Appendix F
Sediment Management Plan

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Sarasota County | Southwest Florida Water Management District | Jones Edmunds | Janicki Environmental, Inc.

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1.0 INTRODUCTION

Sediment is fragmented material that originates from weathering and erosion of rocks or unconsolidated deposits and is transported by, suspended in, or deposited by water (USEPA, 2003). Although sedimentation is a natural process, sediment becomes problematic when it is present in excessive quantities or is of poor quality.

Sediment plays an important role in influencing water quality, ecosystem health, and flood control. Population growth and development can accelerate erosion and sediment deposition, overwhelming natural systems. Excessive erosion and sedimentation are significant chemical and physical issues in watershed management. Sediment alters the natural landscape and pollutes water, resulting in environmental and economic impairment. The U.S. Environmental Protection Agency (USEPA) recognizes sediment as a major contributor to impairment of the nation's waters and has cited sediment as the leading cause of impairment (USEPA, 2003). Sediment control strategies are therefore a key component of watershed management planning efforts.

This Appendix is the sediment management component of the comprehensive water quality management plan for the Little Sarasota Bay Watershed, which includes the Blackburn Bay and Little Sarasota Bay segments. Watershed-based loading of sediment and other associated pollutants, identification of other sediment sources, and potential management and preventative erosion and sedimentation measures for the Little Sarasota Bay Watershed are discussed in this document.

1.1 SEDIMENT SOURCES

Sediment production is a natural watershed process, but urbanization and other land-use changes can impact the processes associated with the sedimentation cycle: erosion, transport, and deposition. Within an urbanized setting like the Little Sarasota Bay Watershed, sediment production has two primary sources: wash-off from land surface and in-stream channel erosion. Bank steepness, degree of concentration (runoff velocity), and stability (e.g., vegetation) influence the quantity of the sediment load that reaches the waterbody. Increased sediment load from wash-off and in-stream erosion can affect water quality, natural habitat, navigation, flood control, and recreational uses downstream. In addition, alterations in circulatory patterns caused by dredging can re-suspend and transport existing sediments.

1.1.1 Land Surface

In urban watersheds, the greatest contributor to wash-off is impervious surfaces. Impervious surfaces increase runoff volume and velocity, which erode areas with little groundcover or loose soils and carry a significant sediment load to the waterways. This increase can affect the physical character and the overall environmental condition of receiving tributaries. A study on the effect of imperviousness on sedimentation showed that significant degradation to stream stability,

habitat, and water quality occurs at even minimal levels of imperviousness on the order of 10 to 15% (Fischenich, 2001).

1.1.2 In Stream Processes

In their historical condition, waterways collected water, nutrients, and sediments from upland runoff and distributed these elements to the contiguous wetlands and the bay in a manner that supported productive biological communities. The timing and quantities of flow suited the complex biological cycles of the streams and bay. The water collected and delivered by the waterways, with its dissolved and suspended load, were and are a major component of the raw materials that fuel the productivity of wetlands, streams, and bays.

An open channel is dynamic and will naturally adjust slope, sinuosity, width, and depth to maintain equilibrium in the system. The equilibrium is dominated by the flow through the system and the sediment load. The natural process of stream channel erosion is typically accelerated and heightened by urbanization in the watershed. Streams adjust to these changes within the physical constraints of bridges, bank stabilization measures, and other hardened surfaces to establish a new equilibrium condition that is often different from their previous “natural” state.

Impacts associated with the “new” equilibrium include the following:

- Greater and more frequent peak storm flows capable of eroding channel beds and banks.
- Enlargement of the channel through incision and widening processes or constriction of channels through sediment deposition.
- Decreased recharge of shallow- and medium-depth aquifers that sustain base and low flows.
- Higher nutrient and contaminant loading.
- Alteration of the channel substrate.
- Reduction of stream system function.

Stream channel erosion is a major contributor of sediment in urbanized watersheds. Channel erosion control should therefore be a priority in sediment management.

1.2 POLLUTANTS OF CONCERN

Sediment that is transported and deposited in waterbodies can disrupt aquatic ecosystems. Excess sediment can cloud the water, which can suffocate fish and block the light required by aquatic plants for photosynthesis. In addition, sediment-rich discharges tend to carry higher loadings of pollution because nutrients, pesticides, and heavy metals adsorb to and are transported along with sediment. Pollutants of concern including total suspended solids (TSS), total nitrogen (TN), and total phosphorus (TP) are associated with the sediment and contaminants attached to sediment in the Little Sarasota Bay Watershed. Appendix C - Water Quality of the Little

Sarasota Bay Water Quality Management Plan (WQMP) provides additional information on these pollutants and the water quality in the Little Sarasota Bay Watershed.

Nitrogen and phosphorus are nutrients that occur in soils naturally; increased erosion increases the nutrient load to the system. Other common sources of nitrogen and phosphorus in an urbanized area are septic systems, pet wastes, industrial wastes, landfills, and fertilizer. Excess nutrients combined with the tropical temperatures in Sarasota County can lead to excessive algae growth impacting the recreational aspects of the waterways as well as creating an oxygen deficit for the marine life and aquatic habitats.

Suspended solids loads are primarily a function of land use; an increase in the amount of impervious area in urban development is associated with an increase in suspended solids in stormwater runoff. If suspended solids remain suspended, the particulates reduce water clarity and limit the amount of sunlight reaching marine life; suspended solids that settle in a stream system adversely impact benthic habitats and the flood control capacity of the system. Additionally, suspended solids may carry toxins and pathogens that adversely impact ecosystems.

Litter from lawn maintenance—such as leaves and grass clippings—and urban debris—such as cigarette butts, food packaging, and batteries—are also pollutants. Litter left on the ground frequently ends up in storm drains, ditches, and streams. In addition to being an eyesore, litter can contaminate waterways with excess nutrients and chemicals. Although natural streams have snags and leaf packs that provide habitat and nutrient processing, in large quantities they can add to the nutrient load in the waterway. Litter can also reduce and in some cases block flow, which can disrupt the ecosystem or cause flooding.

1.3 SEDIMENT CHARACTERISTICS IN THE WATERSHED

Previous studies found that sediment in several of the Little Sarasota Bay tributaries contains contaminants including metals and organics. The *County Wide Survey of Sediment at Weirs* (2003) included the Catfish Creek, Elligraw Bayou, Holiday, Bayou, and Clower Creek basins as priority areas due to enriched sediments. The study did not find any correlation between contaminant concentration and sediment depth; however, a comparison of upstream versus downstream samples showed upstream sediment concentrations were higher for arsenic, chromium, copper, zinc, total nitrogen, silt/clay fractions, and percent organic material. Lead and cadmium concentration, on the other hand, were higher downstream of the weirs. Higher lead concentrations, for example, were found downstream of the Sarasota Parkway in Catfish Creek than were found at upstream weirs.

