Stormwater Management Element

STORMWATER MANAGEMENT ELEMENT

INTRODUCTION

Coastal communities like Fort Myers Beach must respond to flooding that arises from two different sources. One source is unrelated to rainfall and stormwater; it occurs when the Gulf of Mexico and Estero Bay rise to unusual heights due to strong on-shore winds. Often this type of flooding occurs without rainfall. In contrast to flooding caused by water flowing *up onto* the island, flooding caused by stormwater (the second source) results from a conveyance system which is inadequate to get excess water *off* of the island and into the Gulf or Bay. Most barrier islands have intrinsically good drainage because their narrow width provides short drainage pathways, and also have highly pervious sandy soils. However, the overall drainage process can be stymied because of low relief and slope, with the simple result that there is no place for the water to flow. It is also aggravated by development which has reduced the natural drainage functions.

Disregarding water quality concerns for the moment, typical solutions to stormwater flooding attempt to move larger volumes of stormwater runoff away from roads and buildings at a faster rate, or to store it until a later time when the system can accept flow without flooding. For existing development, this is accomplished by increasing the size of drainage pipes, eliminating obstructions, and cleaning or enlarging ditches.

Unfortunately, these same improved stormwater conveyances will also allow rising water in *from* the Gulf at a faster rate. At the community level, the only effective technical remedy to rising flood water is to dike the island and install one-way valves on the outfalls — an impractical solution for an island of this size. There are however, community activities which can remedy some of the damage. For example, adding dunes to the Gulf side (with pedestrian walk-overs) would provide a form of energy dissipation for onshore waves. Rising water would still flood the island from the Bay side, but wave damage would be reduced. Raising the roads and buildings would also reduce damage and hazards when flooding does occur.

In some respects, stormwater *quality* issues stand in stark contrast to the causes and solutions to stormwater *flooding*. Flood control efforts are designed to prevent stormwater flooding from abnormal storms, such as extreme rainfall that occurs only once every 5, 10, or 25 years. Because of the infrequent nature of these storms, they are of little consequence in stormwater quality. The water quality concern is about pollution carried in numerous small storms. Generally, the west coast of Florida experiences about 100 "storm events" annually. Of these, more than 90 percent produce less than one inch of rainfall. Stormwater treatment technology therefore is geared to treat the runoff from up to a one-inch rainfall, thus providing treatment for 90 percent of the events.

Whereas part of the solution to flooding is to move stormwater as quickly as possible to the Gulf or Bay, several forms of stormwater treatment rely on *slowing* the movement of water to allow solids and metals to settle out, or storing it in depressions and allowing it to soak into the ground. For example, grassed swales provide good treatment for small storms where the depth of water in the swale is small and flow is slowed by vegetation. (After bigger storms, the swales fill up and vegetation becomes less effective in slowing the flow of water.)

The term Best Management Practices (BMP) is used to describe techniques for stormwater management. Structural BMPs are physical devices intended to control the quantity and/or quality of stormwater. A stormwater pond is one example of a structural control. Other BMPs are categorized as source controls, which are designed to control the problem at the source and minimize the need for structural controls. For example, reducing the amount of impervious area results in less runoff. This results in more room in the drainage system for the remaining runoff and results in less water that needs to be treated. Source controls are often the only alternative for built-out communities with little room to install structural controls.

The susceptibility of a community to flooding or water quality problems due to stormwater can be measured by assessing the level of service (LOS) available. For flooding issues, a LOS can be expressed in terms of the degree of roadway flooding and/or the extent of first floor flooding for a given hypothetical storm event. For example, for some communities, a "C" level of roadway service is defined as no more than six inches of water on evacuation routes during the largest one-day rain event expected every 25 years. A 25-year recurring storm means a storm has 1/25 of a chance of occurring during a given year. The current Lee County Comprehensive Plan stormwater management LOS is that *designated evacuation routes shall not be flooded for more than 24 hours by rainfall from a "25-year, 3 day" storm,* and . . . *new development (except widening of existing roads) shall hold excess stormwater to match the predevelopment discharge rates for a "25-year, 3-day storm."* (Note that the definition applies only to flooding which results from rainfall and not to flooding from rising water.)

LOS definitions vary considerably by community. In 1993, a task force consisting of DEP and representatives from each of the water management districts jointly published a recommended set of criteria (*Report to Plan Oversight Committee Stormwater Level of Service Conventions Committee*) for flooding LOS. These recommendations defined level "C" as *standard flood protection*, which means evacuation routes and arterial roadways must be passable during a 100-year flood event, and collector roadways must be passable during a 25-year event.

