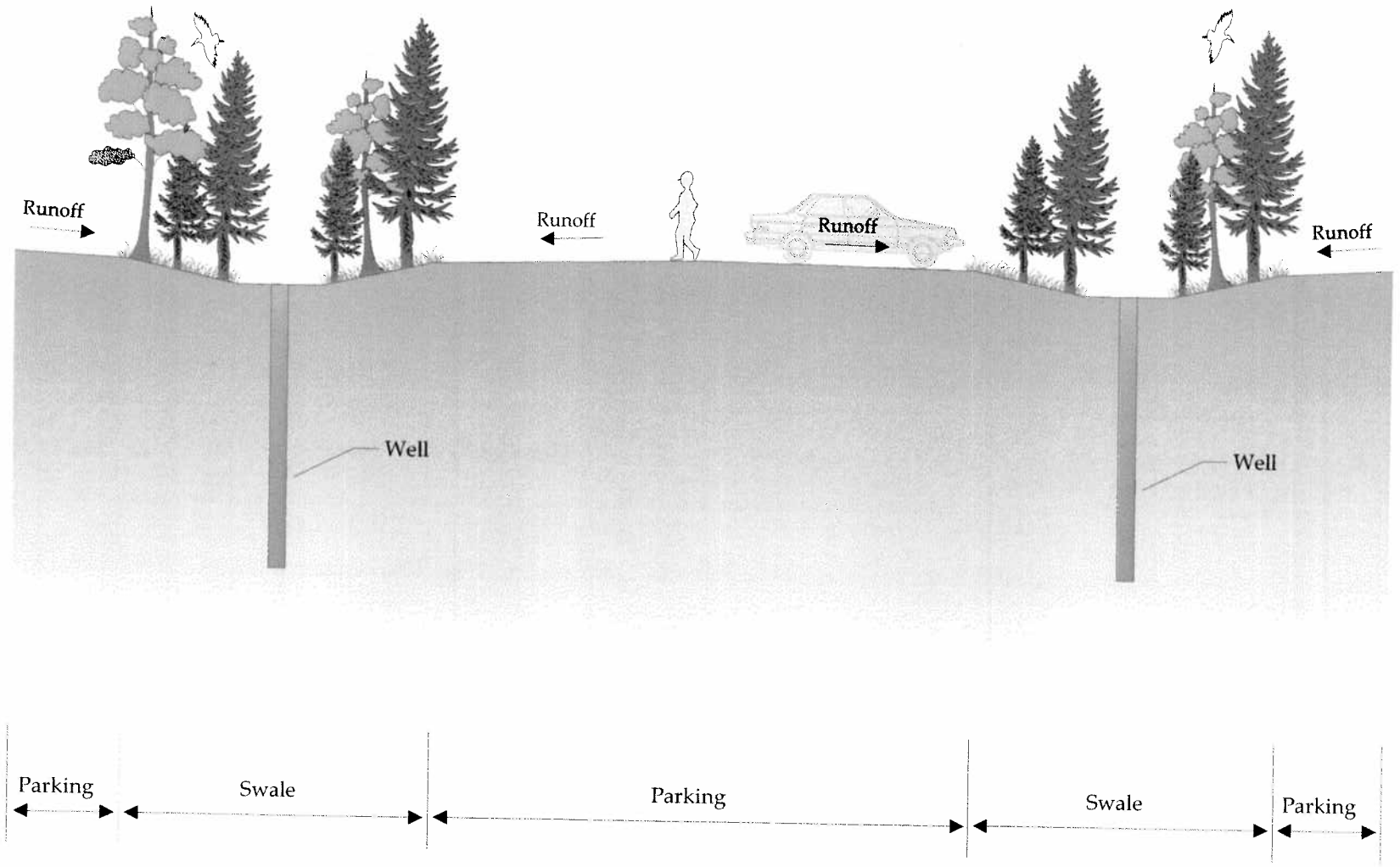
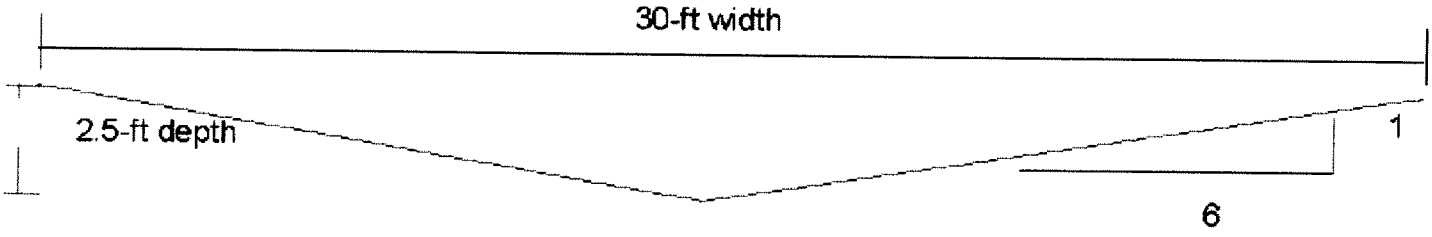


Figure1
Monroe County Stormwater Management Master Plan
Rehabilitation Projects
KMART - Marathon
Recommended Improvement Locations

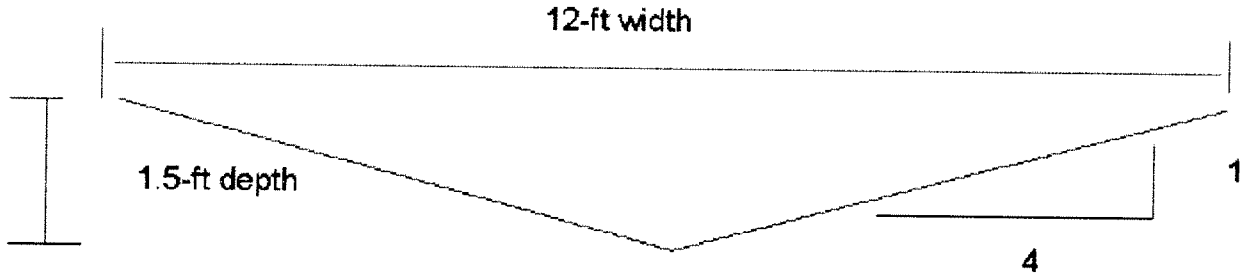


Monroe County Stormwater Management Master Plan
Landscaped Retention Pretreatment Swales with Raised Inlets
Section View

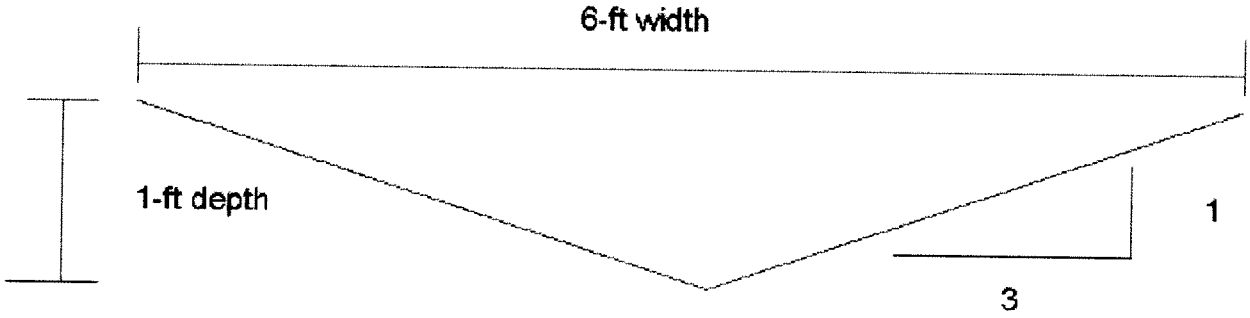
CDM Camp Dresser & McKee Inc.



Dimensions for 800-ft section of swale in parking lot

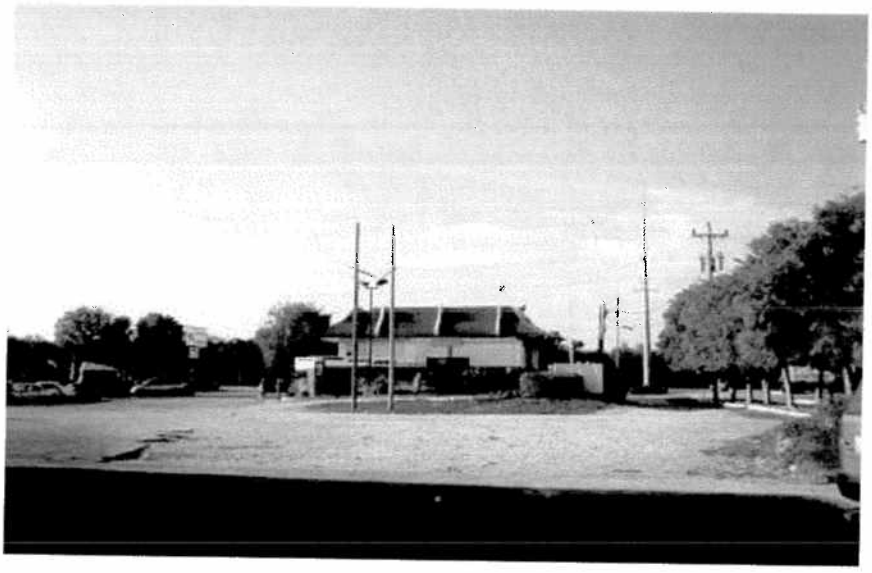


Dimensions for swale on east side of parking lot

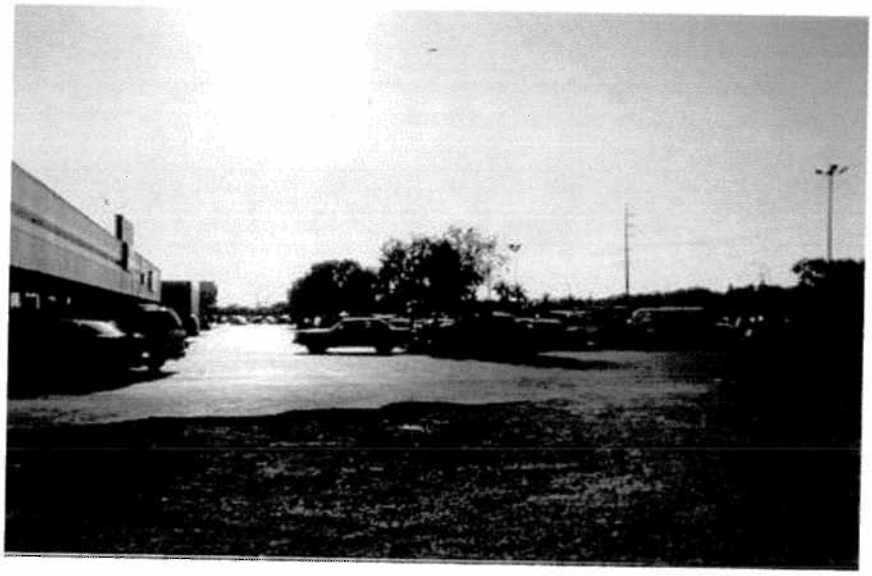


Dimensions for swale behing KMART

Figure 3
Monroe County Stormwater Management Plan
Restoration Projects
Safe Horbor - Stock Island
Swale Cross-Sections



Picture 1 – KMART parking lot, east side, looking north



Picture 2 – KMART parking lot, east side, looking west

Picture 3 – KMART parking lot, SE corner looking west

Picture 4 – KMART parking lot, NE corner looking west

Picture 5 – KMART parking lot, north side looking south

Monroe County Stormwater Master Plan
Capital Cost Summary
K-Mart Shopping Center

	Item	Units	Unit Cost	Quantity	Total Cost
1	Storm Sewer	Ft	Variable (5)	0	$0
2	Storm Inlets	Each	$2,500	0	$0
3	Swales (1) (2)	Ft	$85	3,500	$297,500
4	Road/Driveway Repair	Sq Yd	$20	0	$0
5	Excavation/Earthwork	Cu Yd	$12	0	$0
6	Curb Replacements/Installation	Ft	$10	0	$0
7	Exfiltration Trench	Ft	$250	0	$0
8	Water Quality Treatment Unit (6)	Each	$15,000	0	$0
9	Install/Repair Drain Well	Each	$5,000	3	$15,000
10	Roof Drain Treatment Areas	Each	$1,500	0	$0
11	Porous Pavement	Sq Yd	$20	1,400	$28,000
	Subtotal 1				$340,500
	Contingency (30% of Subtotal 1) (3)				$102,200
	Subtotal 2				$442,700
	Engineering, Survey, & Permitting (15 % of Subtotal 2)				$66,400
	TOTAL COST (4)				$509,100

(1) Residential/Roadway swale costs include excavation, sod or landscaping. Commercial swale costs include excavation, inlets, pipes, barricades, and landscaping.
(2) This does not include land acquisition costs for swales not in existing rights-of-way.
(3) Includes contracor's overhead and profit as well as mobilization and standard contingencies.
(4) All costs are in 2001 dollars. Costs include only stormwater related infrastructure. Replacement or rehabilitation of non-stormwater infrastrucure is not included.
(5) Generally between $2.00 and $3.25/foot/in diameter depending on pipe size.
(6) Unit cost based upon sizing for tributary area of 10 acres or less.

EL PRADO CIRCLE
ON COPPITT KEY

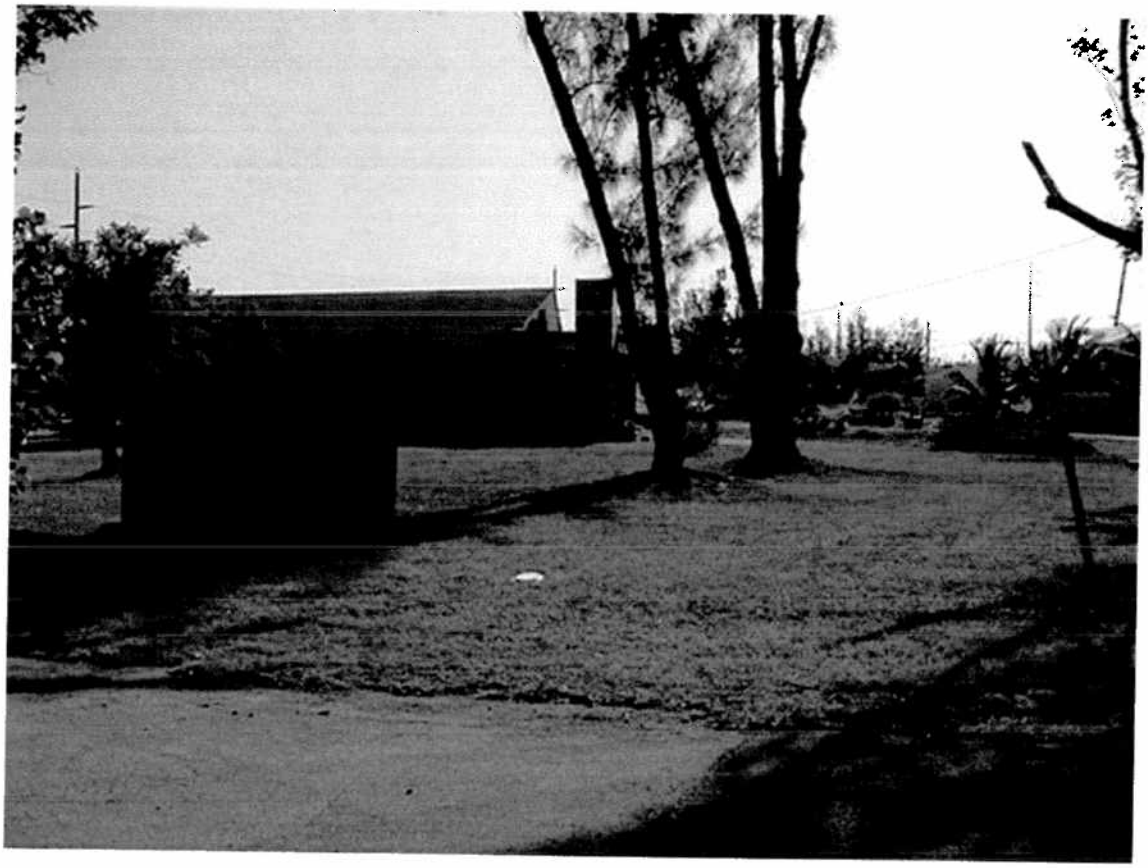
Monroe County Stormwater Master Plan
Capital Cost Summary
El Prado Circle on Coppitt Key

	Item	Units	Unit Cost	Quantity	Total Cost
1	Storm Sewer	Ft	Variable (5)	0	$0
2	Storm Inlets	Each	$2,500	0	$0
3	Swales (1) (2)	Ft	$25	0	$0
4	Road/Driveway Repair	Sq Yd	$20	0	$0
5	Excavation/Earthwork	Cu Yd	$12	0	$0
6	Curb Replacements/Installation	Ft	$10	0	$0
7	Exfiltration Trench	Ft	$250	0	$0
8	Water Quality Treatment Unit (6	Each	$15,000	4	$60,000
9	Install/Repair Drain Well	Each	$5,000	0	$0
10	Roof Drain Treatment Areas	Each	$1,500	0	$0
11	Porous Pavement	Sq Yd	$20	0	$0

Subtotal 1	$60,000
Contingency (30% of Subtotal 1) (3)	$18,000
Subtotal 2	$78,000
Engineering, Survey, & Permitting (15 % of Subtotal 2)	$11,700
TOTAL COST (4)	$89,700

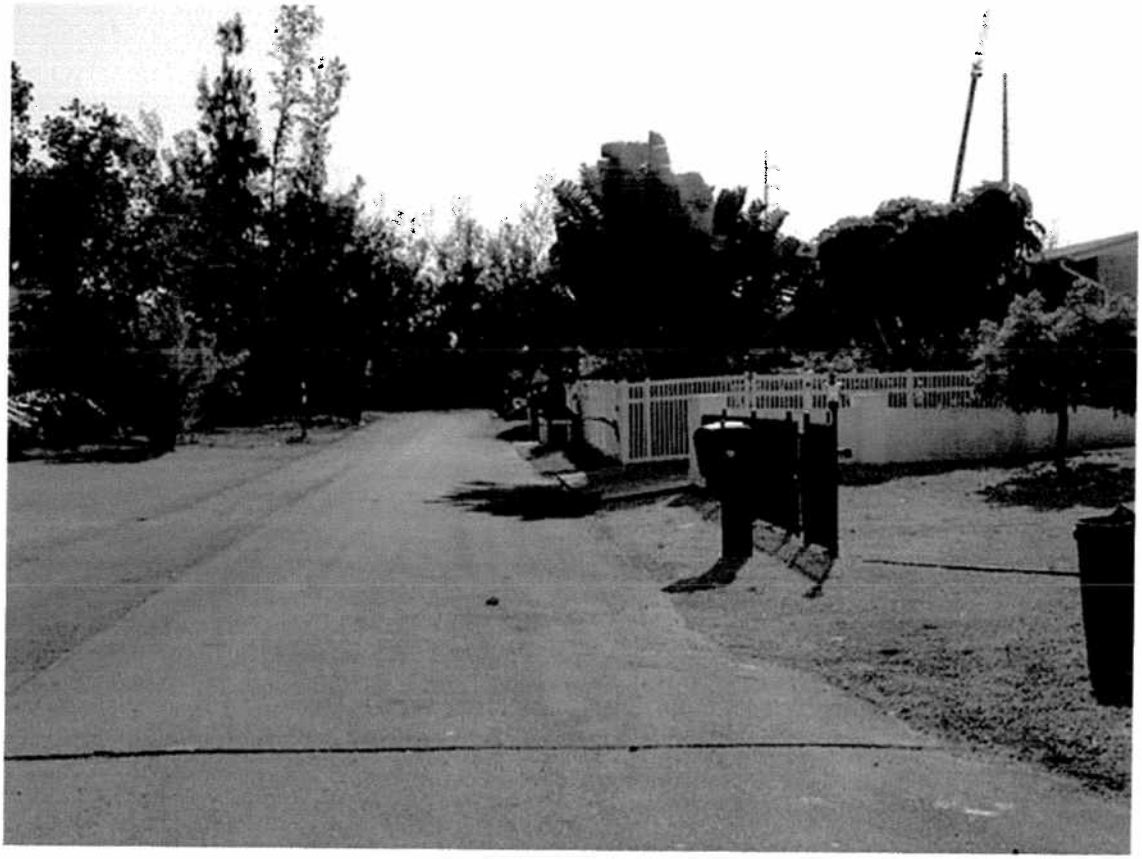
(1) Residential/Roadway swale costs include excavation, sod or landscaping. Commercial swale costs include excavation, inlets, pipes, barricades, and landscaping.
(2) This does not include land acquisition costs for swales not in existing rights-of-way.
(3) Includes contracor's overhead and profit as well as mobilization and standard contingencies.
(4) All costs are in 2001 dollars. Costs include only stormwater related infrastructure. Replacement or rehabilitation of non-stormwater infrastrucure is not included.
(5) Generally between $2.00 and $3.25/foot/in diameter depending on pipe size.
(6) Unit cost based upon sizing for tributary area of 10 acres or less.