Many factors including runoff from roadways and development contribute to contaminants in sediment. Contaminants bind to sediments and are transported with it. The watershed is highly urbanized around the tributaries and coast. Many developments were built before Land Development

Regulations were implemented, so untreated runoff contributes sediment and associated pollutants to surrounding tributaries and Little Sarasota Bay.

Florida's geology contains sedimentary deposits of marine origin, some of which are high in phosphorus content. The watershed's phosphorus-rich geology and soils significantly influence the TP concentrations in the Little Sarasota Bay tributaries and estuary. Florida is divided into ecoregions for the proposed Numeric Nutrient Criteria (NNC), and there is currently a debate concerning the appropriate region for the Little Sarasota Bay. USEPA originally classified the watershed in the Bone Valley region (BV) but re-evaluated and proposed that the area belongs in the Peninsula Region (PR); however, the Southwest Florida Water Management District (SWFWMD) submitted comments to USEPA that the area containing the Little Sarasota Bay Watershed should be kept in the BV region (SWFWMD, 2010).

There is currently a debate concerning the appropriate ecoregion for the Little Sarasota Bay Watershed for Numeric Nutrient Criteria.

1.4 SEDIMENT MANAGEMENT

Increased sediment loading to Little Sarasota Bay tributaries and Little Sarasota Bay directly results from development throughout the watershed. A key component of sediment management involves controlling sedimentation by managing upstream sources and activities that increase stream erosion and sediment flowing to tributaries.

Managing sedimentation in an urban setting requires a multi-pronged approach. We recommend the following three management strategies to reduce unwanted sediment in the system:

- Providing source control to reduce or remove solids in upland areas.
- Implementing maintenance practices designed to reduce sedimentation.
- Improving eroding and sloughing banks for long-term stability.

These strategies will reduce turbidity, increase clarity, and reduce nutrient and sediment load and therefore improve the overall health of the estuaries and Little Sarasota Bay.

Providing source control to reduce or remove TSS in the uplands keeps pollutants from running off in stormwater and reaching the receiving waters of the channel and ditch system and ultimately Little Sarasota Bay. Source control activities include activities such as Low-Impact Development (LID) projects, street sweeping, and construction-area silt fencing.

Regularly scheduled maintenance practices minimize the amount of sediment, debris, and pollutants reaching County waterways. These activities include cleaning out baffle boxes, removing vegetation debris resulting from maintenance activities from swales and roadside ditches, replacing or repairing damaged infrastructure, and maintaining control structures, weirs, and pumps.

Bank stabilization in an urban setting is challenging. Numerous stream banks in the County exhibit the following characteristics that lead to erosion and sloughing:

- Steep slopes due to lack of available easement space.
- Loose soil matrix on steep slopes without hearty root systems or moisture-holding capacity.
- Direct runoff washing out the top of banks.
- Outfalls not properly reinforced.

For stabilization to be effective in the long term, management and restoration should not be limited to a single point in the stream but will be more effective when conducted as multiple projects along a channel system.

Watershed management includes identifying sediment problems, identifying sediment sources, and recommending improvement projects that address the source as well as capturing sediment before it reaches the estuaries. The activities listed above will improve the health of the system.

2.0 SEDIMENT MANAGEMENT OPPORTUNITIES

Jones Edmunds identified potential sediment management opportunities in the Little Sarasota Bay Watershed. Project and site-selection methodology are provided in the following subsections. Analysis and project and programmatic recommendations to reduce erosion and sedimentation in Little Sarasota Bay and its tributaries are described in Section 3.

2.1 METHODOLOGY

Jones Edmunds collected and assembled information, including previous studies, GIS data, and stakeholder input, to identify potential sediment management projects. Jones Edmunds began the investigation with a GIS desktop analysis to identify sediment 'hot spots' throughout the watershed. These hot spots were refined to potential sediment management project sites. This methodology is summarized in Figure 2-1 and detailed in the following sections. Finally, Jones Edmunds conducted field investigations of these sites to evaluate potential sediment treatment options.

2.1.1 INVESTIGATION

2.1.1.1 Identification of Hot Spots

Jones Edmunds reviewed observations, input from stakeholders and County staff, and previous studies and data. Previous sediment studies in the Little Sarasota Bay Watershed include:

- Bay Bottom Habitat Assessment (1993).
- Water and Sediment Quality: Trends and Status for Sarasota Bay (1993).
- Framework for Action Chapter 2: Physical and Chemical Properties; Bay Water and Sediment Quality (1993).
- Clower Creek Sediment Study (1993).
- County-Wide Survey of Sediment Quality at Weir Structures (2003).
- South Creek Canal Sediment Abatement Study (2005).
- Sarasota Bay Estuary Program Outfall Prioritization Project (2007).