The same task force also developed standards for water quality. Compared to a flooding LOS, the concept of a water quality LOS is new in the state of Florida. The water quality ranking system promotes land use controls, followed by structural treatment measures, and penalizes untreated discharge from urban areas.

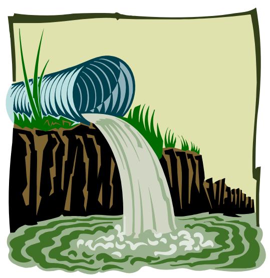
Although this comprehensive plan is not required to have a water quality LOS that must be met to avoid building moratoriums, *new* stormwater discharges must meet standards to be specified in this plan. Available options include adopting the state water quality standards in Chapter 62-25 FAC (formerly 17-25) or adopting those found in Chapter 62-40 (formerly 17-40). The latter standard is ill-defined but much broader, in effect requiring that stormwater be "retained" on-site until it seeps into the ground (instead of "detaining" stormwater for a period and then discharging it in a controlled manner). Stormwater "retention" is highly desirable when sufficient land is available, but it is very difficult to achieve when redeveloping.

REGULATORY ISSUES

The stormwater management policies in the Fort Myers Beach comprehensive plan will be influenced by a variety of federal, state, and regional regulations. For our immediate purposes, the most direct involvement is through Chapter 163.3177(6)(c) of the *Florida Statutes* and Rule 9J-5.011 of the *Florida Administrative Code*. These require that the local comprehensive plan have an element establishing broad and long-term policy guidance for implementing stormwater management throughout the town. Specific management techniques are not contained in these regulations; but through the formal review process, state and regional agencies will ensure that the policies are coordinated with surface water management policy contained in a variety of other plans. The Appendix contains a complete summary of other federal, state, regional and local objectives for management of stormwater and its potential impact on the town of Fort Myers Beach, including the impending implementation of the National Pollutant Discharge Elimination System (NPDES) process.

LOCAL STORMWATER PROBLEMS

While there appears to be very little water quality data collected within the town's corporate boundaries, the regional evaluations for Charlotte Harbor (including Matlacha Pass) provided by Florida Department of Environmental Protection (DEP) are applicable. DEP's 1994 biennial report stated: *"The predominant pollution problems are associated with development: bacteria from accelerated urban runoff through canals[,] and sediments from construction . . . ."*



Water quality in urban canals tends to be poor for a variety of reasons. First, urbanization introduces higher pollutant loads from stormwater runoff. Lawn care adds nutrients, pesticides, herbicides and fungicides to the land, some of which will be broadcast directly into the canals during application, or indirectly carried as stormwater runoff. Stormwater runoff also washes off roadway pollution into the canal systems. Roads collect oil, anti-freeze, brake fluids, petroleum products, brake and tire dust, and combustion products. These residues contain high levels of toxic metals and organic compounds, many of which are attached to solids. In the absence of a stormwater treatment facility for settling and removal, these solids and attached pollutants are washed directly into the Gulf and canal systems. In other cases where the drainage is routed through unvegetated areas such as beaches, high rates of runoff will cause erosion which compounds the problem.

Other impacts from urbanization include direct and indirect discharges of wastes, both domestic and industrial. Septic tanks drainfields contribute pollutants through groundwater seepage into the canals. Local contractors have reported that many discharges still remain from Estero Island homes and businesses despite central sewer service. Because many of these canals are dead-end, circulation is poor and pollutants tend to accumulate in the water column and in the sediments, adversely affecting the flora and fauna with the canal system. Fish kills, increased tissue levels of toxic compounds in fish and shellfish, and reduced productivity and diversity all result from degraded water quality. While there are regulations against causing pollution through direct, or indirect discharges, there are no federal, state, or regional requirements to sample the ambient waters for pollution except when such monitoring is included as a permit condition. Sampling and monitoring of existing conditions must generally be initiated at the local level. In the future, however some monitoring will be required of the town by the stormwater NPDES permit.

The major impediment to better flood control on Estero Island is the lack of available land for structural improvements in the older, northern third of the island where Estero Boulevard frequently floods. Improving flood control in this portion of the island must consider solutions for both coastal flooding due to rising water and for better control of stormwater runoff. For many areas, drainage simply flows overland to the beach, bay or nearest canal. The existing drainage system is largely undocumented, and some facilities are partially buried or otherwise poorly maintained. In the absence of increased maintenance, the performance of the remaining structures will diminish or cease due to siltation. The best opportunity for drainage improvement may consist of identifying and maintaining the existing system, coupled with land-use controls for redevelopment. For improvements to the stormwater quality, source controls should be emphasized and structural controls incorporated wherever possible during retrofits.