Looking East to El Prado Circle (above and below)

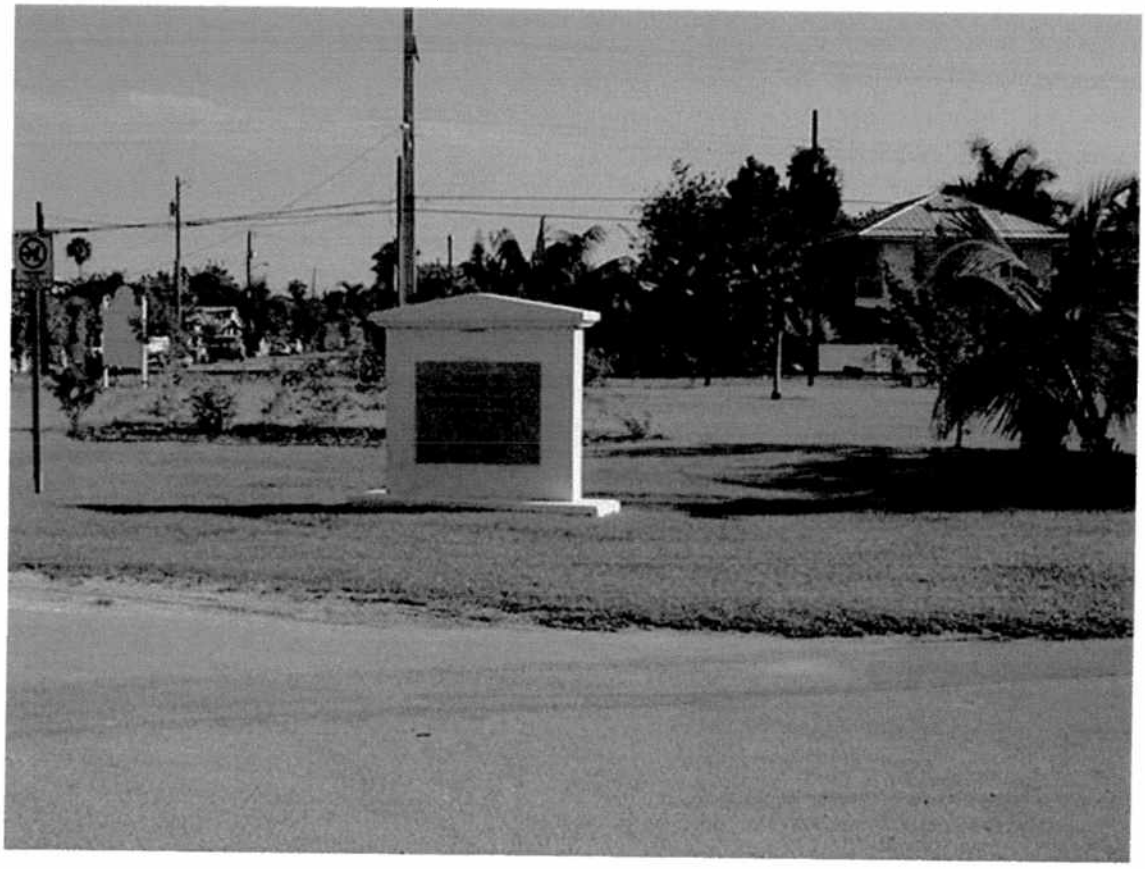


Looking East Across Center Circle
Looking NE Across Center Circle

Looking East to Cul-de-Sac
Looking West From Center Circle



Looking North Across Wilhelmina Harvey Park
Looking East to Cul-de-Sac



Looking SW Across Wilhelmina Harvey Park

Look South Across Wilhelmina Harvey Park

Looking South Across Center Circle

Looking South Across Park to Center Circle

Appendix 4.0-D

Florida Clean Marina Program

Jeb Bush
Governor

BECAUSE YOU CARE

David B. Struhs
Secretary

The Florida Department of Environmental Protection Division of Law Enforcement is committed to improving the health and cleanliness of our waterways. There is a direct link to the future of the marina industry and clean water. Clean water is necessary for your livelihood and the well being of your communities. If the waters are too polluted to recreate, then the boaters will go elsewhere.

To meet both the letter and the spirit of our state's environmental laws, our agency has been in partnership with both private and public entities in the marine industry to develop a *Clean Marina Program*. I truly believe that with education comes compliance. I would like to extend a special thanks for the hard work and dedication of the Advisory Work Committee. If it were not for its tireless effort, this voluntary education program would not be available today. They are: Scott Burt (Bay Point Marina), Jeff Cavanaugh (Tierra Verde Marina), Laura Comer (DEP South District), Cheryl McKee (DEP SE District), Jack Dunphy (DEP NE District), Robert Kirn (Marina Industries Association of Greater Tampa Bay), Bob Koerber (Hall of Fame Marina), Rose Poynor (DEP SW District), Dennis Tober (DEP - Air), Paul Dodson (President, International Marina Institute), Don Borum (Hidden Harbor Marina), George Wakefield (Halifax Harbor Marina), Pete Kaiser (Intracoastal Marina Ltd), Guy P. Hadley (DEP Central District), Duke Turner (Turner Marine of Naples), Lee E. Lyon (President, Marine Industries Association of Florida), Taylor Kirschenfeld (DEP NW District), John Sprague (Marine Industries), Frank Herhold (Marine Industries Association of South Florida), Dr. Marion L. Clarke and Don Jackson (University of Florida/Florida SeaGrant), Margaret Podlich (Boat/U.S. Clean Water Trust), Jan DeLaney and Debbie Hall (DEP Division of Law Enforcement).

First, and most importantly, we want to ensure that we provide educational information to marinas on pollution prevention measures. These measures will not only benefit our environment, but also, our families and future generations. As a marina owner/operator your participation will be important to our achieving these environmental goals -- not because you have to, but because you care.

Sincerely,

Director Thomas S. Tramel, III
Department of Environmental Protection
Division of Law Enforcement

ACKNOWLEDGMENTS

Florida offers some of the nation's most scenic coastlines but preventing damage to our seascape require balanced, common-sense management. Understanding the complexities of our resources and learning how we affect our environment, for better or for worse, will improve how we manage our coastal environment. We have designed the Florida Clean Marina program to introduce you to simple, innovative solutions call the Marina Environmental Measures.

The following people need to be thanked for their participation in developing this program. They are: Bonnie Abellera (FDEP), John Adair (Ross Yacht Sales, Inc.), Bill Allbright (Florida Council of Yacht Clubs), Claudia Allbright (Florida Council of Yacht Clubs), Tammy Allen (Pinellas County DERM), Pam Anderson (Treasure Harbor Marine), Catherine Arnold (FDEP), Ilene Barnett (FDEP), Michael Bateman (FDEP), Marty Beksha (Madeira Beach Municipal Marina), Keith Bell (Plantation Yacht Harbor), Connie Bersok (FDEP), Beverly Birkitt (Birkitt Environmental Services), Guy Bising (Marine Industries Association), Kelley Boatwright, Bruce Boler (FDEP), Ed Borham (FDEP), Don Borum (Hidden Harbor Marina), Darryl Boudreau (FDEP), Rebecca Burger (Center for Marine Conservation), Scott Burt (Bay Point Marina), Renee Cain (Hillsborough County EPC), Jennifer Caldwell-Kurka(FDEP), Marlene Castellanos (FDEP), Jeff Cavanaugh (Tierra Verde Marina), Marion L. Clarke (Florida SeaGrant), Raoul Clarke (FDEP), Tim Cleveland (Eco Sound), Laura Comer (FDEP), Kevin Cody (DERM), Ed Cornell (Apollo Beach Power Squadron), Jim Cuthbert (Middle Keys Marine Association), Robert Day (Indian River Lagoon Program), Don Depra (FDEP), J. Rocky DeSimone (Pensacola Shipyard), Walt Dinardo (Palm Beach Yacht Center), Paul Dodson (International Marina Institute), Mary Duncan (FDEP), Jack Dunphy (FDEP), Susan Engle (Envirocare, Inc.), Frank Feliciano (FDEP), John Fenton (Imperial Yacht Center), Dan Flaherty (Flaherty Marine Inc.), Pam Fletcher (Florida Coastal Management), Robert Frankup (St. Pete, Sail & Power Squadron), Jim Frye (Marina Operators Association of America, Douglas Fry (FDEP), Joni Goodman (Keep Pinellas County Beautiful), Lisa Gordon (FDEP), Randy Graham, Alfred Grasso (Palm Beach County Health FDEPartment), Andrew Grayson (FDEP), Jane Gregory (FDEP), Gary Greene (Bellingham Marine), Ned Grubb (Keep Pinellas Beautiful), Guy P. Hadley (FDEP), Patti Hancock (FDEP), MikeHancock (City of Clearwater), David Harris (Weekly Planet Newspaper), Eric Harter (FDEP), Bill Held (City of Clearwater), Ellen Hemmert (Northwest Florida Water Management District), Frank Herhold (Marine Industries Association of South Florida), Mike Hickey (FDEP), Brett Hinely (Bluewater Bay Marina), Mary Hoppe (National Estuary Program), Nancy Hose (FDEP), Don Jackson (Florida SeaGrant), William Jay (Shell Point Marina), Ted James (Associated Marine Tech), Charles Johnson (FDEP), Pete Kaiser (Kennedy Point Marina), Carla Kappmeyer (FDEP), Robert Kirn (Marine Industries of Tampa Bay), Steven Kent (FDEP), Bonny King (FDEP), Ted Kiper (Florida Geological Survey), Taylor Kirshenfeld (FDEP), Jenny Knight (FDEP), Bob Koerber (Hall of Fame Marina), Larry Krestalude (FDEP), Coleman Langshaw (Fernandina Harbor Marina), Bronson Lamb III (Lamb Marine), Tony LaPorte (Keep Pinellas Beautiful), Cliff Larsh (Vorco Environmental),Bill Lehr (Enviro Marine), Sue Leitholf (FDEP), Art Leskowich (FDEP), James Lewis (FDEP), Craig Liney (FDEP), Eric Livingston (FDEP), Lee E. Lyon (Marine Industries of Florida), Owen Mancarella (FDEP), Teresa Mantel (Envirocare), Jim Marx (FDEP), Terrence McBride (Environmental and Marine Products,Inc.), Mary McCormick (Halifax Harbor), Cindy McGinnis (Mariner Technologies), Greg McGinnis (Mariner Technologies), Cheryl McKee (FDEP), Amy McKenzie (FDEP), Fred McManus (EPA), Bill Miller, Eric Miller (FDEP), Bob Ming (Peninsular Marine Ent), Scott Miser (Associated Marine Technologies, Inc.), Mary Morris (FDEP), Chris Moser (Panama City Marina), Lisa Mulhall, Marty Murphy (Cracker Bay Boats Works), Greg Nelson, Rick Neves (FDEP), Clete Oakley (Halifax Harbor), Greg O'Connell (FDEP), Marilyn Odom (Eco Sound, Inc.), Barbara Otwell (FDEP), Jodi Painter, Margaret Podlich (Boat/US Clean Water Trust), Melissa Penn (Walt Disney World), Cathy Petrowsky (Wastrec), Rose Poynor (FDEP), Gene Quinn (Pinellas County DEM), David Ray (Marine Industries Association), Kent Reetz (FDEP), Gus Rios (FDEP), Cliff Rohlke (FDEP), Kristine Roselius (FDEP), Courtney Ross (Rossyzent Sales), Chris Russell (FDEP), Charles Ryburn (Pinellas Co. FDEPt. Env. Mgmt.), Bill Sanders (Keep Pinellas Beautiful), John Scarboro (FDEP), Mike Scheinkman (FDEP), Vicent Seibold (FDEP), Selva Selvendra (Palm Beach, PHU), Joanne Semmer (Ostego Co-Op), Manoj Shivlani (University of Miami), Linda Simurra-Sharp (Coral Reef Park Co.), Don Smith (Palm Beach County Health Department), Kent Smith (FDEP), John Sprague (Marine Industries Association of Palm Beach County), Ken Stanley, Ellen Stere (FDEP), Kerry Swift (FDEP), George Taff, Sr. (Shell Point Marina), Mary Tagliareni (FDEP), Steffi Tassos (FDEP), Jack Teague (Monroe County Health Department), Joe Telford (Imperial Yacht Center), Dennis Tober (FDEP/Division of Air Resources Management), Jim Tucker (Boat Marina), Duke Turner (Turner Marine of Naples), Jess M Van Dyke (FDEP), Louis Vinci (Indian Springs Marina), George Wakefield (Halifax Harbor Marina), Denise Washick (Center for Marine Conservation), Robert Watson (Great American Marine), Debbie Weiland (PC Marina), Phil Werndli (FDEP), Les Westerman (Rod & Reel Marina), Loretta Westphal (Manatee Bay Marine, Inc.), Fritz Wettstein (FDEP), John Whitescarver (National Stormwater Center), Candy Whitney (Whitney's Marina), Larry Wiesner (Derecktor Gunnell, Inc.), Robert Wilhelm (DFEP), Dick Williams (FDEP), Kris Williams (Monroe County Health Department), Dan Williamson (FDEP), WInterstone Productions, Linda Wolff, (FDEP) and Dennis Yound (Mayport Marine). **Photography:** Digital Stock, Masterfile and Environmental Education (FDEP).**Editor:** Jan R. DeLaney (FDEP). **Design/Copy/Graphics:** Debbie S. Hall (FDEP).

November 1999 Florida Department of Environmental Protection, 3900 Commonwealth Blvd, Tallahassee, FL 32399-3000 Printed on Recycled Paper

FLORIDA'S CLEAN MARINA PROGRAM

There are nearly 2,000 marinas operating in Florida today and hundreds of thousands of boaters use Florida's waters every day. According to the Marine Industries Association of Florida, boating is a $10.2 billion dollar water intensive industry that includes marinas, boatyards and boaters. The effects of year-round boating and boat traffic and their related pollutants contribute to constant and growing pressure on the state's fragile aquatic and marine ecosystems. Clean water is essential to this multi-billion dollar industry.

The aim of the Clean Marina Program(CMP) is prevention. Marinas and boaters may not be aware of the environmental laws, rules and jurisdictions with which they must comply. Compound that with the reality that environmental and operational problems are usually addressed after they happen rather than anticipated.

The goal of CMP is Clean Marina Designation. Designation lets boaters that use the marina know that these businesses adhere to — or exceedprogram criteria, including*Marina Environmental Measures* or MEMs. MEMs are simple, innovative solutions to day-to-day marina operations that protect the environment. These MEMs have been developed through examination of best management practices around the country and the partnership of Florida's marinas, boatyards, boaters and government.

Voluntary participation, "pier" pressure and desire to do environmentally conscious activities and reinforcement of current regulatory processes are the common elements. This approach provides opportunities for public and private entities to work together, as well as, provide incentives and remove institutional roadblocks to wise resource stewardship. The text of these documents were written by the Department of Environmental Protection with the cooperative efforts of the Marine Industries Association of Florida, marine professionals throughout Florida and the United States, Florida SeaGrant, Boat US/ Clean Water Trust, International Marina Institute, Florida Council of Yacht Clubs and local agencies.

CLEAN MARINA COMPONENTS

Pledge Card – Marina owner's signed commitment to pursue and achieve designation.

Program Q&A – Program policies in a question and answer format.

Designation Agreement – Marina owner's signed agreement that upon designation that program criteria and policies will continue to be implemented after designation, allow sampling of water conditions to assess program effectiveness, and actively promote the program.

Clean Marina Action Plan (CMAP) – Working document signed by marina owners and notarized to assess facility operations and determine if operations are in accordance with program criteria; the CMAP is the planning component committing the owner to positive corrective action by a certain date bringing operations in accordance with program criteria leading to designation.

Marina Environmental Measures – This is the collection of goal defined environmental measures that marina owners can use to guide them in achieving designation a Clean Marina.

Annual Self-Assessment Form – Provides the marina owner a checklist to review on an annual basis facility operations to ensure that program policies and criteria are still in place. The form also provides a record of any violations that were self-discovered and reported to the Department and what corrective actions were taken to prevent recurrence. This form is kept on file at the marina and may be requested by Department staff.

Renewal Confirmation Card – Document completed and sent to the Department of Environmental Protection to confirm that a self-assessment has been done and that program criteria used to achieve designation are still in place.

Policy Guidelines – Document that provides definitions and policies used in the administration of the program.

TABLE OF CONTENTS

FORMATTING AND DEFINITIONS

The Clean Marina Program is using Marina Environmental Measures (MEMs) format that includes a problem statement, a goal statement, ideas for you to use in your marina, and regulatory requirements (if any). This document addresses the sources of pollution specific to marinas and promotes pollution prevention through voluntary participation. The format is:

PROBLEM:

The problem statement is a declaration of an existing or potential condition which can result in harm to people or the environment.

GOAL:

The goal states the desired response to the problem statement.

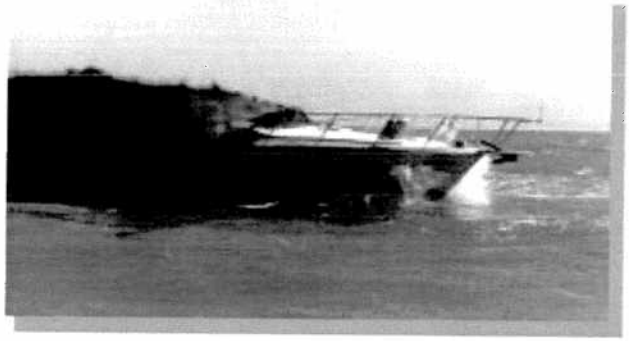
IDEAS FOR YOUR MARINA TO USE:

The suggested ideas describe possible ways to achieve the goal. As a note, these suggested ideas are not the only ideas possible. There are likely to be other approaches not listed here; and if they work use them.