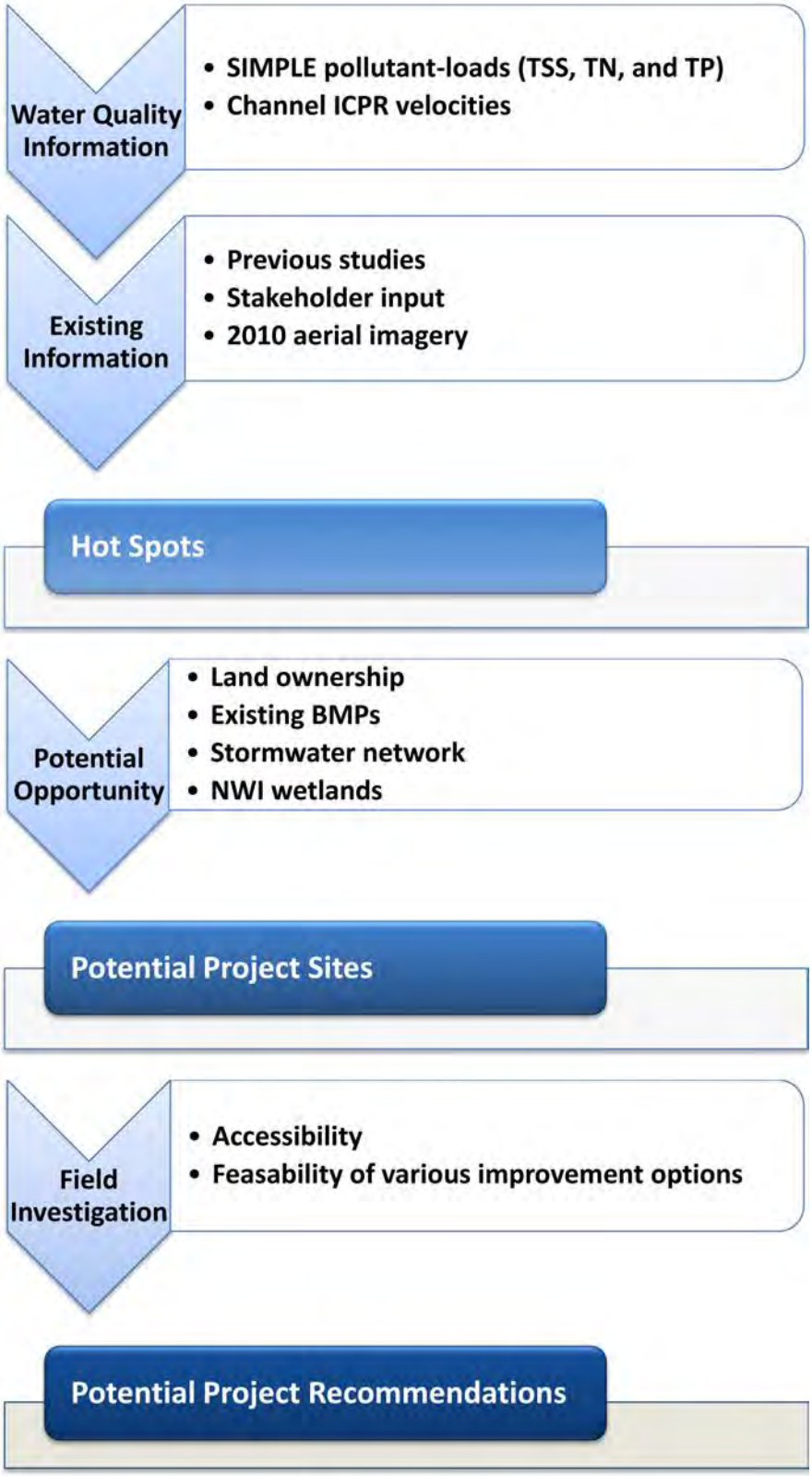

Figure 2-1 Sediment Management Opportunity Identification Methodology

Jones Edmunds used GIS to compile and review data developed from the Pollutant Loading Model results with aerials and other base data and information obtained from Sarasota County, SWFWMD, Florida Department of Environmental Protection (FDEP), U.S. Fish and Wildlife Service (FWS), and previous watershed studies and data. These datasets and information included the following:

- Pollutant-loads (TSS, TP, and TN) estimated from the Spatially Integrated Model for Pollutant Loading Estimates (SIMPLE); pollutant-load results are detailed in the Pollutant Loading Analysis Technical Support Document: Current Loadings.
- Sarasota County surface water Interconnected Channel and Pond Routing (ICPR) model velocity results.
- Areas of erosion and sedimentation identified from 2010 SWFWMD aerial imagery.
- Areas of concern identified in previous studies.
- Areas of concern noted by stakeholders and County staff.

A GIS desktop analysis of the data above yielded potential erosion and/or sedimentation hot spots in the watershed.

2.1.1.2 Identification of Potential Project Sites

Jones Edmunds compiled the potential sediment hot spots with additional base data obtained from Sarasota County. Specifically, these datasets included the following:

- Sarasota County parcels.
- Existing Best Management Practices (BMPs).
- Sarasota County Stormwater Inventory.
- FWS National Wetland Inventory (NWI).

From the GIS desktop analysis of the parameters above, Jones Edmunds identified six potential sediment management project sites in the watershed (Table 2-1 and Figure 2-2).

Table 2-1 List of Potential Sediment Management Project Sites

ID	Site Name	SIMPLE Basin ID
1	Catfish Creek at Central Sarasota Parkway	21
2	Palmer Ranch Parkway	20
3	McIntosh near Prosperity Circle	29
4	South Creek at Honore Avenue	10, 11, 12
5	Oscar Scherer State Park	7
6	Catfish Creek at Tamiami Trail	21