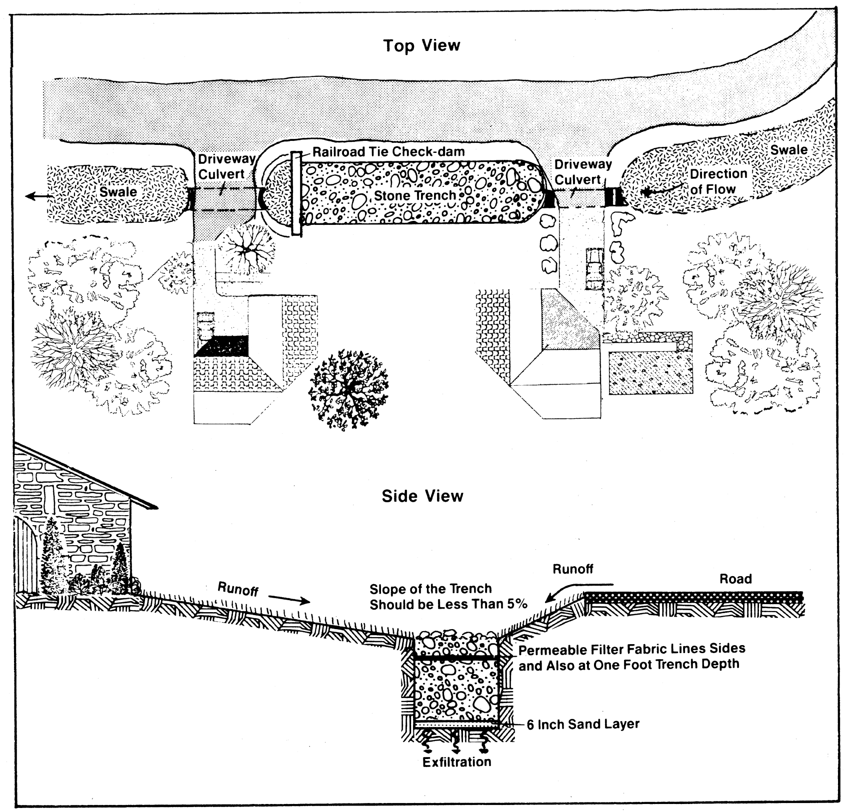
Conditions improve to the south, where drainage facilities are more abundant and better maintained. Properly maintained, these facilities have a life expectancy of 20-50 years. The commercial and multi-family residential developments constructed after the mid 1980s were built to meet the SFWMD requirement that the rate of runoff after development be no greater than before development (for the highest 3-day rainfall total expected every 25 years). Thus, in cases where the development occurred over undisturbed lands, the rate of runoff is equal to the natural rate of runoff.

PLANNING OPTIONS

Coastal Flooding — There are only a few options to reduce the frequency and severity of road and structural flooding resulting from rising water, and they are best addressed during redevelopment. Technical options include installation of flapper-valves on discharge pipe outfalls located above high tide, raising roadways and structures, berming, and flood-proofing structures. While berming is effective at keeping the rising water out, some mechanism (usually pumps) would be required to remove water from within the bermed enclave during heavy storms, and raising of roadways often trades dry evacuation routes for flooded structures. The most cost-effective strategy is to design, build, and redevelop in a manner that will minimize the damage of coastal flooding.

Stormwater Flooding — The performance of the neglected existing drainage facilities could be improved by routine maintenance. Pipes and outfalls should be located, and cleaned. Swales on private property provide some on-site storage and reduce the amount of stormwater that must flow through the conveyance system (see Figure 1). Swales also provide water quality treatment and can recharge the surficial aquifer as additional benefits. In the north of the island, it is likely that many pipes are undersized due to the need to drain increased impervious area which has been added over time. The extent of improvement that can be achieved can be determined with mapping and master planning the drainage of the north end of the island.