REGULATORY REQUIREMENTS:

Where there are regulatory requirements they are included on the back of each section for your convenience and information. This informs you of any statute or rule that governs the activities of marinas.

Information contained within is a result of the best thinking of those acknowledged. It is not designed to provide legal advice or interpretation of any statue rule or regulation. This publication does not necessarily represent the views of EPA, US Fish and Wildlife or NOAA.



PLANNING FOR EMERGENCIES - THE EMERGENCY FILE

PROBLEM:

A number of situations may occur in a marina that require immediate response. Calling 911 may be appropriate in some instances, but additional staff response is also called for in nearly every emergency situation. Without pre-planning, important steps can be overlooked and without a quick reference guide, the best of intentions may not produce the best actions for solving the occasional, but intense problem.

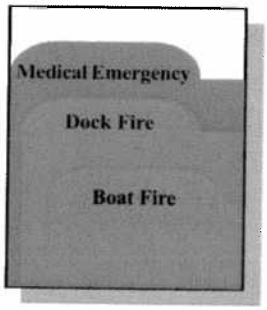
GOAL:

Create an Emergency or Panic File specific to your marina. It should be organized logically and concisely, covering common and even slightly possible situations that might require quick response.

IDEAS FOR YOUR MARINA TO USE:

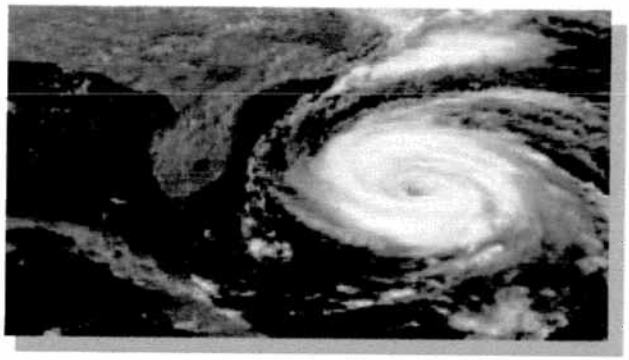
1 Generate basic information regarding how to handle emergencies by conferring with all emergency responders in the area.

2 Compile a set of emergency response procedures, organized under easily understood headings in a notebook or binder called a "Panic" file.



3 Acquaint all employees with the contents of the Emergency or Panic File. Discuss procedures and responsibilities for each situation covered.

4 Review the contents of the Panic File with all appropriate employees at least once each year. Also review the accuracy of information annually. Evaluate effectiveness and rewrite any sections as appropriate.



HURRICANE PREPARATIONS

PROBLEM:

High winds and water during the passage of a hurricane or tropical storm can cause the release of normally secure pollutants into the environment. Hurricane conditions can damage or sink boats that would spill or vent fuel, oils and other chemicals. Marina facilities can be impacted by storm conditions also causing releases of paints and solvents, fuel, oils, chemicals and solid waste.

GOAL:

Upon approach of a tropical storm or hurricane, remove sources of pollution from the potentially affected area. Secure everything that could blow into the water and cause contamination.

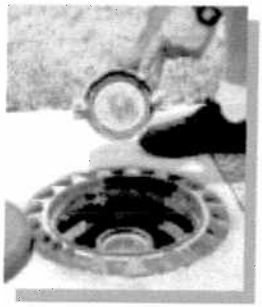
IDEAS FOR YOUR MARINA TO USE:

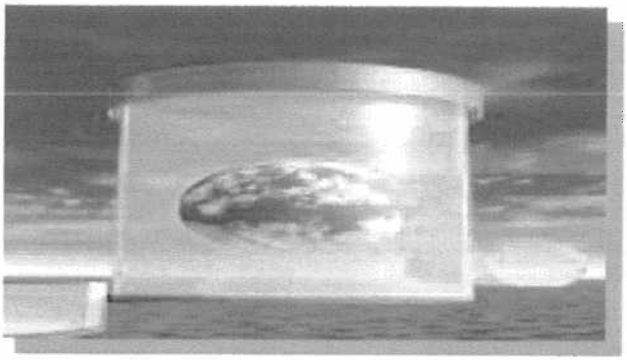
1 Boats need to be evacuated inland or moved out of slips to open waters or protected waters at the earliest time possible, when it is still safe to move the boats.

2 Remove portable containers and cans of paint, cleaner, petro-chemicals, etc. from the affected area.

3 Have waste haulers pick up all solid waste when you first hear of the possiblity of an approaching storm.

4 Underground or above-ground fuel tanks that could be flooded by a storm surge should be fitted with appropriate tie-downs and topped off.





PETROLEUM SPILL RECOVERY PLAN

PROBLEM:

Petroleum spills cause pollution and are costly to clean up. Lack of proper containment and a fuel spill response plan can critically delay containing a discharge.

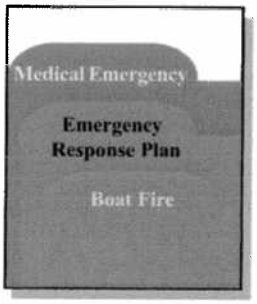
GOAL:

Develop a petroleum spill response and maintain proper petroleum containment. Coordinate this plan with the U.S. Coast Guard, the Florida Department of Environmental Protection and the Florida Marine Patrol.

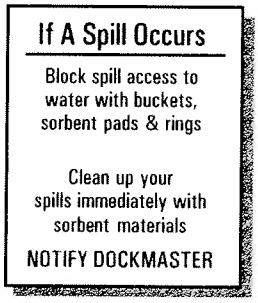
IDEAS FOR YOUR MARINA TO USE:

1 Inform your local harbormaster and fire department about your spill recovery plan and equipment.

3 Have a section "Emergency Response Plan" in the marine Panic File for immediate action at the time of a spill. (See Panic File MEM, page 6)



2 Provide signs informing customers what to do in case of a spill if there is no attendant present.



Contain oil and diesel and notify appropriate agency, but allow gasoline to gently and rapidly disperse. Call 911 where appropriate.

REGULATORY REQUIREMENTS:

**These regulatory requirements apply to any marina that transfers diesel fuel and heavy oils over the water.

1. Develop a petroleum spill recovery plan and train personnel in its use. Chapter 62N-16 Florida Administrative Code. The plan should be short, with clear directions that can be understood by each employee.

Components of a Spill Response Plan should address the following:

Who - to notify within one hour of a spill:

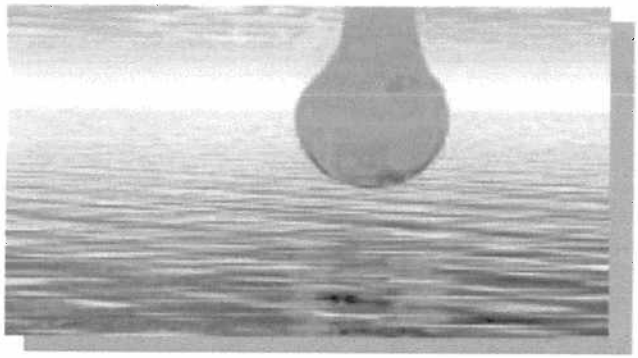
USCG National Response Center	(800) 424-8802
Florida Marine Patrol	(800) DIAL-FMP (800) 342-5367
*FMP on your cell phone	
VHF – Channel 16	
Division of Law Enforcement	(850) 413-9911

What - a Petroleum Spill Response Plan should also include:
Name, location and hours, telephone #'s, radio frequencies.
Facility waterfront and vessel characteristics.
Type and amount of petroleum stored.Name/Phone Numbers of owner and trained personnel designated in charge. Notification responsibilities and procedures.
A list of spill equipment/capabilities on site.
Third party cleanup organization.

When - Identify when additional resources should be called for assistance and determine when equipment will be inspected and replaced, if necessary.

Where - Identify where the petroleum spill response equipment is located in the facility. Identify sources where additional oil response equipment can be quickly obtained (this can include 3rd party cleanup contractors), if it is necessary.

How - Train staff on how the equipment should be used and, when necessary, disposed of properly.
Maintain or have access to containment booms that are 5 times the length of the longest vessel docked and absorbent material to contain the largest potential spill. This equipment may be kept on site or provided and maintained by a contracted petroleum response company provided personnel can begin boom deployment within one hour of a spill.
The US Coast Guard must be notified any time there is a noticeable sheen present on the surface water.
Annually review plan with staff and update for any new technology or equipment.



PETROLEUM CONTROL & CONTAINMENT

PROBLEM:

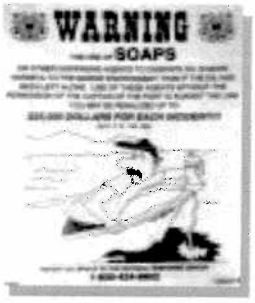
Petroleum products introduced in the environment are a chronic problem. Small incremental discharges of petroleum products add up to significant impacts. During fueling operations an accidental release may occur through the fuel vent, during bilge pumping and from spills. Oil and grease from the operation and maintenance of engines are also sources of petroleum discharges.

GOAL:

Eliminate or reduce the amount of fuel and oil entering marina and surface waters from boat bilges, fuel tank air vents and spills.

IDEAS FOR YOUR MARINA TO USE:

1 Provide signage and pamphlets that stress the impacts from spills and fueling activities. Also detail which precautions should be taken by customers and that customers may be held responsible for cleanup costs. Boater workshops are encouraged to teach these concepts.



2 Promote the use of automatic/back-pressure/shut-off nozzles as long as the mechanism that allows unattended fueling is disabled.

3 Promote the use of fuel/air separators on air vent/overflow systems installed on inboard fuel tanks and vent/overflow collection devices.

4 Promote the use of oil absorbing materials in the bilge areas of all boats with inboard engines. Encourage boaters to examine these materials in their boats at least once a year and replace as necessary. Recycle or dispose of used absorbents in accordance with petroleum disposal regulations. (Use the recycling services of an applicable landfill or recycling center).

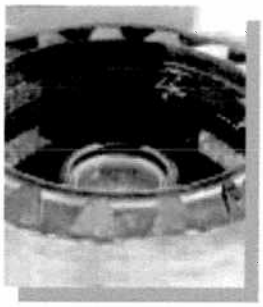
Contain oil and diesel and notify appropriate agency, but allow gasoline to gently and rapidly disperse. Call 911 where appropriate.

5 Have absorbent pads readily available at the fuel dock to mop up spills on the dock or on the water (spill response carts with booms, pads and absorbents should be on standby during fueling). Place used absorbents in a closed drum for proper disposal. Absorbent pads should be made available in well-marked, easily accessible container or containers at locations near the fuel dock. The harbormaster should be trained in the use of absorbent pads. An inventory of absorbent pads should be kept in the storage area with these products and the supply should be inventoried on a regular basis.

6 Place containment berms around fixed pieces of machinery that use oil and gas.

7 Provide impervious fireproof containment trays for use when filling small cans. If possible, the product should be immediately returned to the fuel tanks.

8 Provide secondary containment for piping (double wall piping) and a collection tray under dispensing area.



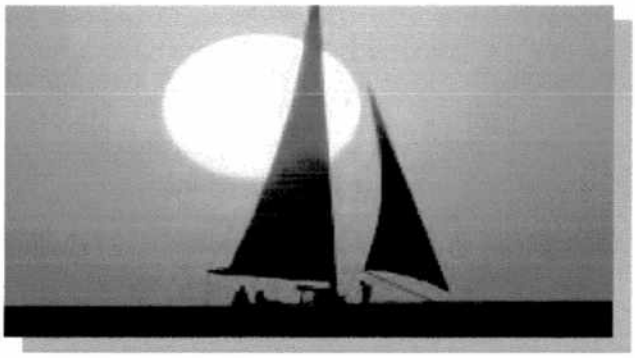
9 Provide stationary skids for fueling personal watercraft which will help to eliminate rocking and keep the vessel level in order to minimize spills.

REGULATORY REQUIREMENTS:

1. The Pollutant Discharge Act addresses in Section 376.07, transfers of pollutants; 376.09 Removal of prohibited discharges; and, 376.12 Liabilities and defenses of responsible parties; liabilities of third parties; financial security requirements for vessels; notification requirements, Florida Statutes.

2. Facility owner/operators or designees must be present during fueling and must have direct access to emergency shut off devices. Chapter 62N-16 Florida Administrative Code.

3. Above ground and underground storage tanks (AST/UST) are regulated by State Statute Chapters 62-761 and are overseen by local county (which may have rules that are more stringent than the State). As for as local programs and county ordinances, NO COUNTY SHALL HAVE RULES MORE STRINGENT THEN THE STATE REGS. The minority exception being Dade/Broward, Alachua, Indian River and possibly Hillsboro (ordinances in effect prior to the State rule).



FIRE SAFETY

PROBLEM:

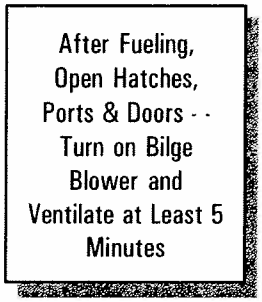
Fires can result from accidents, careless handling of gasoline, the accumulation of gasoline fumes in the bilge or exhaust systems and faulty fuel systems.

GOAL:

Develop a fire safety plan including provisions for preventing, controlling and extinguishing, where possible, fires.

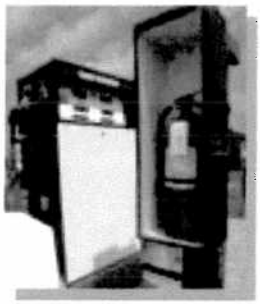
IDEAS FOR YOUR MARINA TO USE:

1 Educate boaters to "Be Smart Before You Start". Post precautionary signs to remind boaters to ventilate, then "sniff" the bilge prior to starting the vessel.



2 Prohibit smoking near fueling areas.

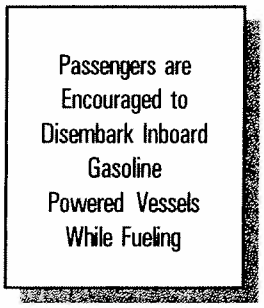
3 Provide and maintain adequate, readily accessible and clearly marked fire extinguishers throughout the marina, especially near fueling stations. Inspect and document fire prevention equipment on a regular basis (monthly, quarterly).



4 Clean up all spills of combustible liquids to avoid a fire.

5 Have an evacuation plan for people and ensure the capability to move boats in case of a fire.

6 Encourage the off-loading of all passengers from gasoline powered vessels before fueling.



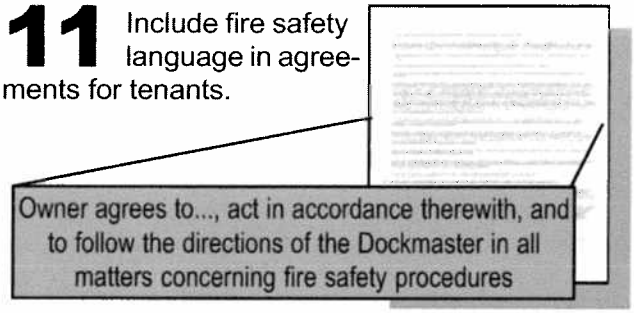
7 Contact your local fire department for guidance and the marina's insurance company for guidance and request a "walk through" of the property.

8 Train personnel on fire safety and how to put out fires.

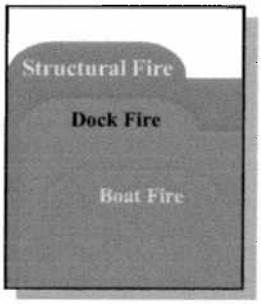
9 Post emergency numbers such as U.S. Coast Guard, local Port Authority and your local fire department in a visible location.

10 Fuel portable containers on the dock or land side where possible.

11 Include fire safety language in agreements for tenants.



12 Include fire safety procedures in the Panic File (ensure all staff who operate or manage the marina are familiar with the contents of the emergency file) with phone numbers of emergency personnel.



2 CYCLE OUTBOARD ENGINE FUELING

PROBLEM:

Incomplete combustion of lubricating oil from outboard engines can release hydrocarbon pollutants to the surface water and air. These releases are commonly the result of an incorrect gas-to-oil ratio (gas:oil) mix during the fueling process which can typically take place at either the boat owner's regular gas station or at the marina. A gas:oil ration of 50:1 is considered a standard mixture, providing adequate lubrication and preventing incomplete combustion of lubricating oil from too high an oil concentration. However, as any recreational boater can attest, it is not uncommon to see bluish-white smoke emitting from an outboard engine indicating a too high oil concentration and resulting in the discharge of incompletely combusted hydrocarbon by-products to the environment.

GOAL:

Reduce the emission of incompletely combusted hydrocarbon by-products formed as a result of putting too much lubricating oil in the gasoline while refueling the tanks of outboard engine powered boats.

IDEAS FOR YOUR MARINA TO USE:

1 Educate outboard engine owners on the correct gas:oil ratio and stress the importance of keeping this ratio 50:1 or in some cases, 60:1.

2 Point out the economic benefits with respect to oil cost and engine maintenance, of using correct mixtures.

2-STROKE MOTORS USE THE RIGHT MIX

Too much oil fouls plugs!

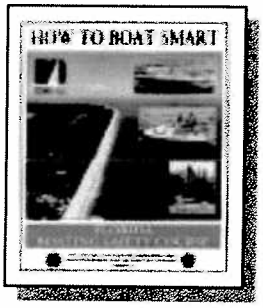
GAS TO OIL RATIO
(see owners manual for proper ratio)

RATIO	1	2	4	6 gallons of gas
96:1	1/12	1/6	1/3	1/2 pints
48:1	1/6	1/3	2/3	1 of oil
24:1	1/3	2/3	1-1/3	2
16:1	1/2	1	2	3

USE PREMIUM TCW-II BIODEGRADABLE OIL

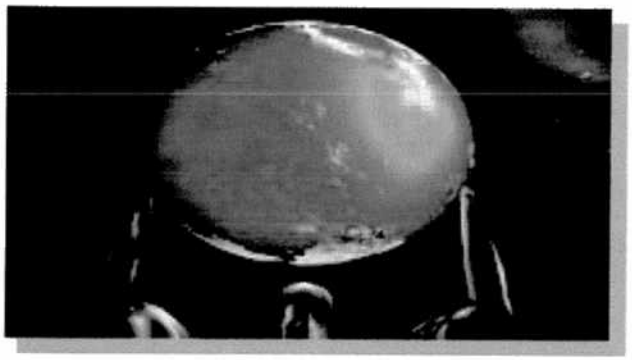
3 Post notices or make pamphlets available at the marina, especially at the fuel pumps, to remind outboard engine owners of the 50:1 ratio. Include a comprehensive list of gas:oil amounts for several engine volumes in a table format that is easy to understand (e.g. "y" ounces of oil to "x" gallons of gasoline).

4 Incorporate proper fueling information into boating safety classes, stressing the importance in maintaining a healthy marine and marina environment.