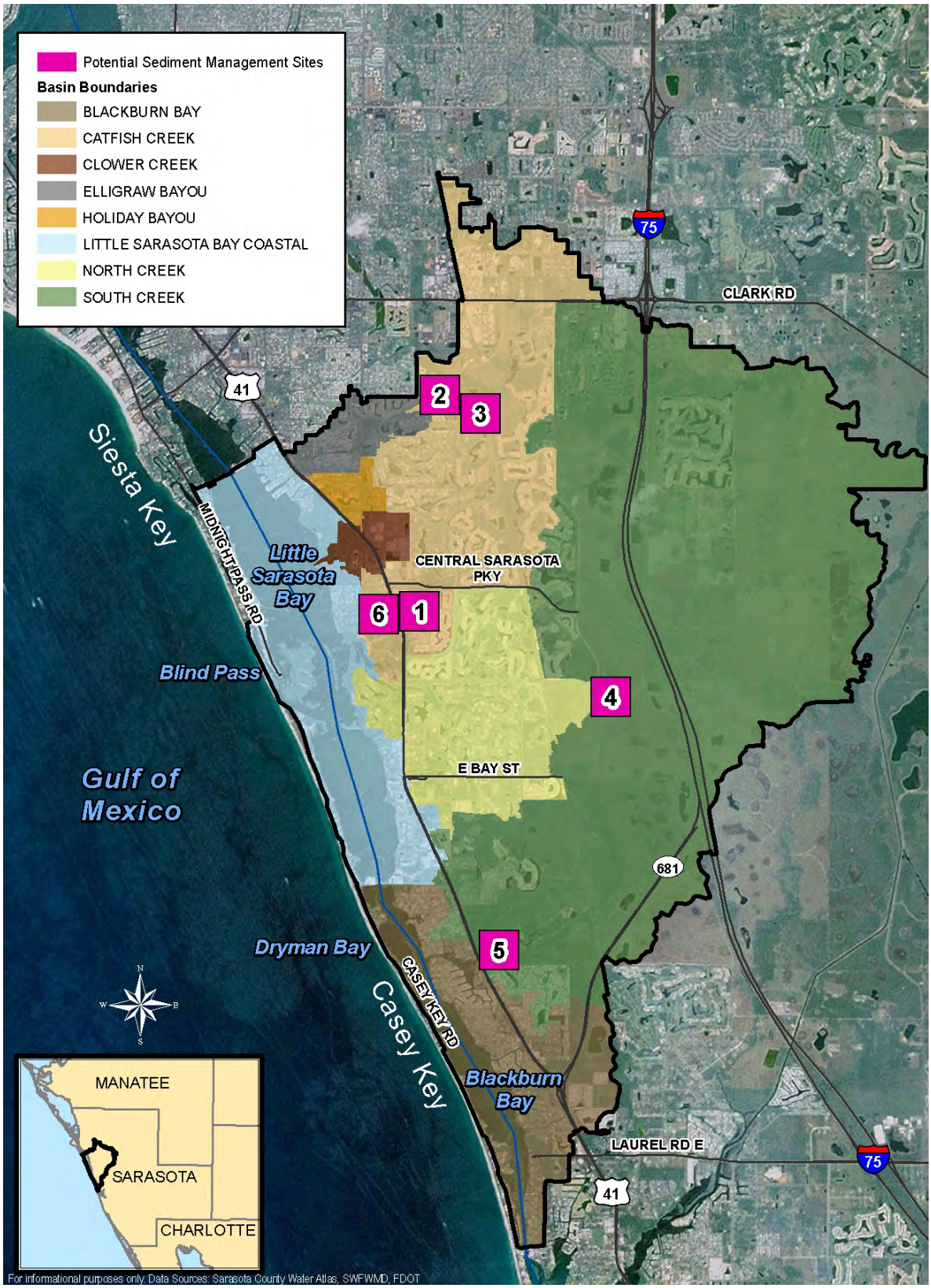

Figure 2-2 Proposed Sediment Management Project Sites

2.1.1.3 Field Investigation

Jones Edmunds visited the proposed sediment improvement sites in April 2011 to characterize the potential project areas and identify and determine potential sediment management options, including general sediment management measures.

3.0 ANALYSIS\RECOMMENDATIONS

The following sections provide investigation summaries and recommendations for the selected project sites as well as program recommendations to help manage sediment in the Little Sarasota Bay Watershed.

3.1 PROJECTS

This section describes the potential sediment management projects.

3.1.1 Site 1 – Catfish Creek at Central Sarasota Parkway

3.1.1.1 GIS Desktop Analysis

Site 1 is in the Catfish Creek basin of the Little Sarasota Bay Watershed on the south side of the Central Sarasota Parkway. Stormwater from a contributing area of approximately 250 acres flows through this portion of the creek and eventually discharges into Little Sarasota Bay. The ICPR schematic shows drop structures from the roadway stormwater system and from a residential development that connect to the creek (Figure 3-1). SIMPLE pollutant-load results show elevated TSS, TN, and TP in the area. This site is located in a County easement. According to the ICPR velocity results, some portions of the stream segment show very high velocities, which are frequently associated with erosion problems.

3.1.1.2 Field Investigation

Site 1 is overgrown with exotic/invasive vegetation. Multiple outfalls from the roadway stormwater system discharge downstream of the Central Sarasota Parkway Bridge. There is sediment accumulation across the entire stream segment and a scour hole on west side of the waterway at the outfall culvert (Figure 3-2).

Figure 3-1 Aerial View of Site 1 (SWFWMD, 2010) with ICPR Schematic

Figure 3-2 Site 1, Facing South from Central Sarasota Parkway

3.1.1.3 Recommendation

Jones Edmunds recommends creating a wetland area by lowering the overbank and replacing exotic/invasive vegetation with native species. Installing riprap reinforced with geofabrics at the multiple outfalls from the roadway system is recommended for stream bank protection.

Summary:

- Create a wetland.
- Remove exotic vegetation.
- Plant native species.

3.1.2 Site 2 – Palmer Ranch Parkway

3.1.2.1 GIS Desktop Analysis

Site 2 is in the Catfish Creek basin at the boundary to the Elligraw Bayou Basin in the Little Sarasota Bay Watershed. Site 2 is a County-owned parcel within the Palmer Ranch Development of Regional Impact (DRI), adjacent to Palmer Ranch Parkway and west of McIntosh Road. (Figure 3-3). This area is classified as a wetland in the NWI. No vegetation is visible along the north bank in the 2010 aerial photography. The sump area of the waterway is murky, has a green tinge, and is overgrown at the outfall.

Although this site is in the Catfish Creek basin, the County ICPR schematic and velocity results show flow from this site to the west and east with the 100-year, 24-hour design storm (Figure 3-4). The conveyance to the east leads to Catfish Creek. Elligraw Bayou is downstream on the west side. The channel flowing into this system from the north has high velocities according to the ICPR results.

Figure 3-3 Aerial View of Site 2 (ESRI, 2010)

Figure 3-4 Site 2 ICPR Schematic

3.1.2.2 Field Investigation

This site is in a well-manicured residential area (Figure 3-5). The water level was shallow and stagnant and had a bad odor, likely from decaying organic material. Heavy vegetation is restricting flow at the culvert on the west side of the waterway. Algae and duckweed were also visible in this area. The grass is mowed to the edge of the waterway on the south side of the residential area. Fertilizer is likely entering the system from the residential area as well.

Figure 3-5 Site 2, Facing East

3.1.2.3 Recommendation

Jones Edmunds recommends adding native plants along the bank adjacent to the entire residential area to capture excess nutrients before they enter the stream system. Design parameters should be re-evaluated to identify components of the system that may not be functioning properly. High velocities shown in the modeling results may be contributing to the erosion potential along the stream segment; installing riprap at this outfall will provide some stream bank protection. The Neighborhood Environmental Stewardship Team (NEST) should provide public education on responsible fertilizer use adjacent to waterbodies to homeowners. The County should also verify that commercial landscape companies working in this area have been certified in accordance with the County ordinance.

Summary:

- Restore bank using riprap at confluences and outfalls.
- Restore wetland using native plants.
- Evaluate pond design parameters.
- Provide public education.

3.1.3 Site 3 – McIntosh near Prosperity Circle

3.1.3.1 GIS Desktop Analysis

Site 3 is in the Catfish Creek basin of the Little Sarasota Bay Watershed. Site 3 is adjacent to McIntosh Road south of Prosperity Circle and is within the Palmer Ranch DRI (Figure 3-6). No owner is listed on the parcel data. There is a depressional area between the pond and Prosperity Circle residences, part of which is classified as wetlands in the NWI. The ICPR model shows minimal discharge from and no inflow to this area, based on a 100-year, 24-hour design storm event. The ICPR schematic shows a drop structure from this area into the pond to the north and overland flow to the east (Figure 3-7). The channel to the east has high velocity according to the ICPR results.