***Figure 1**, Residential swale/trench design*



There are a variety of structural techniques for improving stormwater management on small parcels. One is the use of porous pavement, where runoff from a building's roof and heavily used portions of a parking lots flows onto a porous asphalt layer in a less-used portion of the parking lot. The runoff flows through the pores in the asphalt into an underground reservoir of small stones, and then gradually infiltrates into the surrounding soil; it never runs into roadside drainage swales or tidal waters. Figure 2 shows a cross-section of a porous parking lot

Porous pavement is very effective in removing pollutants from stormwater. However, it is less effective when the water table is close to the surface, and probably shouldn't be used along the beach where sand would be regularly blown onto the porous pavement.

Porous pavement can be very cost-effective in commercial areas where soil and other conditions are suitable. While the asphalt itself is more expensive than conventional pavement, porous pavement eliminates the need for stormwater drainage, conveyance, and treatment.

Regular maintenance of porous pavement is essential. Vacuum sweeping and/or jet hosing is needed quarterly to maintain porosity. Field data from actual installations indicate that this routine maintenance is frequently not followed. As a result, a survey of porous pavement installations in Maryland showed that 75% of the systems were partially or totally clogged within five years. The oldest operating porous pavement installations were about ten years old. (Similar failure rates were noted for infiltration facilities, discussed later, that did not have adequate pre-treatment of stormwater.)

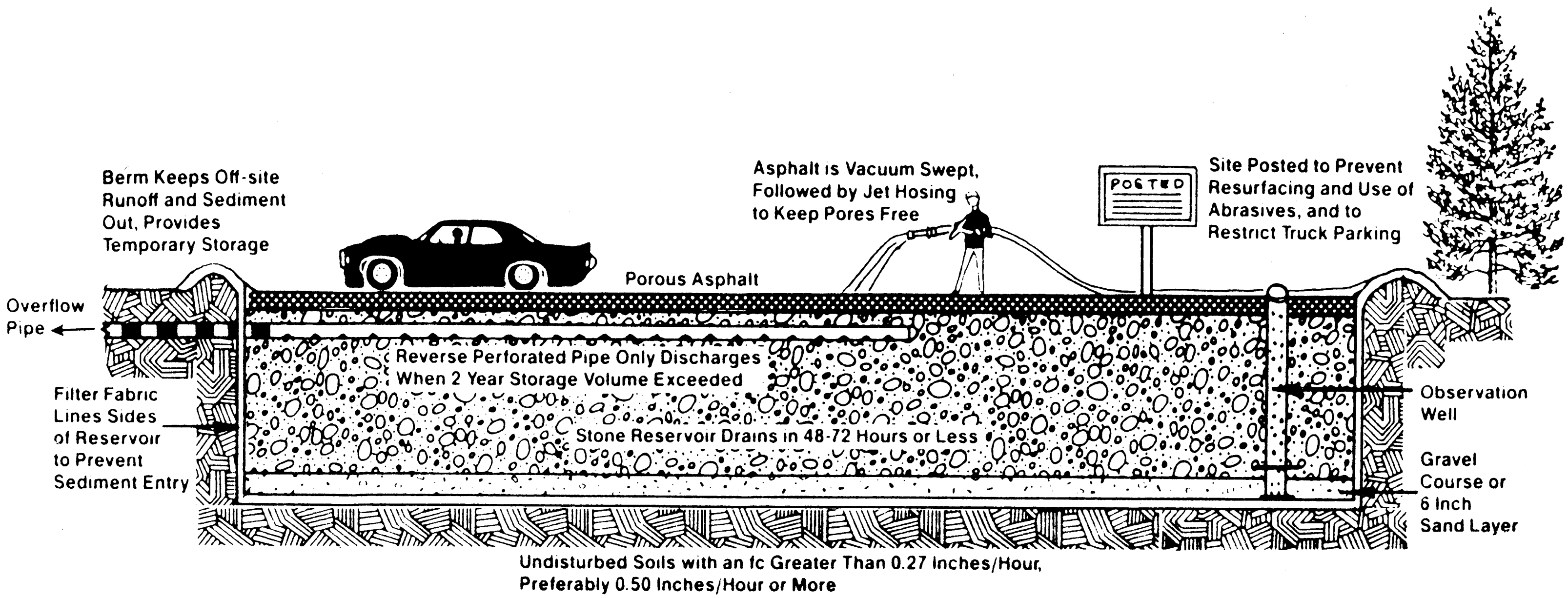


***Figure 2**, Schematic design of a porous pavement system*

Further investigation of the feasibility of porous pavement at Fort Myers Beach is warranted. This would include assessing if the high failure rates in Maryland can be alleviated by better design, inspection, sediment control, and maintenance practices. Also, actual field tests at Fort Myers Beach, with follow-up inspections, would be highly desirable.