An insufficient amount of lubricating oil in the mix will result in excessive wear, leading to shortened engine life, or in some cases, outright engine failure.

5 Use an oil-to-gas measuring device for 2-cycle engines, such as Motor Mate part #304495. Cost is approximately $3.00.



FUEL WASTE MANAGEMENT

PROBLEM:

If boaters do not have a convenient means for properly disposing of items such as stale fuel, the fuel may end up in the environment. Disposed fuel in the dumpster is dangerous and can lead to fines if the material finds its way into the water body or additional removal fees if the hauler considers the material hazardous.

GOAL:

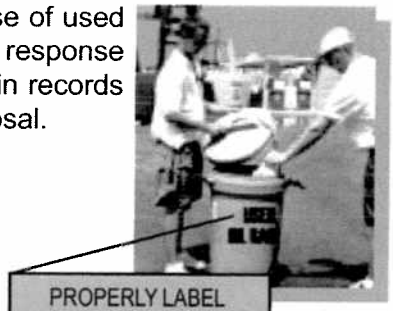
Provide separate, accessible containers for the recycling of waste or stale fuel and the disposal of fuel contaminated absorbent material.

IDEAS FOR YOUR MARINA TO USE:

1 Provide properly labeled containers which store petroleum products that are readily accessible and can be disposed of appropriately. Keep in mind that marinas must control what is being placed in the container because, if contaminated with a mixture of fuel and oil, the cost to remove that container escalates.

2 All containers used to store petroleum products should have a form of secondary containment. Generally, this backup is provided by constructing a nonleaching berm with an impervious bottom around the containers. Other methods may include a fully enclosed holding facility that provides internal secondary containment.

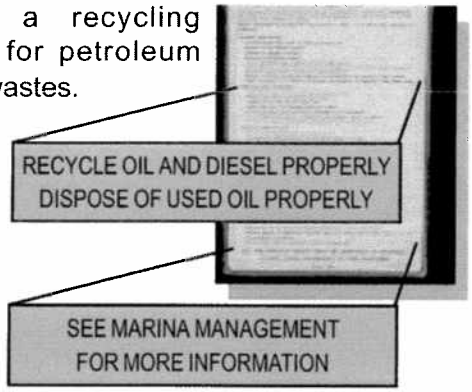
3 Properly dispose of used petroleum spill response products and maintain records of proper waste disposal.



4 Provide recognition or incentives to boaters to comply with proper recycling of stale fuel.

Contact your local DEP District office for information regarding local companies that collect and recycle waste oil, gas, filters, etc.

5 Institute a recycling program for petroleum contaminated wastes.



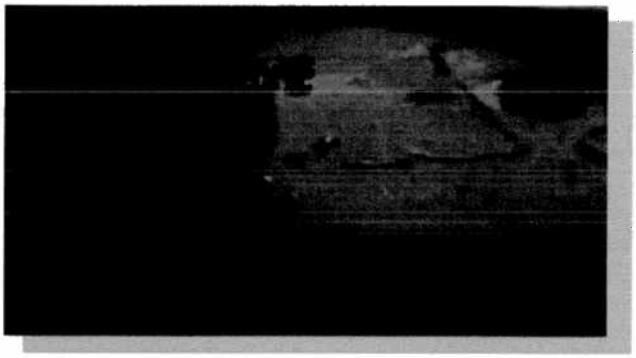
6 Fuel filters should be hot-drained by placing the filter in a funnel over the appropriate waste collection container to allow the excess petroleum product to drain into the container. Drained filters should be collected and recycled.

REGULATORY REQUIREMENTS:

1. The marina must provide labeled containers for the storage of used oil and used oil filters (40 Code of Federal Regulations 279).

2. Used oil and used oil filters are prohibited from disposal at Florida landfills; they must be recycled (Chapter 62N-710.850 Florida Administrative Code).

3. Used oil and used oil filters must be managed in such a way as to avoid discharges to water or soil. (Chapter 62N-710.400 Florida Administrative Code).



USED OIL MANAGEMENT

PROBLEM:

Used oil discharges to the water can degrade water quality and threaten aquatic plant and animal life. Used oil discharges on the ground will require expensive clean-up and may incur penalties.

GOAL:

Manage and dispose of used oil and used oil filters properly.

IDEAS FOR YOUR MARINA TO USE:

1 Provide CLEARLY MARKED designated areas for storage of used oil (see Liquid Waste Storage MEM, page 37).

2 Direct marina patrons as to the proper management of used oil and used oil filters through the use of signs, pamphlets, mailings, lease/ rental agreements and other means.

3 Build curbs, berms or other barriers around areas used for the storage of used oil to contain spills or provide individual containment for containers.

4 Used oil or diesel fuel filters should be hot-drained by placing the filter in a funnel over the appropriate labeled waste collection container to allow the excess petroleum product to drain into the container. Drained filters should be collected and recycled.

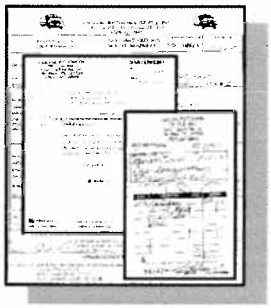
Many local businesses are PUOCCs and accept small amounts of used oil for free, for the nearest used oil collection center dial 1-800-741-4DEP. Post collection center locations near the waste receptacles so marina patrons know where to take their used oil.

Used oil and hazardous waste transporters must demonstrate the required financial responsibility to operate in Florida. For a list of transporters meeting this requirement contact your nearest DEP District office.

Transmission and hydraulic fluids may be mixed with used oil for recycling.

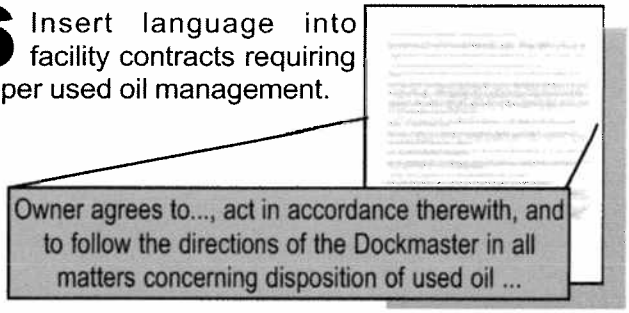
Registering as a PUOCC increases business and includes some limited exemptions from cleanup liability.

5 Contract with a used oil hauler to have used oil and used oil filters transported off-site for recycling. Maintain records of used oil recycling.



7 Provide recognition and incentives to those boaters who use proper used oil management techniques.

6 Insert language into facility contracts requiring proper used oil management.



8 Register with the DEP as a Public Used Oil Collection Center (PUOCC).

DEP
Form# 62-701.900(12)
Application for Registration
Used Oil and Oil Filter

Phone 850-488-0300

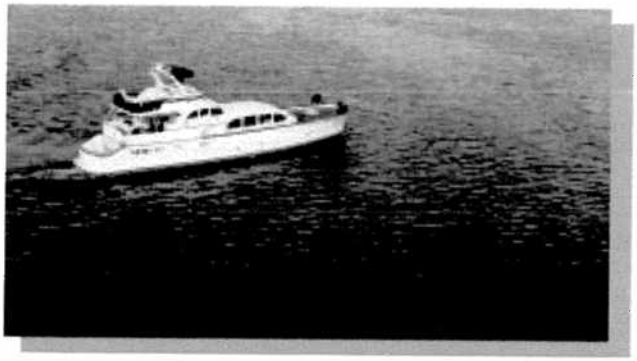
website:
www2.dep.state.fl.us/
waste/programs/used_oil/
pdf/register2.pdf

REGULATORY REQUIREMENTS:

1. The marina must provide labeled containers for the storage of used oil and used oil filters (40 Code of Federal Regulations 279).

2. Used oil and used oil filters are prohibited from disposal at Florida landfills; they must be recycled (Chapter 62N-710.850 Florida Administrative Code).

3. Used oil and used oil filters must be managed in such a way as to avoid discharges to water or soil. (Chapter 62N-710.400 Florida Administrative Code).



BILGEWATER

PROBLEM:

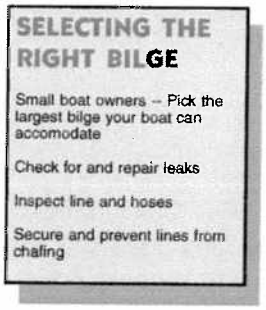
Oil and grease from the operation and maintenance of inboard engines are sources of petroleum in bilges. Discharged bilgewater is a source of pollution in marinas.

GOAL:

Minimize the occurrences of contaminated bilgewater and discharges.

IDEAS FOR YOUR MARINA TO USE:

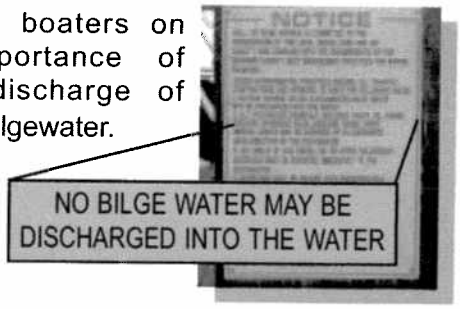
1 Encourage boaters to check for leaks of oil and fuel into the bilge, and to fix leaks that cause contamination of bilgewater. Boaters should inspect lines and hoses for deterioration, and secure and prevent lines from chafing.



2 Encourage owners/ operators to be aware of how fuel saturated absorbent pads are stored on-site to avoid fire.

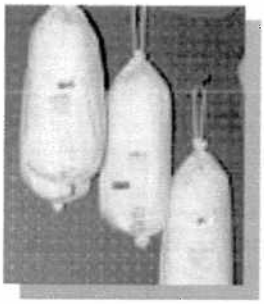
3 Discourage the use of emulsifying soaps such as dish detergent to clean the bilge. Emulsified oil and water will foul the filters of oil/ water separators, rendering them inoperative. Investigate bilge cleaning products that are either non-emulsifying or that create unstable emulsifications which have fast "break times" back into distinct oil and water phases.

4 Educate boaters on the importance of the proper discharge of contaminated bilgewater.



Some of the new absorbent products on the market are now impregnated with beneficial microorganisms that literally "eat" hydrocarbon-based materials.

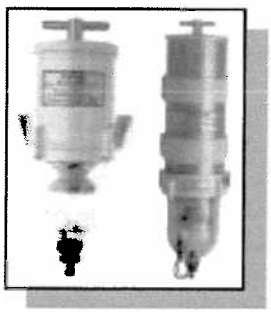
5 Encourage the use of packless stuffing boxes in bilges.



6 Unintended discharges can occur when boats are being removed from the water and the drain plug is pulled. Have boats pull out and away from the water to the boat ramp so bilge water does not drain back into the waterbody. Place absorbants around areas where pollutants can drain into the stormwater system.

7 If oil and/or fuel gets into the bilge, use absorbent pads to remove as much of it from the bilge water as possible. If found, take necessary steps to remove pollutants before removing the plug or drain them ashore into oil/ water seperators.

8 Provide oil/water separators for boaters to purchase and install in their boats, and/or provide land mounted oil/water separators for boaters to empty their bilges at dockside. Here are several useful points to consider:



a. Bilge water should not be discharged to any waterway or public drain with out proper filtration to separate the oil from the water. Any unfiltered bilge water or oil accumulated by oil/water separators should be treated as waste oil and handled accordingly.

b. Bilge mounted oil/water separators are available from manufacturers for the purpose of filtering oil from the water that accumulatedin the bilge. The filtered water is discharged overboard and the oil is contained for proper recovery.

c. Dock or land mounted oil/water separators are also available. A peristaltic or air double diaphragm pump is used to pump bilge water from the bilge to the oil/water separator. Once again, the water is filtered and discharged while the oil is contained for recovery.

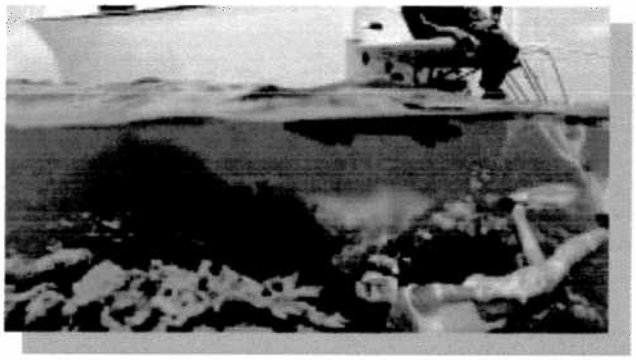
d. Do not use a wet-vac system to pump the bilge water from the bilge to the oil/water separator. will cause mechanical emulsification of oil and water which will foul the oil/water separator filter and render the systeminoperative.

e. When the oil/water separator is mounted on a vessel, a marina should be able to discharge the filtered water back to the waterway. However, first check local regulations.

f. Land or dock-based oil/water separators have to meet EPA requirements for discharge to municipal facilities. The marina could install these systems.

REGULATORY REQUIREMENTS:

1. Pollution discharge restrictions- 33 Code of Federal Regulations 151 prohibits the discharge of any water, substances, or bilgewater which produces a sheen or contains 15 parts per million (or greater) within 12 nautical miles of Florida's coastline or inland navigable waters.
2. Section 376.041, Florida Statutes prohibits the discharge of pollutants into or upon any coastal waters, estuaries, tidal flats, beaches, and lands adjoining the seacoast of the State.
3. Section 403.161(1), Florida Statutes prohibits the causing of pollution in Florida waters.



BOAT CLEANING - IN THE WATER

PROBLEM:

Marina employees and boat owners use a variety of boat cleaners, such as teak cleaners, fiberglass polishers and detergents that can contribute pollution and nutrients to the water. Excess nutrients degrade water quality by promoting nuisance aquatic plant growth and reducing dissolved oxygen levels needed for aquatic life. Additionally, scrubbing antifouling paints can release toxic metals into the water which may also contaminate marina bottom sediments. The removal of contaminated sediments can be very costly.

GOAL:

For boats that are in the water, use cleaning methods that prevent or contain the release of pollutants to surface waters.

IDEAS FOR YOUR MARINA TO USE:

1 Educate the customers on the negative impact of many traditional cleaners and when possible, supply for sale to marina patrons biodegradable spray type cleaners that do not require rinsing.

2 When possible, remove the boat from the water and perform cleaning where debris can be captured and properly disposed of. Promote the use of dry slips and boat lifts, in order to reduce the need for in the water cleaning.

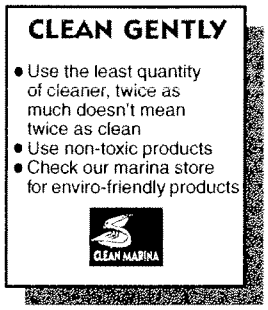
3 Prohibit pressure washing for boat cleaning in the water.

4 Encourage the use of sponges or soft towels to clean the boat hull on a regular basis. Avoid in-the-water hull scraping and any abrasive process that occurs underwater that may remove anti-fouling paint from the boat hull.

5 Wash the boat hull above the waterline by hand. Detergents and cleaning compounds used for washing boats should be phosphate-free and biodegradable and amounts used should be kept to a minimum.

6 Prohibit the use of traditional sudsing cleaners that must be rinsed off and discourage the use of detergents containing ammonia, sodium hypochlorite, chlorinated solvents, petroleum distillates, or lye.

7 Boat cleaning in the water methods should be posted on signs and prominently displayed for marina customers. These methods should be available to hand out to customers at the ship's store.



BOAT CLEANING - OUT OF THE WATER

Cleaning/Pressure Washing/Saltwater Rinsing

PROBLEM:

Washing and boat cleaning near the water can release oils, greases, paint chips and detergents. If these contaminants are allowed to flow into the waterbody they can pollute the water column and sediments. Associated organic matter can add to the biochemical oxygen demand (BOD) of the water body thereby reducing oxygen available to organisms. Additionally, suspended solids may decrease available sunlight for aquatic plant life.

GOAL:

Contain rinse water from cleaning and washing of boats on the uplands where possible.

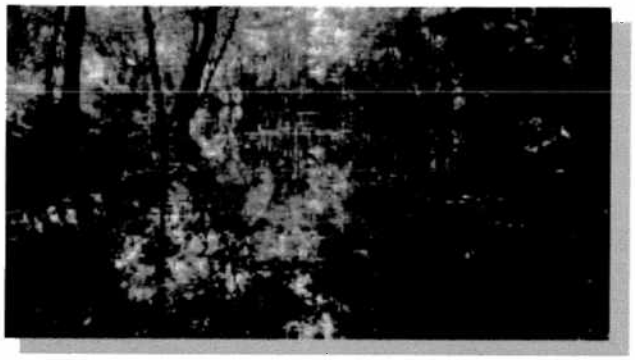
IDEAS FOR YOUR MARINA TO USE:

1 Do not pull the drain plug on boat ramps or over the water. Pull the boat out and away from the water or the boat ramp so bilge water does not drain back into the waterbody. Before pulling the drain plug, bilges should be checked for petroleum or other pollutants which may have collected during operation. If oil or pollutants are found, take necessary steps to remove them before removing the plug or drain them ashore into oil/water separators.

2 Make environmentally compatible cleaning products and information available to boaters.

3 Use infiltration areas capable of treating rinse waters.

4 For marinas that pressure wash, see the Boatyard Best Management Practices for pressure washing.



BOAT CLEANING- EXOTIC PLANTS/SEALIFE

PROBLEM:

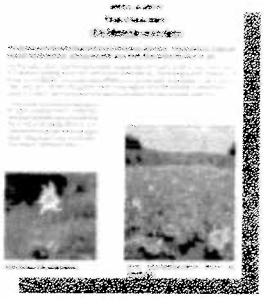
Exotic plants and animals may become attached to vessels and trailers and can be accidentally introduced into pristine waterways. Once introduced, exotics can be very invasive and difficult, if not impossible, to control. When exotic plants or animals spread, they contribute to the degradation of water quality and fish and wildlife habitat by outcompeting native species and by shading submerged vegetation. This adversely impacts water quality; recreational and commercial fishing; and presents navigational difficulties as waters can become choked with vegetation.

GOAL:

Minimize the introduction of exotic plants and animals, such as water hyacinth, hydrilla and zebra mussels from one waterway to another.

IDEAS FOR YOUR MARINA TO USE:

1 Educate the public with signs and pamphlets at all boat ramps and marinas where exotics are a potential problem. Post signs emphasizing the need to inspect vessels thoroughly and to remove exotics from hulls and trailers, particularly below the waterline.



3 Have boaters check bilges, live wells and trailers at ramps to minimize spread of exotics to unaffected areas. Each of these should be empty or the water pumped out and treated for larvae/spore removal. Remove all plant fragments from trailers, props, bait wells, fishing tackle, dive gear, etc., for disposal in an upland facility or receptacle.

2 Emphasize to boaters the need to thoroughly clean trailers and hulls, particularly that part below the waterline and to inspect it after cleaning to insure that no plants or animals are attached. When cleaning boats, exotic organisms on vessel hulls and engines should be removed,collected and discarded to upland disposal sites.