Figure 3-6 Aerial View of Site 3 (ESRI, 2010)

Figure 3-7 Site 3 ICPR Schematic

3.1.3.2 Field Investigation

The pond on the south side of this site is an irrigation pond using reclaimed water (Figure 3-8). The Legacy Trail runs parallel to the east side of the irrigation pond and wetland, dividing this area from a channel/pond system to the east. The wetland portion of this site was partially accessible and appears to be a dehydrated wetland (Figure 3-9). The area is very dry and partially burned and has a large Brazilian Pepper population.

Figure 3-8 Site 3, Facing North

Figure 3-9 Vegetation at Site 3

3.1.3.3 Recommendation

Diverting water from the channel to the west of the Legacy Trail through the wetland would reduce potential erosion and rehydrate the wetland. Further investigation of the site, however, revealed that it is owned by Arielle on Palmer Ranch. Because this property is under private ownership and no other publicly owned parcels were identified adjacent to this system, no project is recommended. Any project recommendations or conceptual plans will require a cooperative agreement between the County and Arielle on Palmer Ranch.

3.1.4 Site 4 – South Creek at Honore Avenue

3.1.4.1 GIS Desktop Analysis

Site 4 is in the South Creek basin of the Little Sarasota Bay Watershed. South Creek at Honore Avenue is within the Palmer Ranch DRI and is owned by Palmer Ranch Holdings, LLC (Figure 3-10). Visible undercutting and erosion in the creek were noted on the initial watershed tour in January 2011 (Figure 3-11). SIMPLE pollutant results do not indicate elevated levels of TSS, TP, or TN.

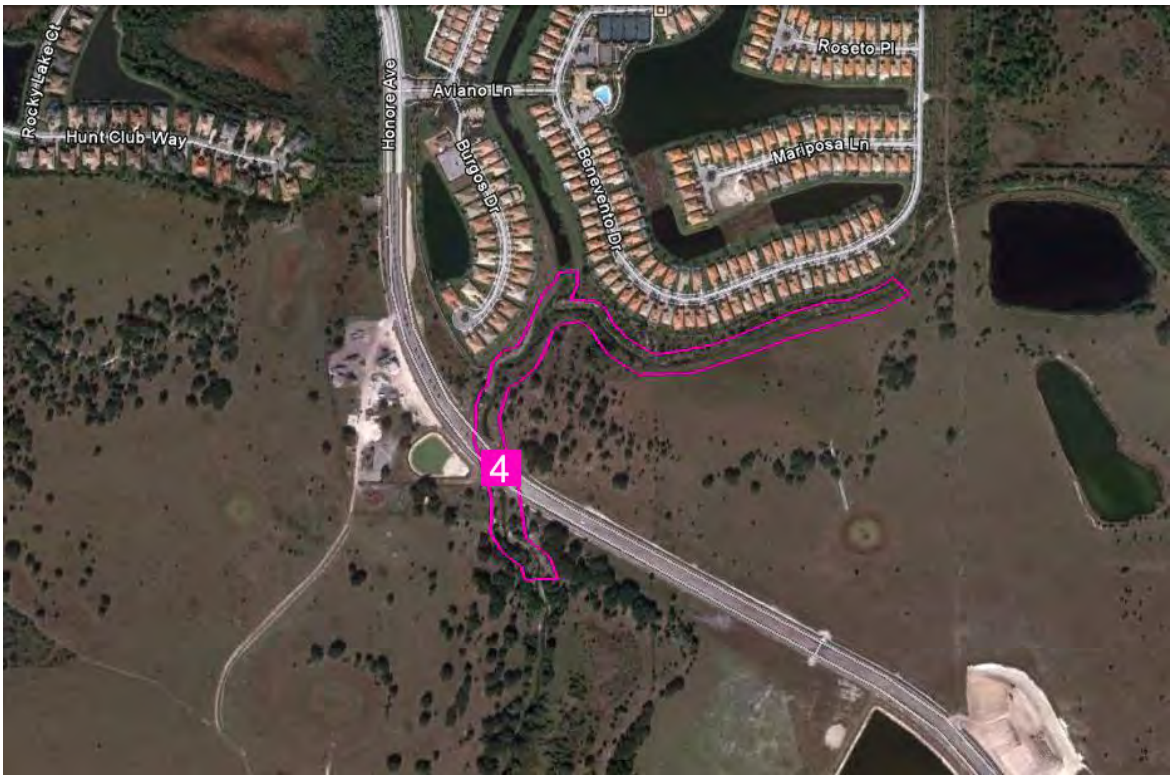

Figure 3-10 Aerial View of Site 3 (Google, 2011)

Figure 3-11 Erosion and Undercutting in South Creek (January 2011)

3.1.4.2 Field Investigation

Sediment accumulation and erosion are visible in South Creek near Honore Avenue (Figure 3-12 and Figure 3-13). There are very steep, sandy, eroded banks beyond the wire cattle fence west of Honore Avenue (Figure 3-14). Vegetation is growing in the sedimented areas within the creek. There is also undercutting, erosion, and sedimented areas with vegetation upstream of Honore Avenue (Figure 3-15).

Figure 3-12 South Creek, Facing West from Honore Avenue

Figure 3-13 Site 3, Facing West toward Honore Avenue

Figure 3-14 Sandy Erosion and Sediment Accumulation Beyond Cattle Fence at Site 3

Figure 3-15 South Creek, Facing East from Honore Avenue

3.1.4.3 Recommendation

The site is within the auspices of the Palmer Ranch Home Owner Association. Any project recommendations or conceptual plans will require a cooperative agreement between the County and the Association. Jones Edmunds recommends discussing the opportunities for bank restoration and stabilization projects with the homeowner association management.

3.1.5 Site 5 – Oscar Scherer State Park

3.1.5.1 GIS Desktop Analysis

Site 5 is in the South Creek basin at the boundary of the Blackburn Bay Coastal basin in the Little Sarasota Bay Watershed (Figure 3-16). Site 5 includes the most downstream portion of South Creek on the east side of Tamiami Trail. There appears to be sediment accumulation in the creek on the east side of Tamiami Trail at Oscar Scherer State Park. SIMPLE pollutant results do not indicate elevated levels of TSS, TP, or TN, and ICPR does not suggest high velocities in this area.

Figure 3-16 Aerial View of Site 5 (SWFWMD, 2010)

3.1.5.2 Field Investigation

No sediment accumulation was visible in the creek at the time of the field visit (Figure 3-17 and Figure 3-18).