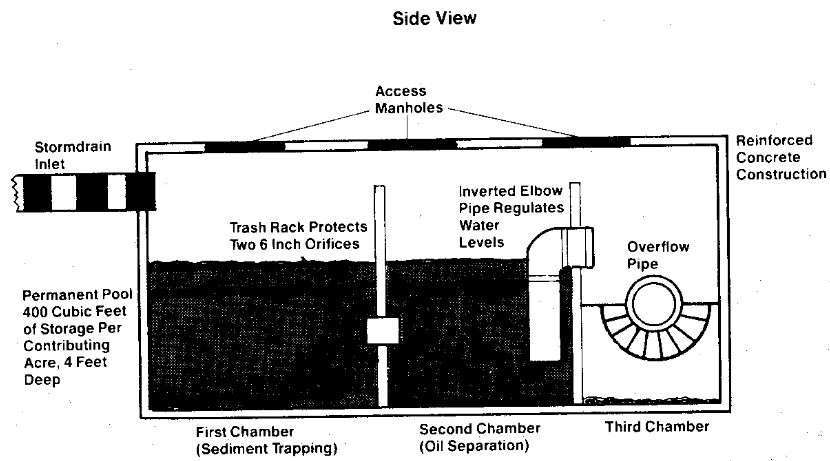
Minimizing impervious area is always a good strategy for both quantity and quality concerns. Another strategy, raising roadways, may improve the roadway flooding LOS, but potentially at the cost of additional off-road flooding of nearby buildings. Despite these limitations, strategies which can effectively minimize impervious area and maximize infiltration will reduce the flooding potential and water quality problems.

Infiltration and exfiltration facilities are also popular in retrofit conditions where useable space is limited. Infiltration trenches are rock-filled ditches which receive stormwater at the top. Exfiltration trenches are similar in design, but stormwater is introduced into the interior of the trench via a pipe which runs through the middle of the trench. (The current improvements to Estero Boulevard include several exfiltration trenches that were installed below the road's pavement between Times Square and the Lani Kai.) Both devices have limited life expectancies unless some form of pretreatment is provided. Application on Estero Island may be further limited by a high water table, which is reported to be at 1.0 foot above sea level with roadway elevations averaging about 3.0-5.0 ft above sea level. For proper operation of this type of facility, a minimum of 2 to 4 feet is recommended below the *bottom* of the trench to seasonal high water. Since the road surface, road bed, and depth of the trench all consume vertical space, exfiltration trenches may not be effective in some locations along Estero Boulevard.

Stormwater Quality — There are several other options available to improve the quality of stormwater runoff:

- Street sweeping or vacuuming is an effective source control to remove sand and floatables (besides making the streets look clean).
- Vegetated swales are also attractive and provide treatment.
- Vegetated buffer strips work in a similar fashion by slowing the rate of flow and allowing the solids to settle. However, being of fixed width, buffer strips are more sensitive to the velocity of runoff and therefore are recommended only for small structures.
- Catch basins could be replaced with "water quality inlets" (baffled concrete tanks for solids and oil separation). As with porous pavement, regular vacuuming and maintenance must be provided to maintain optimal removal rates. A cross-section view of a water quality inlet is provided in Figure 3.

***Figure 3**, Schematic design of a water quality inlet*



Because of existing development on the island, there are limited options for large-scale water quality treatment facilities. There are however, numerous other options available to improve water quality including both structural and source controls which can be evaluated and potentially incorporated into redevelopment plans or master planning efforts. Other examples include:

- minimize or reduce use of lawn chemicals in swales and along a buffer bordering the canals;
- establishing oil recycling facility to reduce illegal dumping of used oil;
- establish a program to locate and eliminate other unwanted or illicit discharges;
- discourage or prohibit discarding of lawn clippings in canals;
- institute a routine inspection/maintenance program for any remaining septic tanks;
- institute leash laws and pet clean-up requirements,
- establish limits on impervious areas and encourage permeable alternatives to impervious surfaces (e.g., wood decks instead of concrete patios etc.);
- encourage the use of slow-release fertilizers;
- encourage natural lawn care instead of chemical control;
- sand filters / enhanced sand filters (similar in function to infiltration trenches, but shallower and with greater surface area).

The advantages and disadvantages of various structural controls are summarized in Table 9-1. (The cross-section diagrams in this element were taken from the same source as Table 9-1 or from *Controlling Urban Runoff: A Practical Manual for Planning and Designing Urban BMPs*, Metropolitan Washington Council of Governments, 1987.)