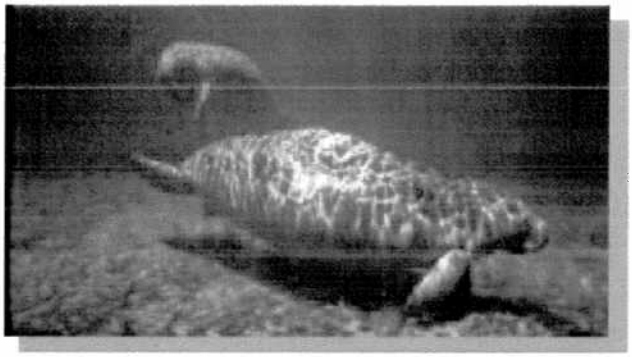
4 Have boaters flush raw water through cooling systems and clean sea strainers before launching boats trailered or motored from other states or nations.

For further information on exotic species contact the DEP's Bureau of Aquatic Plant Management, (850) 487-2600.

5 For marinas located in waterways where exotic aquatic plants are present, mainly those in fresh water, provide facilities for complete rinsing of vessels, trailers, bait wells, etc. and for the proper disposal of collected exotic plants and animals.

REGULATORY REQUIREMENTS:

Importation, transportation or release of exotic plants and animals are prohibited or regulated by Section 369.25 (aquatic plants), Section 370.081 (saltwater animals) and Section 372.26 (imported fish)



BOATING- SENSITIVE HABITATS & ENDANGERED SPECIES

PROBLEM:

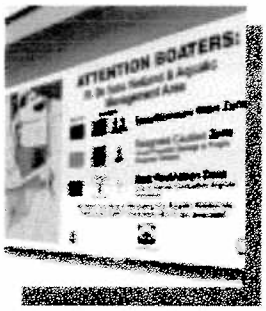
Vessel operation in shallow water can result in groundings and turbidity (murky water) as a result of props and hulls striking or churning up bottom sediments. Prop dredging can directly pull up and destroy sensitive submerged resources, such as corals and submerged grasses that are extremely valuable as shelter, nurseries, and food for aquatic organisms. Turbidity reduces water clarity, which reduces sunlight penetration through the water column (which can adversely affect the growth of submerged vegetation), and interferes with feeding/respiration by aquatic organisms. Careless operation of motorized vessels can result in injury or death of endangered species, such as manatees.

GOAL:

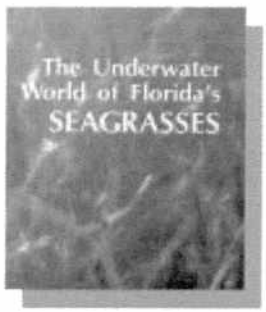
Where necessary, restrict boating activities to avoid shallow waters that may be affected by props and boats hulls, and to reduce the risk of injury or death to endangered species.

IDEAS FOR YOUR MARINA TO USE:

1 Post signs, maps or charts showing the location of known shallow bottoms, speed zones, sea grass beds or the occurrence of endangered species in the vicinity.

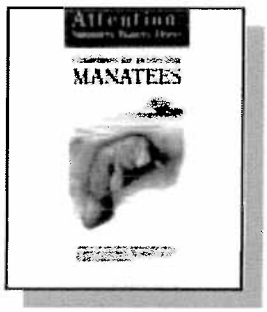


3 Provide educational materials to vessel operators about the damage that may occur from prop dredging, which may cause turbidity and damage valuable underwater resources, such as seagrasses.



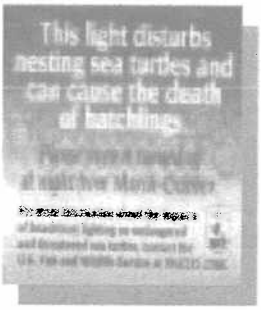
2 Maintain private aid to navigation of channels accessing the marina for the protection of the environment and safety of boaters.

4 Provide educational materials to vessel operators of the risks to endangered and threatened species, such as manatees, from boating.

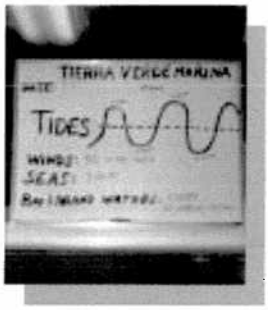


Report manatee, dolphin and marine trutle injuries, deaths, tag sightings or harassments to the Florida Marine Patrol at 1-800-Dial-FMP [342-5367] (*FMP on your cellular)

6 Reduce attractants where possible, such as light, freshwater flows (hoses, etc.) and people feeding or annoying mammals.



7 Install a tide or water level gauge at an easily accessible and visible location in the marina so boaters can see what current tides are. Make current tide tables available for patrons at the facility.



REGULATORY REQUIREMENTS:

1. The manatee is protected under federal law by the Marina Mammal Protection Act of 1972 and the Endangered Species Act of 1973.

2. To catch, molest, injure, kill or annoy or otherwise interfere with the normal activity and well-being of manatee, mammalian dolphins or marine turtles are prohibted by Section 370.12, Florida Statute.

3. Dredging, including inadvertent prop dredging, is regulated under Part IV of Chapter 373 of the Florida Statutes.

SOLID WASTE MANAGEMENT

PROBLEM:

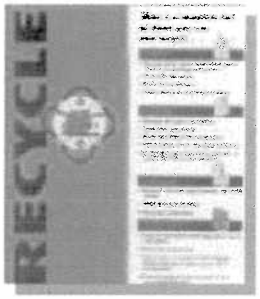
Marinas generate various solid wastes that can be a nuisance and an eyesore if not properly containerized. Improper disposal of solid waste can also cause pollution and hazards to wildlife and may lead to fines and cleanup costs. Hazardous wastes and used oil may be improperly placed in solid waste receptacles contaminating the solid waste and posing a threat to human health and safety and the environment.

GOAL:

Manage and dispose of all solid waste properly. Check with your local Solid Waste Authority for information on what materials are allowed in dumpsters, etc.

IDEAS FOR YOUR MARINA TO USE:

1 Install adequate signs identifying waste disposal practices. Use pamphlets, flyers, newsletters, inserts, and meetings to convey the importance of any environmental precautions that have been instituted in the marina.



2 Properly dispose of all trash and sweepings into trash cans and dumpsters. Provide "wind/wildlife -proof" covers for all receptacles.

3 Consider composting of vegetative waste or have the waste disposed of at a municipal waste facility. Discourage the burning of vegetative waste. Open burning produces particulate air pollutants and produces chemicals such as phenols and hydrocarbons.

4 Train facility personnel in proper waste management and storage procedures.

5 Provide convenient trash disposal and recycling facilities to marina patrons. Covered dumpsters or other covered receptacles are preferred. Ensure that an adequate number of clearly marked recepticles are placed in the marina and on the docks.

6 Schedule daily (AM and PM are recommended) "walk-throughs" of the facility, picking up stray litter. Include "netting" debris out of the water. Encourage boaters to assist in this effort, perhaps in the form of monthly recognition of patrons who routinely assist.

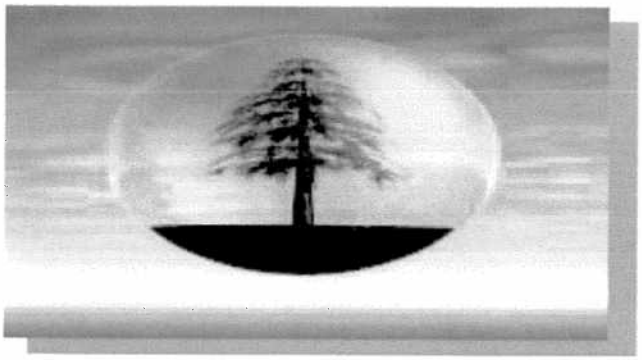
7 Implement recycling and trash reduction programs for appropriate materials, such as glass, aluminum, plastic, trash, newspapers, batteries and oil.

8 Provide recognition and incentives to those boaters who use proper waste management techniques.

REGULATORY REQUIREMENTS:

1. On-site solid waste disposal is prohibited unless the facility is a permitted landfill. (Section 403.708, Florida Statutes).

2. Open burning of solid waste is prohibited. (Chapter 62-701.300(3) Florida Administrative Code).



LIQUID WASTE STORAGE MANAGEMENT

PROBLEM:

Marinas have special wastes such as bilge water, used oil, used oil filters, contaminated spill control material, old gasoline, used batteries and hazardous wastes such as acetone, paint and parts washing solvents. Mismanaged waste may lead to spills, mixing of incompatible wastes and violations of hazardous waste and used oil regulations. At facilities that are used by outside contractors and do-it-yourselfers, wastes are commonly left in the storage area in unlabeled open containers. Releases of liquid waste can degrade water quality and threaten aquatic plant, sea life, human health and safety.

GOAL:

Design a waste storage facility that will contain spills, keep rainwater off of tanks and containers and provide adequate aisle space for container inspections. Manage the storage facility to avoid spills and accidental mixing of incompatible wastes.

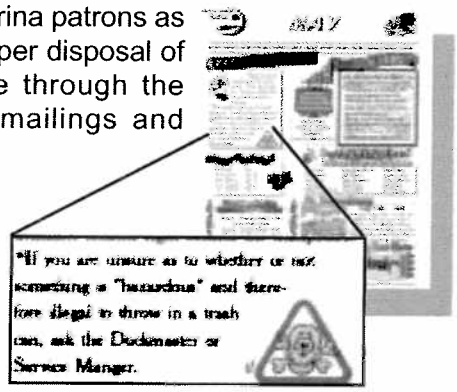
IDEAS FOR YOUR MARINA TO USE:

1 Keep the storage unit locked except during times when a trained facility employee is available to monitor proper waste segregation. Some facilities post signs that indicate wastes can only be put in storage under the supervision of facility personnel.

2 Provide a spill contingency plan that spells out how to respond to fires and accidental spills; and what to do with waste containers in case of an approaching hurricane. This plan can be incorporated into the marina's fueling contingency plan.

3 Train employees in spill contingency plan.

4 Direct marina patrons as to the proper disposal of all liquid waste through the use of signs, mailings and other means.

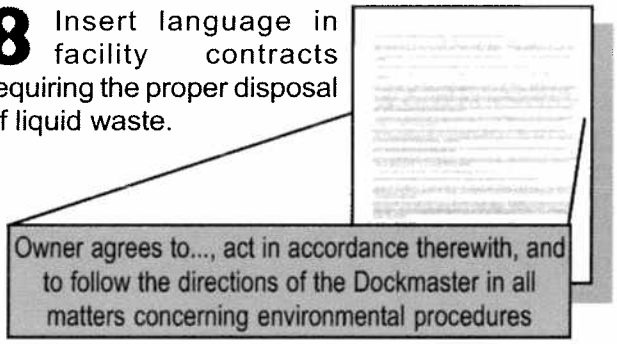


5 Provide spill control material and empty containers for emergency clean-up.

7 Provide snap top funnels to ensure that containers and tanks are properly closed after adding the waste.

6 Design an adequately sized containment structure with berms and a roof to keep rainwater from filling the containment structure.

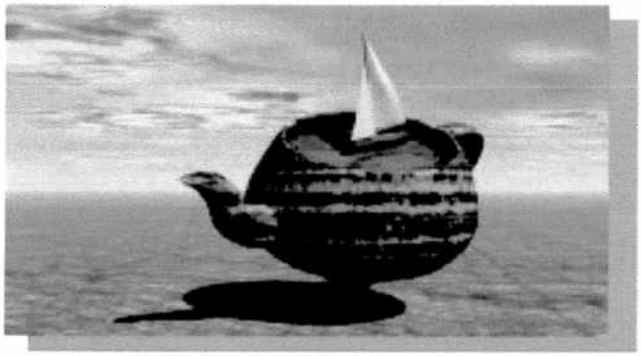
8 Insert language in facility contracts requiring the proper disposal of liquid waste.



REGULATORY REQUIREMENTS:

1. Hazardous waste must be managed and disposed of in accordance with Title 40 Code of Federal Regulation Parts 260-268. (See Hazardous Waste Management, page 21 through 24).

2. Used oil and used oil filters must be managed and disposed of in accordance with Chapter 62-710 Florida Administrative Code (See Petroleum Control, page 10).



HAZARDOUS WASTE MANAGEMENT

Waste Generated by Marinas

PROBLEM:

Improper disposal of hazardous waste can cause harm to human health and the environment and can result in serious penalties and expensive clean-up costs if contamination occurs.

Some of the hazardous wastes generated at marinas may include: ignitable paint waste, parts cleaning solvents and waste acetone. These three hazardous wastes above may be recycled on-site by using a distillation or filtration unit to reduce waste and recover valuable product. The residue waste from on-site recycling may be hazardous waste.

The following hazardous wastes may require special handling, so separate MEMs are included in this document to address these special wastes:

Used Batteries (see MEM page 55)
Waste Antifreeze (see MEM page 59)
Waste Distress Signal Flares (see MEM page 53)
Mercury Containing Lamps (see MEM page 57)

Some of these wastes are generated by the services provided at the marina, either by marina staff, or outside contractors working at the marina. Some of these wastes are generated by marina patrons (see MEM page 45).

GOAL:

Ensure that all hazardous wastes generated at the marina are managed and disposed of properly.

IDEAS FOR YOUR MARINA TO USE:

1 Design an adequate waste storage facility as described in the Waste Storage MEM on Pg. 19.

2 Use alternative parts washing products that do not contain listed or ignitable solvents. The waste parts washing product may still exhibit hazardous waste characteristics due to hazardous constituents such as lead that are removed during parts cleaning. It is the responsibility of the marina operator to test the waste periodically to ensure that it is not hazardous waste.

Hazardous waste transporters must demonstrate the required financial responsibility to operate in Florida. For a list of transporters meeting this requirement contact your nearest DEP District office.

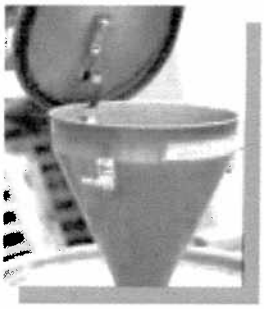
3 Provide spill control material and empty containers for emergency clean-up.

5 Contract with an approved hazardous waste hauler for periodic waste disposal. (FAC 62-730)

4 Segregate wastes to ensure that only waste that is hazardous is handled as such.

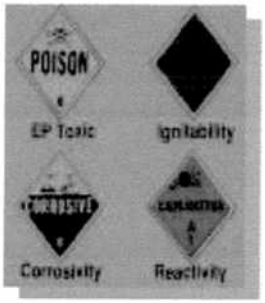
6 Use a distillation unit to recycle solvents generated in painting operations and from parts washing to minimize hazardous waste generation. Still bottoms are the solids that are seperated out of useable solvent. Still bottoms are usually hazardous waste. Call your nearest DEP District Office Hazardous Waste Section for more information.

7 Use snap top funnels to ensure that containers and tanks are properly closed after waste is added and clearly label containers and tanks in order to avoid mixing incompatible wastes (40 CFR 265 Subpart CC reg. may require the use of drums of 26 gallons or less capacity for exemption from the CC emissions requirements for generators).

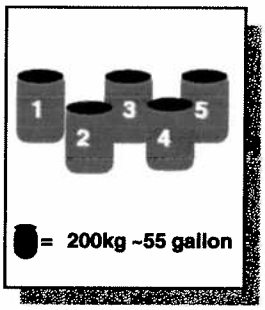


REQUIREMENTS for CONDITIONALLY EXEMPT SMALL QUANTITY GENERATORS OF HAZARDOUS WASTE (0 - 220 LBS/MONTH):

1 The marina operator must determine which waste streams are hazardous using process knowledge, product knowledge or testing. Title 40 Code of Federal Regulations Part 262.11.



2 If the marina operator accumulates over 1,000 kg (2,200 lbs/5 drums) of hazardous waste, the marina will be regulated as a Small Quantity Generator (see requirements below).



3 The marina must ensure delivery of hazardous waste to a proper recycling facility or permitted transfer/ storage/disposal facility. Title 40 Code of Federal Regulations Part 261.5.

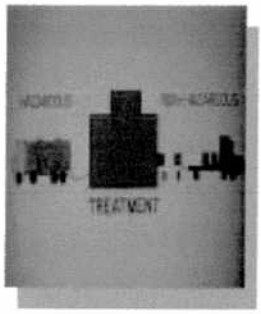
4 The marina must document delivery of its hazardous waste through written receipts which are retained for at least 3 years. Chapter 62-730.030(3), Florida Administrative Code.

REQUIREMENTS for SMALL QUANTITY GENERATORS OF HAZARDOUS WASTE (220 - 2,200 LBS/MONTH):

1 The marina must obtain an EPA ID # (call 850/ 488-0300 for more information). Title 40 Code of Federal Regulations Part 262.12

2 The marina operator must determine which waste streams are hazardous using process knowledge, product knowledge or testing. Title 40 Code of Federal Regulations Part 262.11

3 The marina must use a manifest system for hazardous waste shipments and ship only to permitted transfer/storage/disposal facilities. The marina may use a reclamation agreement if it meets the requirements of Title 40 Code of Federal Regulations Part 262.20(e)



4 The marina must not accumulate over 6,000 kg (13,200 lbs/30 drums) of hazardous waste or you will become a large quantity generator and be subject to more stringent standards.

5 The marina must designate an emergency coordinator. Title 40 Code of Federal Regulations Part 262.34(d)(5)

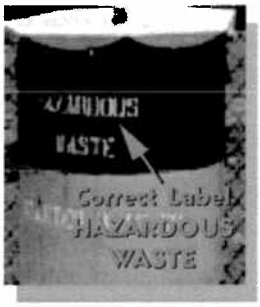
6 The marina must post the phone numbers of the emergency coordinator and the local fire department. The location of fire extinguishers, spill control equipment/material and the fire alarm (if any) are also posted. Title 40 Code of Federal Regulations Part 262.34(d)(5)

7 The marina must train personnel who handle hazardous waste in proper management procedures and emergency response in case of a spill or fire. 40 Code of Federal Regulations 262.34(d)(5)

8 The marina must follow emergency procedures to address spills, fires, including notifying the National Response Center (800/424-8802) and the State Warning Point (850/488-1320). Title 40 Code of Federal Regulations Part 262.34(d)(5)

9 Hazardous waste disposal and analyses records must be maintained for a minimum of three years. Land Disposal restriction certificates must be retained for a minimum of five years. Title 40 Code of Federal Regulations Parts 262.40(a) and 268.7

10 The marina must label all containers and tanks with the words *HAZARDOUS WASTE*. Title 40 Code of Federal Regulations Part 262.34(a)(3)



11 An accumulation start date must be placed on each hazardous waste container as soon as hazardous waste is placed inside. Title 40 Code of Federal Regulations Part 262.34(a)(2)

12 The marina may not accumulate hazardous waste on-site for more than 180 days and remain a Small Quantity Generator, 40 Code of Federal Regulations 262.34 (d). If the marina exceeds 180 days, their status will change to Large Quantity Generator and they will have to comply with more stringent regulations.