Figure 3-17 South Creek at Tamiami Trail Bridge

Figure 3-18 South Creek, Facing East from Tamiami Trail

3.1.5.3 Recommendation

Jones Edmunds did not identify any sediment problems in this area; therefore, no sediment management projects are recommended. Apparently the aerial photograph on which the accumulated sediment was noted was taken at low tide, and what appeared to be accumulated sediment was simply the natural bottom of the tidal creek.

3.1.6 Site 6 – Catfish Creek at Tamiami Trail

3.1.6.1 GIS Desktop Analysis

Site 6 is in the Catfish Creek basin of the Little Sarasota Bay Watershed on the east side of Tamiami Trail. Untreated runoff from Tamiami Trail enters the waterway on the upstream side of the bridge (Figure 3-19). SIMPLE pollutant-load results show elevated TSS, TN, and TP in the area. This site is located in a County easement. According to the ICPR velocity results, some portions of the stream segment show very high velocities, which are frequently associated with erosion problems.

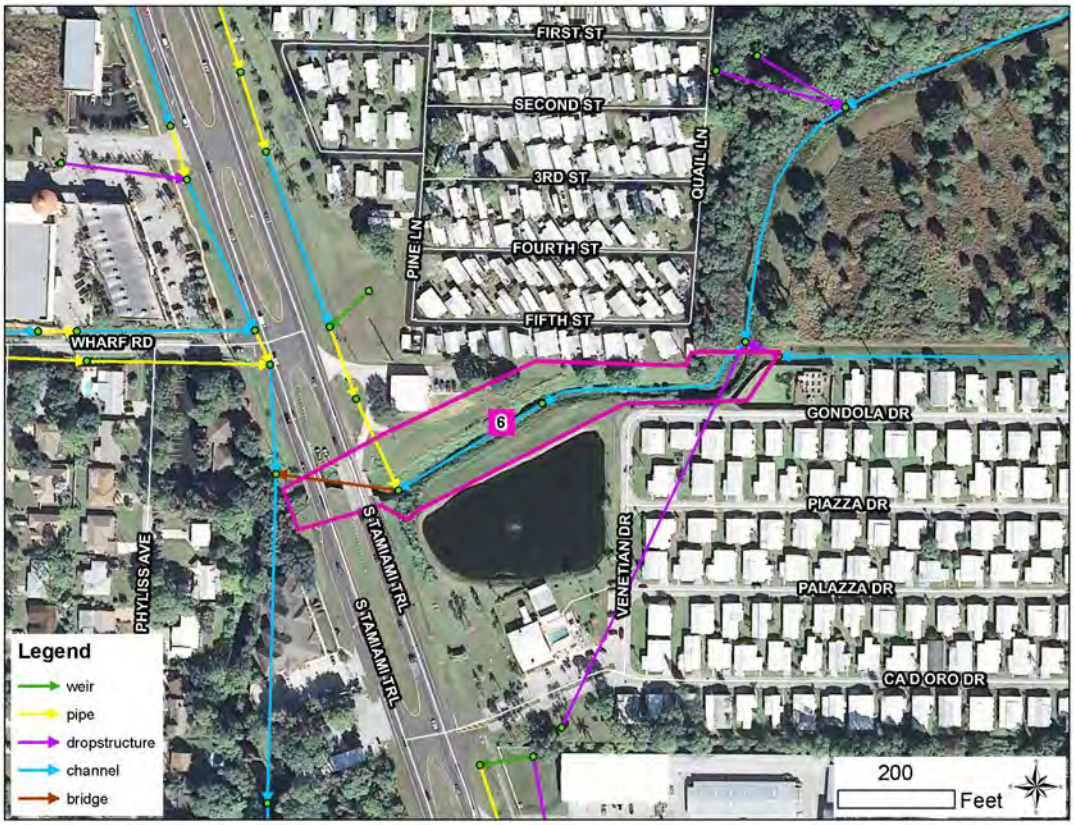

Figure 3-19 Aerial view of Site 1 (SWFWMD, 2010) with ICPR Schematic

3.1.6.2 Field Investigation

Site 6 has eroded stream banks and sediment accumulation (Figure 3-20). The waterway narrows as it approaches and flows under the US 41 Bridge. A fire station is adjacent to the waterway and a pipe discharges from Tamiami Trail (Figure 3-21). There is erosion at the bases of the fire station gutters, and this water runs directly into the waterway (Figure 3-22).

Vegetation on the upstream side of bridge consisted of exotic/invasive species including parrot feather, hydrilla, coontail, and alligator tail (Figure 3-23). Downstream of the bridge was very large bulrush (native) that appeared to be doing well because of the low energy on the downstream side of bridge, which is not consistent with the downstream ICPR velocity results. Sediment is accumulating on the upstream side of the bridge.

Figure 3-20 Site 1, Facing East from Tamiami Trail

Figure 3-21 Site 1, Facing Southwest toward Tamiami Trail

Figure 3-22 Gutters on Fire Station Building

Figure 3-23 Exotic Vegetation at Site 1

3.1.6.3 Recommendation

Jones Edmunds recommends constructing a sediment sump that is accessible for maintenance south of the fire station to catch sediment and pollutants entering the waterway from Tamiami Trail. Removing exotic/invasive species in the stream and bank restoration with native plantings is also advised. Installing riprap at the roadway outfall and upstream of the bridge is also recommended to provide stream bank protection. Adding cisterns to the fire station gutter outfalls will eliminate the erosion from the gutters. In lieu of a cistern, a gutter bubbler system is recommended.

Summary:

- Construct a sediment sump.
- Remove exotic vegetation.
- Plant native species.
- Provide cisterns for fire station.

3.2 GENERAL SEDIMENT MANAGEMENT MEASURES

3.2.1 Geofabrics

3.2.1.1 Description

Geosynthetic fabrics or geofabrics are used to enhance the subgrade and prevent soil erosion without hardening the channel bank. Erosion-control fabrics are available with long and short (biodegradable) life spans to provide permanent protection or to allow vegetation the proper conditions to become established. Non-biodegradable netting underlain by straw or mulch can also be used to allow time for vegetation to develop hearty root systems. Steeper slopes (less than 3:1 (H:V)) may require a geoweb, an additional element for stabilization. A geoweb averages 6 inches deep and contains pockets for soil media to be held in place, which help revegetate the bank and prevent sloughing. Either product can be used individually, but on steep banks using both a geofabric and a geoweb will generally provide a longer-term solution.

3.2.1.2 Recommendation

We recommend installing geofabrics on County projects as appropriate to stabilize channel banks and reduce sedimentation in Little Sarasota Bay.