13 The marina must maintain hazardous waste containers closed. Title 40 Code of Federal Regulations Part 262.34(d)(2)

14 Incompatible wastes must be segregated. Title 40 Code of Federal Regulations Part 262.34(d)(2)

15 The marina must conduct weekly container inspections and maintain written records of those inspections Title40 Code of Federal Regulations Part 262.34(d)(2) and Chapter 62-730, Florida Administrative Code

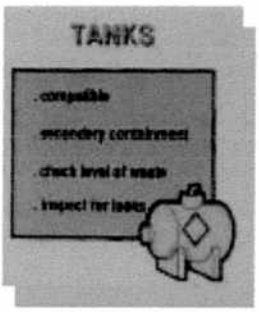
16 The marina must provide adequate aisle space for drums, so that they may be inspected for leaks and missing labels. Title 40 Code of Federal Regulations Part 262.34(d)(4)

17 The container must be compatible for the type of waste stored within. Title 40 Code of Federal Regulations Part262.34(d)(4)

18 The marina must be maintained and operated to minimize the possibility of fire, explosion, or any unplanned sudden or non-sudden release of hazardous waste to air, soil, surface water which could threaten human health or the environment. Title 40 Code of Federal Regulations Part 265.31

19 The marina must attempt to familiarize local fire department, police and hospitals with the types of hazards and potential emergencies that might occur at the facility. Title 40 Code of Federal Regulations Part 262.34(d)(4)

20 If the marina uses tanks to store hazardous waste they must meet the requirements of Title 40 Code of Federal Regulations Part 265 Subpart J (for more information call the nearest DEP District Office).



REGULATORY REQUIREMENTS:

1. Hazardous waste must be managed and disposed of in accordance with 40 Code of Federal Regulation 260-268. (See Hazardous Waste Management, page 21 through 24).

2. Used oil and used oil filters must be managed and disposed of in accordance with Chapter 62-710, Florida Administrative Code (See Petroleum Control, page 10).

3. Compliance monitoring at facilities under the Resource Conservation and Recovery Act with Chapter 62-730, Florida Administrative Code).

"HOUSEHOLD" HAZARDOUS WASTE MANAGEMENT

Hazardous Waste Generated by Marina Patrons

PROBLEM:

Hazardous waste generated by marina patrons may be improperly released onto the ground or into the water if a proper disposal mechanism is not provided. The marina operator may be liable for damages and injuries that might occur should a fire or explosion result from hazardous waste placed in the dumpster. The marina operator also may be liable for clean-up costs should environmental contamination occur.

GOAL:

Provide a convenient mechanism for proper hazardous waste disposal for marina patrons.

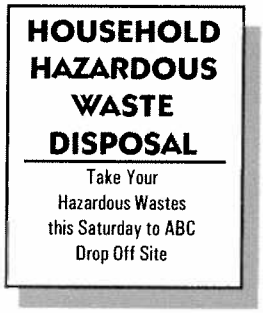
IDEAS FOR YOUR MARINA TO USE:

1 Provide clearly marked containers for hazardous waste generated by marina patrons that do maintenance work at the marina. Manage and dispose of hazardous waste in accordance with the regulations.

2 Post signs by solid waste receptacles that prohibit disposal of hazardous waste.

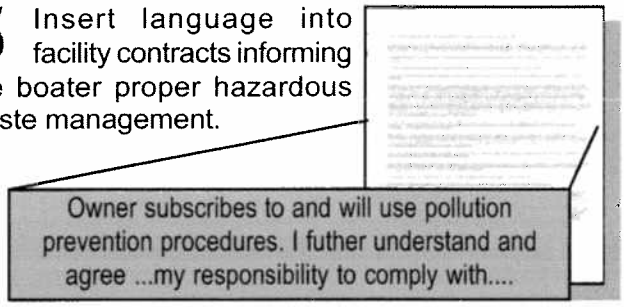
3 Place or stencil messages by storm drains that indicate the surface water that the drain discharges into. Dumpers might be less likely to dump if they realize that their favorite fishing water may become contaminated.

4 If the marina does not want to maintain hazardous waste on site, direct marina patrons as to the proper disposal of hazardous waste through the use of signs and mailings. Many counties provide free disposal service for household hazardous waste. Post collection center locations near the waste receptacles so marina patrons know where to take their hazardous waste.



Hazardous wastes generated by recreational boaters are considered household hazardous waste. Household hazardous waste, though exempt from many hazardous waste regulations, must be handled with care and be disposed of properly.

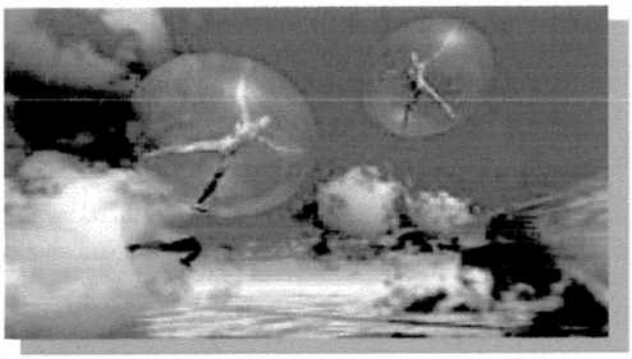
5 Insert language into facility contracts informing the boater proper hazardous waste management.



6 Provide recognition and incentives to those boaters who use proper hazardous waste and used oil management techniques.

REGULATORY REQUIREMENTS:

1. Section 403.161, Florida Statutes prohibits discharges that cause pollution to waters of the State.



HULL AND TOPSIDE MAINTENANCE: PAINTING

PROBLEM:

Painting of vessel hulls or application of topside coatings, and activities associated with paint handling may result in the concentrated release of harmful vapors and liquid solvents. Wastes generated from painting activities will probably be hazardous wastes if the paints contain solvents and/or heavy metals (lead, copper cadmium, barium or chromium). Water based paints containing heavy metals may also generate hazardous wastes. Disposal of hazardous waste is expensive. Mismanagement of hazardous waste cancause pollution of the environment and lead to costly penalties and cleanup costs if discharges occur.

GOAL:

Reduce the amount of harmful vapors released into the air. Minimize the amount of hazardous waste generated by recycling and product substitutions. Properly manage and dispose of all hazardous waste.

IDEAS FOR YOUR MARINA TO USE:

1 Vessel painting should be carried out in a manner that is as compatible to the environment as possible. Whenever possible, painting should be done indoors. The method chosen should take into account the particular type of paint to be used, the customer's specifications and the intended look and use of the painted vessel. For example, the use of low solvent/high solid content paints or water based paints that do not contain environmentally harmful solvents may be used to decrease the release of environmentally destructive vapors into the atmosphere. The use of rollers or brushes may be a consideration as opposed to spray painting.

2 When spray painting, emissions may be reduced by employing operator techniques that ensure a good transfer efficiency of paint to surface. Some of these include:

a. Keeping spray guns and lines clean and well-maintained.

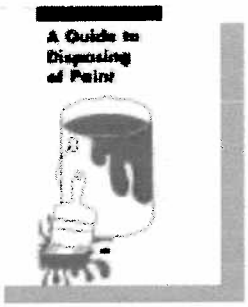
b. Outdoor spray painting should not be conducted under adverse wind conditions.

c. Keeping guns perpendicular to the surface being painted, maintaining a uniform distance from the surface, and moving the gun at a uniform speed to keep spray patterns consistent.

3 Painting on land should occur over an impermeable surface and in such a manner that overspray does not fall on open ground or surface water. A boom should be available to contain any overspray that reaches surface waters. Overspray on water must be removed immediately from the surface of the water.

4 Waste solvents from cleaning spray equipment must be placed into a labeled container with a lid to prevent evaporation into the atmosphere. All hazardous waste from painting operations must be properly containerized, managed, and disposed of in accordance with hazardous waste regulations (see Hazardous Waste Management, page 39). To avoid exceeding the accumulation time periods, the paint shop can establish a satellite accumulation container (not to exceed 55 gallons) to collect hazardous waste. The container must be labeled and kept closed except when adding or removing waste. Once the container is full, it must be dated with the accumulation start date and moved to the waste storage area so a new satellite container can be started.

5 Empty paint and thinner cans must be completely dry before they are placed in the dumpster for disposal. (Note: Some solid waste management facilities may not accept this waste stream).



6 Perform major hull and topside work inside buildings whenever possible to assist in containing contaminants, reducing wind dispersal, and minimizing exposure to rain and runoff into the waterbody.

* Note: Specific OSHA safety precautions may be required.

7 Minimize hazardous waste and get more life out of your product by recycling solvent paint waste with a solvent distillation unit. The distillation bottoms will be hazardous waste and must be managed and disposed of accordingly. The solvent that is recovered can be used to clean equipment, saving the marina the cost of new solvent.

8 If spray painting over water is performed, every effort must be made to keep paint from falling in the water. Some boatyards construct wet sheds to contain overspray and keep paint and debris from falling in the water. Wet sheds are enclosed with a roof and curtains to control fugitive emissions. A boat inside a wet shed slip is encircled with floating rafts secured against the hull to capture any falling paint drops, overspray and debris. The area should be boomed such that all overspray that accidentally reaches the water can be collected and removed via skimming or other effective methods.

9 If spray painting is to be done, use equipment such as high-volume-low-pressure (HVLP) spray guns which have transfer efficiencies of about 85%. (Transfer efficiency, or TE is the percentage of paint sprayed that actually reaches the surface being painted. What doesn't reach the surface is lost as overspray, therefore, the higher the TE, the better paint coverage and lower the paint consumption.)

10 Solvent soaked rags should be placed in fire proof storage bins and recycled through an industrial laundry service.

REGULATORY REQUIREMENTS:

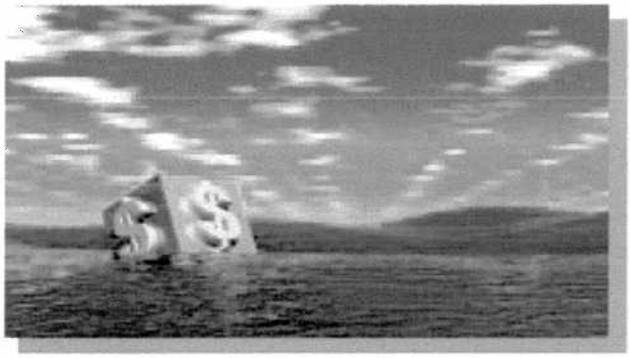
1. All hazardous waste generated at the facility must be managed and disposed of in accordance with Chapter 62-730 Florida Administrative Code (See Hazardous Waste Management MEM, page 33).

2. Marine facilities that engage in spray painting may be required to obtain an air operating permit from the DEP or their Local Air Pollution office. The rules pertinent to these regulations are covered in Chapter 62-296, Florida Administrative Code, and/or by local regulations or ordinances.

3. The federal Clean Water Act and the Oil Pollution Act of 1990 prohibit the discharge of paint into waters subject to the Coast Guard's or the Environmental Protection Agency's jurisdiction.

4. Paint chips and sanding dust must be collected for disposal at a permitted landfill. On site solid waste disposal of Paint chips and sanding dust must be collected for disposal at a permitted landfill. On site solid waste disposal of paint chips and sanding dust on land or water is prohibited, Section 403.708, Florida Statutes.

5. NPDES industrial stormwater permits are required for marinas and boatyards that conduct boatyard activities over land that ultimately discharge to surface waters. These permits must be obtained from US Environmental Protection Agency. These permits require that the facility use BMPs and prepare a pollution prevention plan. (Title 40 Code of Federal Regulations Part 122.26)



ENGINE REPAIR AND MAINTENANCE

PROBLEM:

Gasoline engines that are not properly maintained can emit high levels of hydrocarbons, carbon monoxide, and nitrous oxides, and diesel engines that are not properly maintained can emit high levels of particulate matter into both the air and aquatic environment. Engine service and repair operations generate waste which, when handled incorrectly, can cause human hazards, endanger the environment and be costly to cleanup.

GOAL:

Implement a "low emissions" policy, encouraging boat owners to maintain engine systems in a manner that is friendly to the environment through regular maintenance schedules and tune-ups. Properly handle and dispose of waste generated from engine service and repair.

IDEAS FOR YOUR MARINA TO USE:

1 Maintain supplies of absorbent materials for use by boaters, employees or contractors to clean up spills.

2 Provide labeled separate or individual disposal containers for used oil, used oil filters, anti-freeze and stale gasoline.

3 Distribute pamphlets for proper management and maintenance practices. Train employees on proper waste control and disposal procedures. Post MEMs so everyone knows the marina's maintenance disposal policy.

4 Properly maintain engine repair areas and inspect the maintenance area regularly for cleanliness and safety hazards. An ounce of prevention is worth many lawsuits!

5 Keep solvent containing parts washers closed when not in use to avoid loss of product and evaporation into the atmosphere. Use solvents with high flash points to reduce evaporation and fire hazard.

6 Have all contractors/ mechanics sign an environmental agreement which outlines how all materials are to be handled when on marina property. Do not allow contractors on the property who do not sign or have violated the terms of the agreement.

REGULATORY REQUIREMENTS:

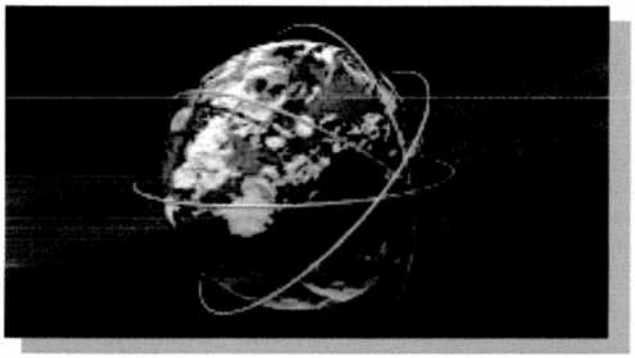
1. Used oil must be managed in such a way as to avoid discharges to water and soil. (see Used Oil Management MEM, page 23). (Chapter 62-710 Florida Administrative Code).

2. Oil changes and hydraulic repairs must be performed in a manner that prevents discharges. (Section 403.751 Florida Statutes).

3. Hazardous wastes must be managed and disposed of properly (see Hazardous Waste Management MEM, page 39). (Chapter 62-730 Florida Administrative Code, Title 40 Code of Federal Regulations Parts 260-268)

4. Properly labeled separate or individual containers must be provided for used oil, used oil filters, and hazardous waste. (Chapter 62-710 Florida Administrative Code, and Title 40 Code of Federal Regulations Part 262).

5. It is prohibited to pour liquid waste down floor drains, sinks or outdoor storm drain inlets (Section 403.727 Florida Statutes).



DISTRESS SIGNAL FLARE MANAGEMENT

PROBLEM:

Commercial and recreational boaters generate distress signal flares that are damaged, water logged or have outlived their shelf life. The distress signal flares generated by recreational boaters are considered household hazardous waste. Household hazardous waste, though exempt from many hazardous waste regulations, must be handled with care and be disposed of properly. The flares are highly reactive and require proper thermal treatment to render them non-hazardous. If waste flares are improperly placed in the marina dumpster for disposal, the marina may be liable for damages and injuries that might occur due to fire or explosion.

GOAL:

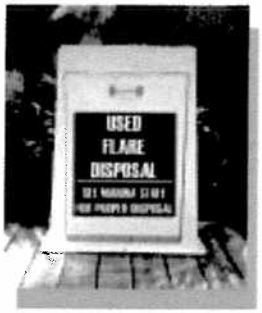
Provide a mechanism for properly managing and disposing of waste safety flares.

IDEAS FOR YOUR MARINA TO USE:

1 For safe destruction of damaged or out-of-date flares, make arrangements with the local sheriff or fire department for thermal treatment of waste flares generated by boaters at your marina.

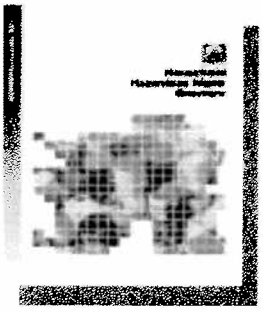
2 After notifying the US Coast Guard, use out-of-date flares for boater safety demonstrations.

3 Provide a well marked fire safe container for waste flares.



4 Post signs near solid waste receptacles prohibiting the disposal of waste flares.

5 If your local or county government already provides a disposal service for waste flares, provide this information to the boaters in your marina.

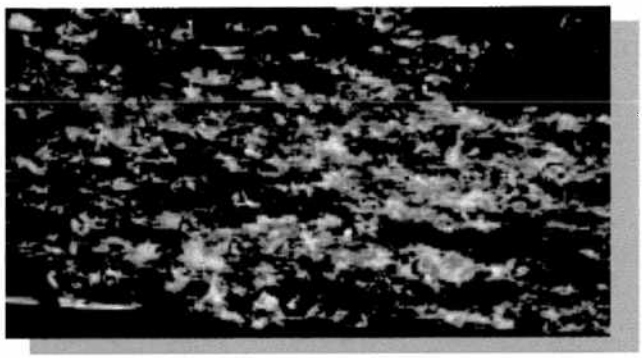


6 Organize (or ask local authorities to organize) a local amnesty day for waste flare disposal.

REGULATORY REQUIREMENTS:

1. Hazardous waste generated by commercial boaters must be managed and disposed of in accordance with the hazardous waste regulations in 40 Code of Federal Regulations 260-268.

2. An "Emergency Thermal Treatment" permit from DEP is required for sheriff or fire department personnel who dispose of waste safety flares (Chapter 62-730.320, Florida Administrative Code). Only a local law enforcement bomb squad experienced in the handling and disposal of explosives may conduct the thermal treatment.



BATTERY MANAGEMENT

Lead Acid Marine/Auto and Rechargeable

PROBLEM:

Lead acid batteries have long been used in auto, truck and boating applications for powering starter motors, other electric motors, lights and accessories. They contain a wet electrolyte sulfuric acid solution which can spill if the cell caps are removed or missing, if the battery is not properly anchored down or if the battery case cracks. The acid can damage metal, ropes (lines), personal flotation gear, clothing, eyes and skin. These batteries also contain several pounds of lead which, along with the acid electrolyte, is detrimental to human health and the environment if improperly disposed.

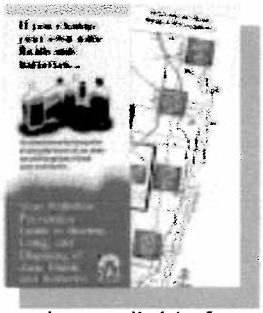
Smaller dry cell nickel-cadmium and sealed lead acid rechargeable batteries are becoming more and more prevalent as power sources, as opposed to single-use alkaline batteries, in portable electronics such as hand held camcorders, navigational instruments, cellular phones, laptop computers and portable power tools. The use of rechargeable batteries is encouraged instead of single-use batteries because it results in less battery waste. However, both nickel-cadmium and small sealed lead acid batteries contain toxic heavy metals that can have negative impacts on human health and the environment. Once in the environment these heavy metals can accumulate in food crops and edible fish as well as appear in drinking water and in the air we breathe.

GOAL:

Educate the boating public and provide for designated secure areas where rechargeable batteries that are no longer usable can be stored for recycling.

IDEAS FOR YOUR MARINA TO USE:

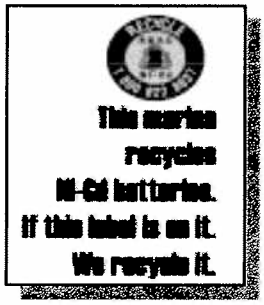
1 Post signs around the facility to alert the public to the disposal ban on lead acid and rechargeable batteries. Include the 1-800-8-BATTERY phone number for nickel-cadmium battery recycling information. Ready made signs and fliers for nickel-cadmium batteries may be available from the Rechargeable Battery Recycling Corporation (RBRC). Call 352-376-6693 or check the RBRC web site at "www.rbrc.org" for information. Include the DEP information line phone number of 1-800-741-4DEP and DEP web site at "www.dep.state.fl.us" for help in recycling batteries or other materials.