3.2.2 Soil Amendment

3.2.2.1 Description

Soil amendment is aimed at improving water retention, permeability, infiltration, drainage, and structure of the soil and providing a better environment for root systems. For amendment to be successful, the amendment media needs to be thoroughly mixed into the soil and not just buried. Soil amendment products are organic or inorganic. Common organic amendments are sawdust, wood chips, compost, manure, sphagnum moss, and biosolids. Common inorganic amendments are tire chunks, perlite, and vermiculite. Choosing a soil amendment is site specific, and some of the factors to consider are longevity, pH, texture, and salinity of the soil. Soil amendment does not depend on installing geofabric and may be done independently.

3.2.2.2 Recommendation

The County should evaluate the Composting Pilot Study recommended in the Roberts Bay North Watershed Management Plan (Chapter 8, RBP26) for areas in the Little Sarasota Bay Watershed and implement where applicable. Compost collected during the study should be worked into stream banks that need to be stabilized during routine maintenance by County staff.

An evaluation of the composting study should be completed to determine the most beneficial soil amendment material based on cost, maintenance requirements, and effectiveness of preventing erosion.

3.2.3 Vegetation

3.2.3.1 Description

Planting and recruiting native vegetation with adequate root systems are common practices in bank stabilization. Vegetation protects the soil against erosion by building soil structure. The plants create a more cohesive soil matrix and filter pollutants commonly found in stormwater runoff.

3.2.3.2 Recommendation

Native plant species will provide longer-term erosion control and bank protection and should be planted during regular maintenance or during the construction of new County projects. The appropriate selection of plants during the design phase of a project is essential as fast-growing plants with abundant foliage may impede the flow and reduce the overall flood capacity of a conveyance system. Suggested plantings of upland and wetland plant species for stream/ditch bank stabilization are listed in Table 3-1, and suggested wetland plants for stormwater ponds are listed in Table 3-2. These are general recommendations for plantings.

Table 3-1 Proposed Species for Stream/Ditch Stabilization			
Common Name	Scientific Name	Location	Size
Yaupon holly	*Ilex vomitoria*	Upper side slopes	1 gallon
Dwarf palmetto	*Sabal minor*	Upper side slopes	1 gallon
Knotgrass	*Paspalum vaginatum*	Upper side slopes	1 gallon
Sand cordgrass	*Spartina bakerii*	Upper side slopes	4-inch liner
Cinnamon fern	*Osmunda cinnamomea*	Lower side slopes	1 gallon
Bacopa	*Bacopa spp.*	Lower side slopes	Bare root
Lizards tail	*Saururus cernuss*	Lower side slopes	Bare root

Table 3-2 Proposed Wetland Plant Species for Stormwater Ponds		
Common Name	Scientific Name	Location
Soft rush	*Juncus effuses*	Side slopes
Sand cordgrass	*Spartina bakerii*	Side slopes
Yellow canna	*Canna* sp.	Side slopes
Giant bulrush	*Scirpus californicus*	Pond basin
Pickerelweed	*Pontedaria cordata*	Pond basin
Cow lily	*Nuphar luteum*	Pond basin
Water lily	*Nymphae odorata*	Pond basin

3.2.4 Sediment Sumps

3.2.4.1 Description

Sediment sumps allow coarse-grained suspended solids to settle out of the flow, reducing the sediment load carried downstream. When the sumps are designed in conjunction with a low-flow weir for small storm events, a fraction of the finer-grained sediment will also settle out of the water behind the weir. Properly designed sediment sumps allow suspended sediment to settle out of the flow in a desirable location—one that will not adversely impact the natural system and can be maintained. Detailed design studies of flow rate, particle characteristics, and settling rates will provide optimal location and size of the sump.

3.2.4.2 Recommendation

The County should perform regular maintenance on their sediment sumps. When a sump is filled to 40 to 50% of the original capacity, accumulated sediment should be removed to maintain the design removal efficiency of the BMP.

3.2.5 Monitoring for Constituents of Concern

3.2.5.1 Description

FDEP has developed two levels of guidance to address heavy metal contaminant concentrations in sediment: Effects Levels and Target Cleanup Levels.

Threshold Effect Level (TEL) and Probable Effect Level (PEL) address lower and upper limits for adverse biological effects on aquatic organisms. The TEL represents the upper limit of the range of sediment contaminant concentrations in which no adverse effects on aquatic organisms have been shown through testing and sampling. Within this range, concentrations of sediment-associated contaminants are not considered to represent significant hazards to aquatic organisms (FDEP, 1994). The PEL represents the lower limit of the range of contaminant concentrations that are usually or always associated with adverse biological effects. The concentrations of sediment-associated contaminants are considered to represent significant and immediate hazards to aquatic organisms. Within this range of concentrations, adverse biological effects are possible, but it is difficult to predict the occurrence, nature, and severity of the effects.

Additionally, FDEP developed Soil Cleanup Target Levels (SCTL) to help protect human health from direct exposure to anthropogenically-contaminated soils in residential and commercial settings. Table 3-3 shows the current FDEP guidelines.

Table 3-3 FDEP Guidelines

Metal	SCTL (residential)	SCTL (commercial)	TEL	PEL
	Sediment Contamination (mg/kg)			
Aluminum (Al)	80,000	N/A	N/A	N/A
Antimony (Sb)	27	370	N/A	N/A
Arsenic (As)	2.1	12	7.24	41.6
Barium (Ba)	120	130,000	N/A	N/A
Beryllium (Be)	120	1,400	N/A	N/A
Cadmium (Cd)	82	1,700	0.676	4.21
Chromium Cr)	210	470	52.3	160
Copper (Cu)	150	89,000	18.7	108
Lead (Pb)	400	1,400	30.2	112
Nickel (Ni)	340	35,000	15.9	42.8
Selenium (Se)	440	11,000	N/A	N/A
Silver (Ag)	410	8,200	0.733	1.77
Thallium (Tl)	6.1	150	N/A	N/A
Zinc (Zn)	26,000	630,000	124	271
Mercury (Hg)	3	17	0.13	0.696

3.2.5.2 Recommendation

We recommend monitoring for constituents of concern in areas that have been identified by others as having heavy metal contaminants.

3.2.6 Street Sweeping

3.2.6.1 Description

New technology incorporated into street sweepers has brought about a re-evaluation of the benefits and effectiveness of street sweeping. Vacuum-assisted and regenerative-air sweepers are now able to pick up fine-grained sediments that carry a large portion of the pollutant load. Two distinctive but not mutually exclusive removal rates are cited in the literature: the removal of sediment load and the removal of nutrients associated with the sediment load due to stormwater runoff.