2 Provide well marked containers where the public can place unusable rechargeable nickel cadmium and small sealed lead acid batteries. Mark the containers "For Rechargeable Battery Recycling Only" and keep the containers closed. If located indoors, these containers could be sturdy cardboard, plastic or fiberglass. If located outdoors, they should be plastic, fiberglass or some other material which does not conduct electricity or absorb water with a lid. Do not use metal containers.

3 Provide a well marked secure area where lead acid batteries can be brought for recycling. The batteries should be stored on an impervious surface such as concrete, fiberglass or plastic, with sides to contain spilled electrolyte and under cover from rain with all cell caps in place. Lead batteries should not be stored in a manner that exposes them to the elements. Prolonged direct sunlight can weaken the battery casing and lead to an acid release.

4 Periodically place flyers in customer's bills or other correspondence reminding them of the battery disposal ban.



5 Participate in the national nickel-cadmium rechargeable battery take-back program offered through the Rechargeable Battery Recycling Corp (RBRC). Call 352-376-6693 for information or check the RBRC web site at www.rbrc.org.

Educational materials, signs, etc. should explicitly target rechargeable batteries in order to minimize the number of single use batteries, e.g., flashlight, radio, etc., which people may put in collection containers. Single use batteries can be discarded into regular trash containers.

Emphasize to boaters that batteries and other wastes should not be thrown overboard as this is a direct route to pollution of the waters they enjoy and the fish they catch and eat.

Large wet cell lead acid batteries can usually be picked up and recycled at no charge due to the value of the lead. Usually, the same companies which accept the wet cell lead acid batteries also will accept the small sealed lead acid batteries.

REGULATORY REQUIREMENTS:

It is unlawful for anyone to dispose of lead acid, either the wet cell or small sealed cell and nickel-cadmium rechargeable batteries in the solid waste stream either sanitary landfilling or municipal waste incineration (Sections 403.708(14) and 403.7192, Florida Statutes) or in the waters of the State (Section 403.161, Florida Statutes). Used lead acid batteries are regulated as hazardous waste if these are not carefully managed and recycled.

MERCURY CONTAINING LAMPS:

FLUORESCENT AND HIGH INTENSITY DISCHARGE (HID)

PROBLEM:

Fluorescent lamps are used in a wide variety of lighting applications in offices and boats. High Intensity Discharge (HID) lamps are used in many outdoor lighting applications like parking lots and street lighting and some indoor locations such as high ceiling work areas or boat storage areas.

Compared to incandescent lighting, fluorescent and HID lighting uses less energy and produces less heat. However, fluorescent and most HID lamps contain mercury. This mercury can contaminate our air, surface water and ground water. Mercury contamination in Florida is most evident from the fish consumption advisories issued by the Department of Health due to high mercury levels in certain fish.

GOAL:

Recycle all discarded fluorescent and HID lamps used in marina business applications following all appropriate regulations. Educate the boating public about the disposal bans and places where mercury-containing lamps can be taken for recycling, e.g., county household hazardous waste programs.

IDEAS FOR YOUR MARINA TO USE:

1 Post signs around the facility to alert the public to the incineration ban on mercury-containing lamps. Provide local or toll free phone numbers to access recycling programs. Include the DEP information line phone number of 1-800-741-4DEP and DEP web site at "www.dep.state.fl.us" for help in recycling mercury-containing lamps or other materials.

2 Train employees to handle bulbs without breaking and place mercury containing lamps in appropriately labeled containers for proper recycling or disposal.

Fluorescent lamps are fragile and easily broken. Use sturdy containers which do not tip over easily and train employees who will handle the discarded lamps. When a fluorescent lamp breaks, mercury is released. If lamps are stored in a hot, poorly ventilated area and broken lamps are not promptly cleaned up, OSHA exposure levels for mercury may easily be exceeded.

Lighting ballasts used with fluorescent lamps are often changed during lighting relamping or maintenance. Ballasts manufactured prior to 1979 usually contained polychlorinated biphenyls (PCBs) and cannot be disposed in Florida. Recycling of these and all lighting ballasts is recommended.

REGULATORY REQUIREMENTS:

1. It is unlawful to incinerate mercury-containing lamps in any quantity (excluding those from households). In addition, businesses which discard more than 10 such lamps per month must either recycle the lamps or send them to a hazardous waste landfill for disposal (Section 403.7186, Florida Statutes). It is also unlawful to dispose of these lamps in the waters of the State (Section 403.161, Florida Statutes).

2. Recycle all discarded fluorescent and HID lamps used in marina business applications following Chapter 62-737, Florida Administrative Code. Major requirements are listed below:
   - Do not place used lamps used in marina business applications in the regular trash.
   - Store lamps in an area and in a manner that will prevent them from breaking.
   - Do not over fill the shipping container.
   - Do not tape lamps together for storage or shipment.
   - Label the lamp storage area and each container as "Spent Mercury-Containing Lamps for recycling".
   - Do not intentionally break or crush lamps because mercury may be released.
   - If lamps are accidentally broken, immediately store them in a tightly sealed container. It is recommended that you mark the container as "Spent Broken Mercury-Containing Lamps For Recycling".
   - Clearly and visibly label each container and the storage area with the starting date of accumulation when the lamps were first placed in the container and storage area.
   - If on-site storage is not feasible, lamps may be transported to a central accumulation point at one of your own facilities, to a registered or permitted storage facility or directly to a recycling facility. Your business may transport its own lamps or hire a transporter complying with the Department's regulations.
   - Keep copies of any shipping papers for at least 3 years.

USED ANTIFREEZE MANAGEMENT

PROBLEM:

Antifreeze (ethylene glycol) is toxic to animals, humans and aquatic life. When antifreeze is improperly discarded onto the ground or allowed to flow into storm drains or off paved areas into the ground it eventually finds its way into our waterways. A small quantity of antifreeze poured onto the ground can contaminate a large volume of groundwater, which could lead to expensive clean-up costs and degradation of water supplies to other users. Pets such as dogs, have been known to be poisoned from drinking water contaminated with antifreeze. Used antifreeze typically contains high concentrations of lead (5 mg/liter or more is considered hazardous waste), which also can poison our water supplies.

GOAL:

Provide a convenient mechanism for collecting, managing and recycling or disposing of used antifreeze.

IDEAS FOR YOUR MARINA TO USE:

1 Use dedicated antifreeze collection equipment. This would include collection funnels, transfer pans or buckets and storage containers (drums or tanks). Transfer used antifreeze immediately to a dedicated storage container compatible with the antifreeze stored in them. Containers must be in good condition and kept closed at all times except when emptying or filling. Label used anti-freeze collection equipment and containers with the words "Used Antifreeze".

2 Antifreeze containers must be protected from the elements and located in a secured area. Inspect containers at least weekly to check for signs of leaks or deterioration caused by corrosion or other factors. Replace leaking containers immediately.

3 Post signs for marina/ boatyard staff and boater owners advising of the prohibition on disposal of used antifreeze and giving directions for the proper collection and management of the used antifreeze.

USED ANTIFREEZE

Collect separately in tightly sealed labelled drum or tank.

DO NOT add to used oil tank or pour into drains.

Recycle on site or off site at an approved service.

4 Never mix used antifreeze with any other chemicals or substances, rendering it unacceptable for recycling. Keep stored antifreeze free from cross-contamination by oil, fuels and degreasers by providing a separate, well-labeled container.

5 Use, where possible, environmentally friendly anti-freeze.

REGULATORY REQUIREMENTS:

Antifreeze may become contaminated with heavy metals (such as lead) and organics (such as benzene, trychloroethelene or tetrachloroethlene)at levels that would render the used antifreeze a hazardous waste. If the antifreeze is not recycled, a hazardous waste determination must be made by the generator (marina or boatyard operator). 40 Code of Federal Regulations Section 262.11 and Chapter 62-730, F.A.C. If the waste antifreeze is determined to be hazardous waste, it must be managed and disposed of in accordance with 40 Code of Federal Regulations 260-268.

If used antifreeze is recycled on site by the marina or boatyard, a hazardous waste determination must be made on the waste antifreeze filters generated from the recycling process equipment. 40 CFR Section 262.11. If the lead concentration is 5 mg/liter or more it is a hazardous waste (See MEM page 39).

FISH WASTE MANAGEMENT

PROBLEM:

The amount of fish waste disposed into a small enclosed basin such as a marina can exceed that which exists naturally in the water at any one time. In small quantities, this fish waste is fed upon by scavenging fish (such as catfish) and is not a problem. However, in sufficient quantities where water circulation is restricted, the decomposition of this fish waste can deplete the water of dissolved oxygen, leading to water quality degradation and fish kills. This is most often a problem at marinas with large numbers of fish landings or at marinas that have limited fish landings but poor flushing. "Fish feeding" with bait or cleaned fish similarly loads marina basins with nutrients, but can also disrupt the feeding behavior of wild animals and spread diseases among them. Releasing of fish waste in the marina also may attract unwanted predators such as alligators.

GOAL:

Promote sound fish waste management through a combination of fish-cleaning restrictions, public education and proper disposal of fish waste.

IDEAS FOR YOUR MARINA TO USE:

1 Educate boaters regarding the importance of proper fish cleaning practices. Provide signage at fish cleaning stations. Encourage boaters to dispose of unwanted bait offshore and to eviscerate (gut) fish and dispose of contents at sea.

2 Use a macerator for fish waste disposal to the central sewer or arrange for crabbers to take the carcasses.

3 Use fish waste as chum bait in open waters away from the facility.

4 Establish fish cleaning stations with trash receptacles and waste water hookups.

5 Implement fish composting where appropriate.

REGULATORY REQUIREMENTS:

1. Section 403.161, Florida Statute prohibits discharges that cause pollution to waters of the State.

STORMWATER MANAGEMENT

For Non-Industrial Activities

PROBLEM:

Normal activities occurring on the non-industrial areas of marina uplands, such as vehicular traffic and equipment operation, as well as dust, detergents and other upland generated debris are a source of pollution which may be flushed into surface waters during periods of rainfall. These discharges continually degrade water quality and contribute to violations of standards for turbidity, oils and greases, metals, nutrients and dissolved oxygen. The highest concentration of these surface pollutants occurs in the runoff associated with the first inch of rainfall. This phenomenon is generally referred to as the "first flush" effect. Many existing marinas were constructed prior to implementation of stormwater management rules. As a result, many of these marina facilities discharge untreated stormwater directly to the marina basin.

GOAL:

Reduce the concentration of pollutants entering surface waters through use of various stormwater management techniques which cause the first flush of runoff to be slowed, detained or percolated through on-site vegetation and soils so that they are not directly discharged to the water body.

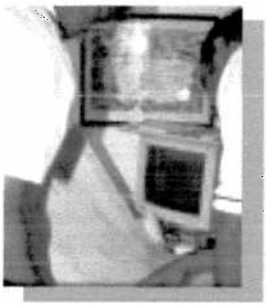
The effort required for modifying or retrofitting an existing marina to improve the management of stormwater can range from very simple to somewhat complex. Several MEMs are easily implemented by marina staff, while others require the assistance of an architect or engineer. All stormwater improvements are extremely site specific and will depend on widely varying conditions such as soil type, depth to groundwater, land use and cover type, size and geometry of the site, existing ground slopes and existing stormwater discharge locations. As such, the following "Ideas for Your Marina to Use" are general in nature and apply primarily to the non-industrial areas of the marina. For a comprehensive overview of stormwater BMPs, please refer to DEP's *Florida Development Manual - A Guide to Sound Land and Water Management.*

IDEAS FOR YOUR MARINA TO USE:

1 General good housekeeping can be an effective management tool for accumulated dust and dirt, litter and trash.

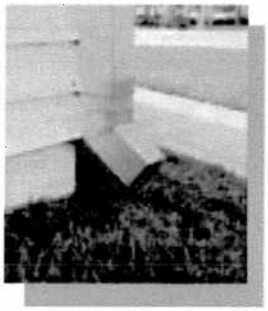
2 Keep general cleaning and maintenance materials tidy and stored in covered areas. Opened or punctured fertilizer bags, insecticide/herbicide containers, detergents, etc. can be a significant source of pollution during rainstorms.

3 Check to ensure that all stormwater and sanitary sewer systems are separate. 'f your stormwater system has water draining during dry weather, perhaps a sewer pipe or other non-stormwater discharge is going into the stormwater conveyances.



4 Inspect your stormwater system regularly, especially after large storms, to assure that it is still working properly. Remove debris and other materials that have accumulated, especially on discharge structures.

5 If roof areas have raingutters, direct the downspouts onto permeable landscaped areas instead of paved surfaces.



6 The installation of vegetated buffers at existing marinas can provide a natural filter to remove pollutants and sediments contained in surface water runoff. This buffer should typically be located between an upland area (pollutant source) and the adjacent water body. As runoff moves through the vegetated buffer, sediment and pollutants attached to sediments are settled and/or are filtered out. In general, the greater the width of the buffer, the greater the pollutant removal capacity. For example, a 15-foot vegetated buffer is able to remove up to 50 percent or more of the sediment and attached pollutants moving through the buffer area.

A vegetated buffer should be of shallow slope, thickly vegetated and should have relatively level contours along its length. If buffers are not graded with level contours, channelized flow or gullying may occur. Channelizing of flow renders the vegetative buffer ineffective for pollutant removal and actually encourages erosion and eventually becomes a point source of pollution itself. Vegetative buffers of thickly growing grasses that are maintained at a height of four inches or more are very effective at removing sediments and attached pollutants. Grassed buffers are also easily maintained. Interspersed shrubs, bushes and trees in a grassed buffer area will enhance scenic and aesthetic qualities and also promote its use by wildlife. Some buffers can also be used for light recreation such as picnic areas.

7 Reducing the amount of runoff from the marina upland areas also decreases the amount of pollution entering the water. One approach is to replace hard-packed or paved areas that would normally allow for high runoff with a pervious material such as gravel or sod. Most non-industrial type marina activities can be conducted on these types of pervious surfaces. Placing gravel or shell over packed sand or dirt provides additional opportunity for stormwater percolation while helping with dust control.

8 Increasing the use of grassed or natural greenspaces or landscape islands serves to further reduce the amount of runoff generated from the upland area. In many cases, these grassed areas can also be designed to serve as depressional retention areas, where runoff from adjacent impervious surfaces (pavement, buildings, etc.) can be collected and percolated through the underlying soil. Even areas for vehicle traffic which are not frequently used (such as overflow parking, etc.) can be sodded instead of paved. Further, the use of curb cuts, perimeter swales and raised collars on existing storm sewer inlets can increase the use of pervious land for percolation of stormwater.

9 Another technique for reducing direct discharge of stormwater to the waterbody is to re-direct drainage flow patterns on the marina upland area. This option should be considered any time when other construction or infrastructure improvements are under way. Often times, subtle changes to the site grading (slope), strategic use of berms or redirecting swales or other drainage features can effectively drain stormwater to buffer areas, greenspaces or other stormwater handling areas.

10 Many other traditional MEMs for stormwater treatment exist including installation of storm sewers and construction of retention/ detention ponds, wet detention and underground exfiltration systems.

REGULATORY REQUIREMENTS:

1. An environmental resource permit (or stormwater discharge permit in the northwest district) may be required from your DEP district, local agency, or water management district as applicable if a new stormwater system is to be constructed or if an existing system will be modified. A permit may also be required if new site work is proposed at the facility. (Part IV, Chapter 373, Florida Statutes)

LANDSCAPING FOR STORMWATER MANAGEMENT

PROBLEM:

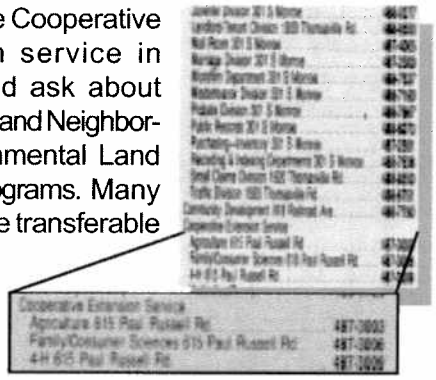
Traditional landscaping design uses plants that typically need maintenance such as frequent watering, fertilizers and pesticides. These materials can get into stormwater or leach through the soil and get into groundwaters.

GOAL:

Use environmentally friendly landscaping techniques (such as xeriscaping) which feature native plants and turf suited to the climate and conditions at your site. These plants need less maintenance thereby reducing potential stormwater pollutants and saving you money.

IDEAS FOR YOUR MARINA TO USE:

1 Contact the Cooperative Extension service in your county and ask about the Florida Yards and Neighborhood or Environmental Land Management programs. Many of these ideas are transferable to marina sites.



2 Refer to a plant reference guide to choose the correct plants for your location. Observe what grows well on vacant land around your site. These plants are particularly well adapted and have low maintenance needs. They may be good choices for your landscape unless they are exotic invasive species.

3 Some exotic plants such as Brazilian pepper, Australian pine and melalueca to name a few are illegal to plant in Florida and should be removed from your property. Other undesirable species include the carrotwood tree, Java plum, Chinese tallow and wedelia (a ground cover). For a complete list contact the Exotic Pest Plant Council.

4 Select drought resistant (xeriscape) plants to minimize irrigation needs.

5 Select slower growing species. These may take longer to provide the desired look for your property but will need less pruning, create less yard waste and have a longer lifespan than faster growing plants.

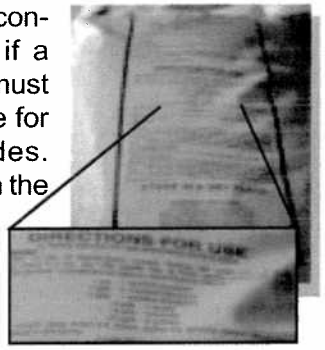
6 Limit the number of showy plants which require more water and attention and place them where they will have the most visual impact.

7 Aim for diversity using a variety of trees, shrubs, ground cover, native grasses and wildflowers, where possible. These are less prone to disease and infestation than monocultures and provide greater wildlife value.

8 Consider using ground cover and landscaped beds of native plants instead of turf, where appropriate. These require less water, fertilizer, pesticides and maintenance. However, in high traffic areas, turf is often appropriate.

9 If chemical fertilizers are needed, use a slow release variety in which at least 30% of the nitrogen is water insoluble. DO NOT use varieties containing herbicides or insecticides.

10 A common misconception is that if a little is good then more must be better. This is not true for fertilizers and pesticides. Follow the instructions on the product label.



11 Pesticide dusts and sprays are highly susceptible to wind drift. If they must be used, only apply during early morning or late evening hours when there is little or no air movement.

12 DO NOT wash pesticide application equipment over paved surfaces which drain to waterbodies. Use pressure washing pad or other suitable permeable surface. Follow the instructions found on labels for disposal.

13 If you employ a professional landscape maintenance service, make sure they use environmentally friendly methods.

14 Integrated Pest Management (IPM) is an environmentally friendly alternative to the use of conventional pesticide products. Examples of safer solutions for landscape pests include insecticidal soap (2 1/2 tbsp. of dish soap per gallon of water); horticultural oil (add 2 1/2 tbsp. of vegetable oil to the insecticidal soap); Bacillus thuringiensis (BT) a bacterium which controls caterpillars (available at nurseries); coffee grounds and tea bags prevent mosquito larvae from hatching; shallow pans of beer help control slugs. Try using these least toxic alternatives before taking more drastic measures.

15 Create a compost area for yard debris. This material is a good alternative to chemical fertilizers and its free. Composting also eliminates the need to haul off yard waste.

SEWAGE PUMPOUTS AND WASTE DUMP RECEPTACLES

PROBLEM:

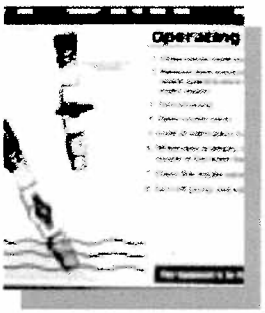
Overboard discharges of domestic sewage from marine heads or holding tanks contribute significantly to water quality degradation and introduce dangerous pathogens into the water. Poorly maintained pumpouts and waste dump receptacles limit their use and discourage the proper disposal of sanitary wastes.

GOAL:

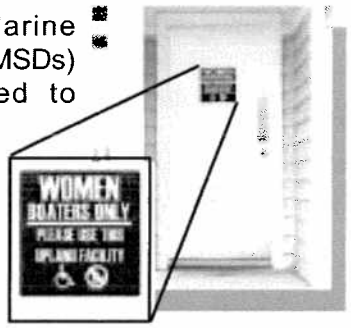
Encourage the proper use of pumpout facilities and waste dump receptacles by boaters, particularly liveaboards and overnighters. Ensure that sewage pumpout facilities and waste dump receptacles are maintained in good operational and sanitary condition to encourage their use.

IDEAS FOR YOUR MARINA TO USE:

1 Install pumpout connections at convenient locations or at each slip and provide clear instructions for operating them. This is especially important where there are liveaboards. (Instruction should include warning against the disposal of toxic materials.)

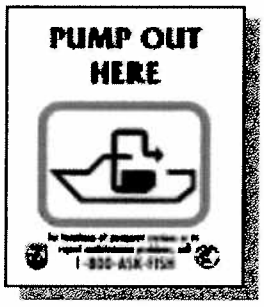


3 Boats with Marine Sanitation Device (MSDs) should be encouraged to use shoreside facilities.



2 For small boats with port-a-potties, install waste dump receptacles at boat ramps and clearly label them with instructions for their use. (Instruction should include warning against the disposal of toxic materials.)

4 For all marinas with pumpout facilities, literature advertising the marina should indicate pumpouts are available.



5 Develop regular inspection schedules.

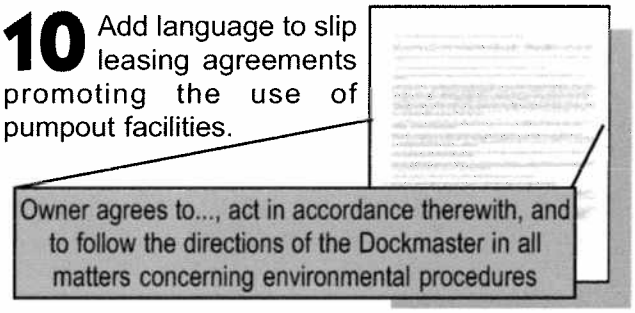
6 Have personnel on hand to monitor and ensure the proper use of the equipment.

7 Arrange maintenance contracts with contractors competent in the repair and servicing of pumpout and waste dump receptacle equipment.

8 Keep sewer lines clean to avoid plugging (a common problem with high strength waste).

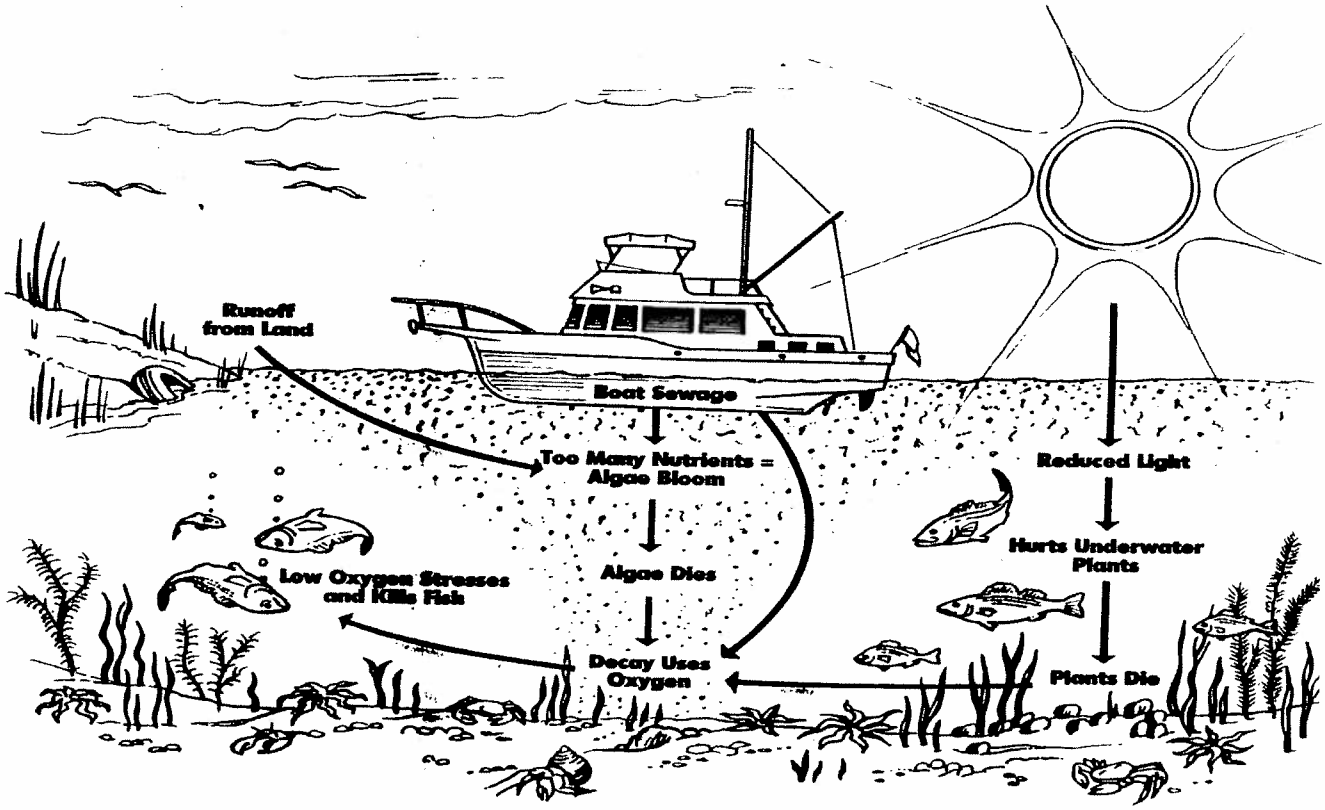
9 Provide convenient pumpout services free of charge or for a nominal fee in order to encourage use. Services may include portable or stationary units, or pumpout boats. (Make the charge part of dock fee, if necessary, to recover cost.) Direct connections to all slips capable of mooring boats with heads (particularly liveaboards) is preferred.

10 Add language to slip leasing agreements promoting the use of pumpout facilities.



11 Provide signage for proper disposal of marina patron's animal waste.

12 Maintain a dedicated fund for the repair and maintenance of pumpout stations and receptacles.



Pumpout facilities are especially important in marinas with liveaboards.
Studies have documented a correlation between boating activity and elevated levels of fecal coliform, especially in areas of poor flushing.

***Connection to a central sewage system is preferred.**

***Empty portable pumpout collectors regularly.**

***Ensure that septic fields are properly constructed and placed high above water level.**

At a marina with an existing wastewater treatment system, the permitting authority for new pumpout construction will be the same agency that permitted the existing system.
That is, a marina with a package treatment plant permitted by DEP will need a DEP permit to construct new pumpout facilities. A marina with an existing on-site wastewater treatment system permitted by Department of Health (DOH) will need a permit from DOH to construct new pumpout facilities.

Boat waste water is higher strength than conventional residential wastewater and may cause problems for wastewater collection and treatment systems.
These problems include overloading, odors, plugging, sludge handling, corrosion, permit violations and toxicity.

a) Boat wastewater is similar to recreational vehicle (RV) wastewater. Solutions which have worked for RV Parks in your area may also work for your marina.
b) Boat wastewater may need to be stored either at the marina or adjacent to the wastewater treatment facility and be added slowly to the regular wastewater stream to avoid shocking or over loading the treatment facility.
c) Septic tanks should be a last resort for treating marina wastewater. If no other alternatives are practical, consider oversizing the facilities to accommodate the high strength nature of the waste and peak seasonal volume.

REGULATORY REQUIREMENTS:

1. Florida statutes prohibits the discharge of raw seage from any vessel (Section 327.53 – 4(a), Florida Statutes).

2. All vessel owner, operator and occupant shall comply with United States Coast Guard relations pertaining to marine sanitation devices and with United States Environmental Protection Agency regulations to areas in which the discharge of sewage, treated and untreated. (Section 327.53 – 5, Florida Statutes).

GRAY WATER

PROBLEM:

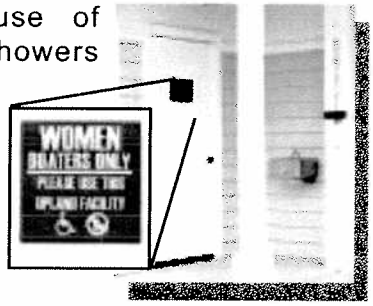
Gray water is defined as waste water from sinks and showers. Direct discharges of gray water increases Biochemical Oxygen Demand (B.O.D.) and nutrients in the water, lowers dissolved oxygen and may lead to undesirable algal blooms.

GOAL:

Reduce the volume of gray water discharges and the concentrations of pollutants contained in gray water discharges at marinas.

IDEAS FOR YOUR MARINA TO USE:

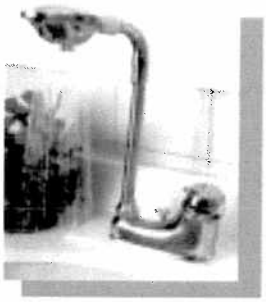
1 Encourage use of shoreside showers and laundry.



2 Educate boaters to use biodegradable, phosphate-free detergents and soaps on vessels.

3 Minimize food wastes overboard by providing regularly maintained, accessible trash receptacles.

4 Encourage boaters to conserve water and use water saving devices such as low volume showerheads.



5 Maintain marina design depths as necessary in order to prevent damage to adjacent areas.

FLORIDA SEA GRANT COLLEGE

1999 PROGRAM DIRECTORY
PO BOX 110400
GAINESVILLE, FL 32611-040
352-392-1837

ADMINISTRATION
352-392-5870

James C. Cato - Director
ext 227

William Seaman, Jr. - Assoc Director
ext 228

Ed Harvey - Fiscal Officer
ext 230

Twila Stivender - Administrative Assistant
ext 221

Jackie Whitehouse - Executive Secretary
ext 222

EXTENSION PROGRAM
352-392-1837

Don Jackson - Assistant Dean
ext 226

Betty Spivey - Office Manager
ext 224

Treva Damron - Senior Secretary
ext 225

COMMUNICATIONS
352-392-2801

Steve Kearl - Communications Director
ext 233

Susan Grantham - Coordinator
ext 232

Geri Simmons - Senior Secretary/Publications
ext 231M

EXTENSION SPECIALISTS

Charles Adams - Marine Economics
University of Florida
Box 110240
Gainesville FL 23611-0240
352-392-1826 ext 223

Gustavo Antonini - Waterway Management
University of Florida
Box 110405
Gainesville FL 32611-0405
352-392-6233

Steven Otwell - Seafood Technology
University of Florida
Box 110375
Gainesville FL 32611-0375

EXTENSION AGENTS

Craig Aubrey
Taylor County
203 Forest Park Dr
Perry FL 32347-6396
850-838-3508

Dianne Berger
Florida Bay Education Project
93911 Overseas Highway
Tavernier FL 330707
305-853-3592

Harrison Bresee - Miami/Dade County
RSMAS
4600 Rickenbacker Cuaseway
Miami FL 33149-1098
305-361-4017

Chris Combs - Brevard County
4090 Minton Road
West Melbourne FL 32904
407-952-4537

EXTENSION AGENTS (CONTINUED)

Nancy Diersing
Florida Bay Education Project
93911 Overseas Highway
Tavernier, FL 33070
(305) 853-3592 or Suncom 464-3592

Douglas Gregory- Monroe County
5100 College Road
Key West, FL 33040-4364
(305) 292-4501 or Suncom 472-4501

Joseph Halusky- Nassau, Duval, St. Johns, Putnam, Clay, Flager Counties
233 Marine Center Drive
St. Augustine, FL 32086-8622
(904) 461-4014 or Suncom 856-4014

William (Bill) Mahan- Franklin County
33 Market Street, Suite 305
Apalachicola, FL 32320-2310
(850) 653-9337

Sonya Wood Mahler- Escambia, Santa Rose Counties
3740 Stefani Road
Cantonment, FL 32533-7792
(850) 475-5230

Rich Novak- Charlotte County
6900 Florida Street
Punta Gorda, FL 33950-5799
(941) 639-6255

Don Pybas- Miami-Dade County
18710 SW 288 Street
Homestead, FL 33030-2309
(305) 248-3311 or Suncom 478-4778

John Stevely- Manatee, Sarasota, Hillsborough, Collier Counties
1303 17th Street West
Palmetto, FL 34221-5998
(941) 722-4524

Leslie Sturmer- Levy, Dixie Counties
P.O. Box 89
Cedar Key, FL 32625
(352) 543-5057

Donald Sweat-Levy, Citrus, Hernando, Pasco, Pinellas Counties
830 First Street South
St. Petersburg, FL 33701
(727) 553-3399

Robert Turpin- Okaloosa, Walton Counties
5479 Old Bethel Road
Crestview, FL 32536-5513
(850) 689-5850 or Suncom 698-5850

CAMPUS COORDINATORS

Florida A&M University - Larry Robinson
(850)599-3550

Florida Gulf Coast University - Greg Tolley
(941) 590-7208

Florida Atlantic University- Russell Kerr
(561) 297-3986

Florida Institute of Technology- Junda Lin
(407) 768-8000 Ext. 7587

Florida International University- James Fourgurean (305) 348-4084

Florida State University- Nancy Marcus
(850) 644-5498

Harbor Branch Oceanographic Inst.- Dennis Hanisak (561) 465-2400 ext. 306

Mote Marine Laboratory- Randy Edwards
(941) 388-4441

Nova Southeastern University- Brenda Mashburn (954) 262-5370

University of Central Florida- Linda Walters
(407)823-2148

University of Florida- William Seaman
(352) 392-5870 ext. 228

University of Miami - Nelson Ehrhardt
(305) 361- 4741

Univeristy of North Florida - Anthony Rossi
(904) 620-2830

University of South Florida - Norman Blake
(813) 553-1521

University of West Florida - Carol Rafalski
(850) 474-2825

DEP DISTRICT TECHNICAL AND OUTREACH SUPPORT

Technical Contact: Chip Kirschenfeld, Eric Harter
Outreach: Sava Varazo

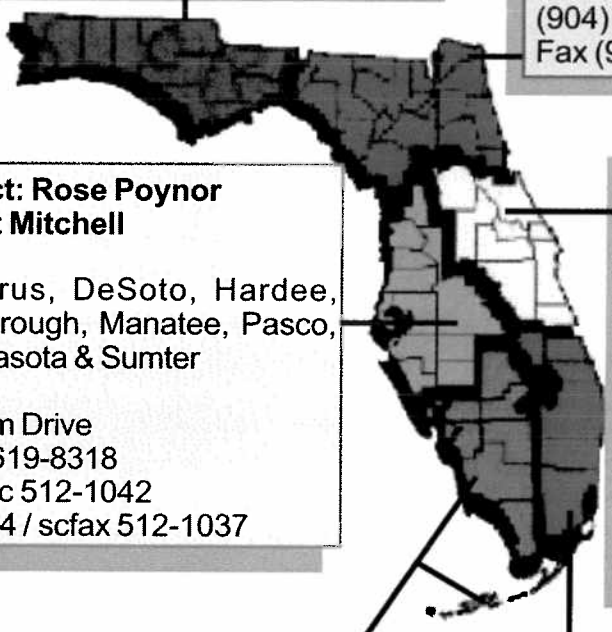
Jurisdiction: Bay, Calhoun, Escambia, Franklin, Gadsden, Gulf, Holmes, Jackson, Jefferson (western half), Leon, Liberty, Okaloosa, Santa Rosa, Wakulla, Walton & Washington

160 Government Center
Pensacola, Florida 32501-5794
(850) 595-8300 / sc 695-8300
Fax (850) 595-8417 / scfax 695-8417

Technical Contact: Jack Dunphy
Outreach: Deena Feeley

Jurisdiction: Alachua, Baker, Bradford,Clay, Columbia, Dixie, Duval, Flagler, Gilchrist, Hamilton, Jefferson, Lafayette, Levy, Madison, Nassau, Putnam, St. Johns, Suwannee, Taylor & Union

7825 Baymeadows Way, Suite 200B
Jacksonville, Florida 32256-7590
(904) 448-4300 / sc 880-4300 x201
Fax (904) 448-4366 / scfax 880-4366



Technical Contact: Rose Poynor
Outreach: Merritt Mitchell

Jurisdiction: Citrus, DeSoto, Hardee, Hernando, Hillsborough, Manatee, Pasco, Pinellas, Polk, Sarasota & Sumter

3804 Coconut Palm Drive
Tampa, Florida 33619-8318
(813) 744-6100 / sc 512-1042
Fax (813) 744-6084 / scfax 512-1037

Contact: Charles Johnson
Outreach: David Herbster

Jurisdiction: Brevard, Indian River, Lake, Marion (part), Orange, Osceola, Seminole, Volusia

3319 Maguire Boulevard
Suite 232
Orlando, Florida 32803-3767
(407) 894-7555 / sc 325-2290
Fax(407)897-2966/scfax342-2966

Technical Contact: Laura Comer
External Affairs: Lisa Douglass ext 175

Jurisdiction: Charlotte, Collier, Glades, Hendry, Highlands, Lee & Monroe

2295 Victoria Avenue, Suite 364
Fort Myers, Florida 33902-2549
(941) 332-6975 / sc 748-6975
Fax (941) 332-6969

Technical Contact: Cheryl McKee
Outreach: Willie Puz

Jurisdiction: Broward, Dade, Martin, Okeechobee, Palm Beach, & St. Lucie

Mailing Address:
PO Box 15425
West Palm Beach, Florida 33416-5425

Physical Address:
400 North Congress Avenue
West Palm Beach, Florida 33401
(561) 681-6720 / sc 226-6600
scfax 226-6780

DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF LAW ENFORCEMENT
CLEAN VESSEL AND CLEAN MARINA PROGRAMS

(850) 488-5757

MR. JAN R. DELANEY
Program Manager
Ext 178

MS. DEBBIE HALL
Education/Outreach
Ext 139

MS. JANICE JOHNSON
Grants Specialist
Ext 154

FAX 850-487-4590