The amount of sediment removed by street sweeping depends on several factors. The intensity of a rainfall event, the length of time between sweeping events, particle size, land use, and the location of the impervious surface (upgradient or downgradient) all contribute to the amount of sediment available for sweeping, the efficiency of sediment removal, and the quantity of sediment removed from the potential sediment load to stormwater runoff. The frequency of sweeping in wet and dry seasons impacts the overall removal rates, and the U.S. Geological Survey (Breault et al., 2005) reports that only a small fraction of the total load is removed unless intensive sweeping programs are implemented. Total sediment load reduction by street sweeping is cited in the literature as 15 to 90% of the potential sediment load to the stormwater system.

3.2.6.2 Recommendation

We recommend street sweeping select areas in the watershed twice per month during the wet season and every 2 months during the dry season to maximize removal of sediment and pollutants between rain events. Based on the hot spot analysis, street sweeping is recommended for the following areas in order of priority:

1. Roadways in the Clower Creek basin.
2. Roadways in the Holiday Bayou basin.
3. Roadways in the northernmost portion of the watershed, including portions of the Catfish Creek and South Creek basins.
4. Roadways in the Little Sarasota Bay Coastal basin.
5. Roadways in the Blackburn Bay Coastal basin.

3.2.7 Maintenance Buffer

3.2.7.1 Description

Buffer zones along watercourses provide important benefits, including water quality improvement, flood protection, bank stabilization, and habitat protection. While most research has focused on forested buffers, the same benefits may be realized in an urban setting. A buffer in an urban setting is typically an area of vegetation consisting of trees, shrubs, and grass designed to:

- Trap and remove sediment, phosphorus, nitrogen, and other nutrients.
- Protect stream banks from erosion by providing hearty root systems to increase the cohesiveness of the soil matrix and reduce the velocity of overland flow.

The width and slope of the buffer zone as well as the sediment size impact the removal efficiency of a buffer zone. Therefore, recommended minimum buffer zone widths vary from 10 feet in existing urbanized areas, to tens or hundreds of feet for new development, to thousands of feet for certain agricultural areas. For example, University of Florida's Institute of Food and Agriculture (IFAS) recommends that individual residential buffer zones should be at least 10 feet. The County's LDR requires a minimum 50-foot vegetated buffer between subdivision development and water bodies and a 30-foot buffer along wetlands on golf courses.

3.2.7.2 Recommendation

We recommend working with residents through NEST or other programs to evaluate areas that could be improved by adding buffer zones. Adding buffers on properties that were developed along waterways before the Land Development Regulations were implemented should be a primary goal. Distributing existing educational materials, such as the County's "Living on the Water's Edge," to waterfront homes is also recommended.

3.2.8 Strategic Maintenance Plan

3.2.8.1 Description

The *Strategic Maintenance Plan*, adopted in 1999, establishes level-of-service (LOS) goals for maintenance activities in the County. The plan identifies maintenance practices and classifies practices into *Routine*, *Extraordinary*, and *Support* activities in which the staff engages for maintenance repairs, improvement, management, and operation of the public stormwater system.

Stormwater maintenance has traditionally played an active role in maintaining the flood capacity of the stormwater system throughout the County. A more robust maintenance program incorporating the recommendations described below will play a larger role in improving the quality of the runoff reaching the estuaries and bays of Sarasota County.

3.2.8.2 Recommendation

Jones Edmunds recommends the following approach to expand and enhance the focus of the stormwater maintenance process to include water quality in addition to flood protection:

- Implement the 1999 Strategic Maintenance Plan.
- Achieve the inspection and maintenance frequency required in the MS4 Permit.
- Update the Strategic Maintenance Plan.
- Adopt practices listed below when fiscally feasible.

Updating the *Strategic Maintenance Plan* and adopting several non-structural BMPs and source-control practices may provide the best opportunities to increase awareness and implement maintenance improvements aimed at improving water quality. The following modifications, additions, or removal of maintenance practices will help the County meet its water quality goals:

- Inspection and Permit Compliance:
  - NPDES Inspection.
  - Asset Management.
- FEMA Community Rating System.
- Facility Maintenance and BMPs:
  - Facilities: Scheduling.
  - Facilities: Denuding Conveyance Features.
  - Non-Structural BMPs: Buffer Zones.
  - Non-Structural and Structural BMPs: LID.
  - Source Control: Street Sweeping.
  - Source Control: Herbicides.
  - Source Control: Fertilizer Management.
  - Source Control: Harvesters.

Jones Edmunds analyzed current maintenance policies and procedures as part of the Roberts Bay North and Lemon Bay Watershed Management Plans (WMPs). The recommendations listed above are detailed in the Roberts Bay North and Lemon Bay WMPs.

3.2.9 Keep Sarasota County Beautiful

3.2.9.1 Description

Keep Sarasota County Beautiful is a County-wide program with a mission to enhance and promote public interest and participation in the general improvement of the environment throughout Sarasota County through education, cleanup programs, recycling, and other methods of reducing solid waste. It is an affiliate of Keep America Beautiful, Inc., a national, non-profit,

public education organization dedicated to improving waste-handling practices in American communities.

3.2.9.2 Recommendation

Litter is one of the most visible stormwater pollution issues in the watershed. Jones Edmunds recommends that the County increase the number of community cleanup projects in the watershed through the Keep Sarasota County Beautiful program. The County should work with homeowner associations and neighborhoods to recruit volunteers and organize educational and cleanup events. The County should also work with marinas to organize boating cleanups.

In addition, Jones Edmunds recommends that the County review dumpster and trashcan locations and handling and inspection procedures. The County should make sure that there are adequate trash receptacles in public areas, especially in marinas, along the waterfront, and near major storm drains, and that they are being properly emptied and maintained.

4.0 CONCLUSION

Three of the potential project sites were deemed viable locations for sediment management projects (Table 4-1). Implementation of these projects and programmatic recommendations will reduce erosion, sediment, and associated pollutant loading and improve water quality in the Little Sarasota Bay Watershed.

Table 4-1 Recommended Sediment Management Projects

ID	Site Name	Recommended
1	Catfish Creek at Central Sarasota Parkway	✓
2	Palmer Ranch Parkway	✓
3	McIntosh near Prosperity Circle	
4	South Creek at Honore Avenue	
5	Oscar Scherer Park	
6	Catfish Creek at Tamiami Trail	✓

Jones Edmunds will calculate pollutant-load reduction, develop conceptual plans and cost estimates, and provide project and program rankings for the selected project sites in Appendix G.