DESIRABLE COURSES OF ACTION

One task which should be completed by the Town of Fort Myers Beach in the near future is mapping the existing drainage facilities within the town. The mapping should include a description of relic systems (for example, filled swales) that are no longer structurally intact or functioning. The cost of this effort could be reduced greatly with the assistance of knowledgeable volunteers to locate and map the structures and facilities. Professional surveyors would then determine the exact height and capacity of the system.

From the data gathered, an evaluation of the stormwater system's response to a design storm (either SFWMD or a locally derived standard) should be completed under existing conditions and under conditions of a fully maintained and operational system. Depending on the results, a limited-area stormwater master plan should be considered to evaluate options available to achieve the desired level of service for stormwater.

Through the master planning process, the feasibility of drainage options can be evaluated, and the potential for increasing groundwater recharge can be evaluated. For example, it may be that increasing pipe size will have little or no effect because there is insufficient slope in certain areas, and pumps may be the only alternative for improvements.

The stormwater planning process could be phased to priority areas of the island since such an effort is expensive. A complete master plan for the northern third of the island alone might cost $100,000 to $200,000.

Planning for water quality improvements is cost-effectively completed at the same time as the master planning process, although many aspects of source control can be implemented in the absence of the master plan. For example, street sweeping, minimizing herbicide/pesticide use near canals, and establish-

Table 9-1
Comparison of Stormwater Best Management Practices

URBAN BMP OPTIONS	Reliability for Pollutant Removal	Longevity*	Applicability to Most Developments	Regional Concerns	Environmental Concerns	Comparative Costs	Special Considerations
Extended Dry Detention Ponds	Moderate, but not always reliable	20+ years, but frequent clogging and short detention common	Widely applicable	Very few	Possible stream warming and habitat destruction	Lowest cost alternative in size range.	Recommended with design improvements and with the use of micropools and wetlands.
Wet Detention Ponds	Moderate to High	20+ years	Widely applicable	Arid and high ET regions	Possible stream warming, trophic shifts, habitat destruction, safety hazards	Moderate to high compared to conventional stormwater detention	Recommended, with careful site evaluation
Stormwater Wetlands	Moderate to High	20+ years	Space may be limiting	Arid and high ET regions; short growing season	Stream warming, natural wetland alteration	Marginally higher than wet ponds	Recommended
Multiple Pond Systems	Moderate to High; Redundancy increases reliability	20+ years	Many pond options	Arid regions	Selection of appropriate pond option minimizes overall environmental impact.	Most expensive pond option	Recommended
Infiltration Trenches	Presumed moderate	50% failure rate in 5 years	Highly restricted (soils, groundwater, slope, area, sediment input)	Arid and cold regions; sole-source aquifers	Slight risk of groundwater contamination.	Cost-effective on smaller. Rehab costs can be considerable.	Recommended with pretreatment and geotechnical evaluation.
Infiltration Basins	Presumed moderate if working	60-100% failure in 5 years	Highly restricted (see infiltration trench)	Arid and cold regions; sole-source aquifers	Slight risk of groundwater contamination.	Construction cost moderate, but rehab costs high.	Not widely recommended until longevity is improved.
Porous Pavement	High (if working)	75% failure in 5 years	Extremely restricted (traffic, soils, groundwater, slope, area, sediment input)	Cold climate; wind erosion; sole--source aquifers.	Possible ground water impacts; uncontrolled runoff.	Cost-effective compared to conventional asphalt when working properly	Recommended in highly restricted applications with careful construction and effective maintenance
Sand Filters	Moderate to High	20+ years	Applicable (for smaller developments)	Few restrictions	Minor.	Comparatively high construction costs and frequent maintenance.	Recommended, with local demonstration
Grassed Swales	Low to Moderate, but unreliable	20+ years	Low density development and roads	Arid and cold regions	Minor.	Low compared to curb and gutter.	Recommended, with checkdams, as one element of a BMP system.
Vegetated Filter Strips	Unreliable in Urban Setting	Unknown, but may be limited	Restricted to low density areas	Arid and cold regions	Minor.	Low.	Recommended as one element of a BMP system.
Water Quality Inlets	Presumed low	20+ years	small (<2 acres), highly impervious catchments	Few	Resuspension of hydrocarbon loadings. Disposal of hydrocarbon and toxic residuals.	High, compared to trenches and sand filters.	Not currently recommended as a primary BMP option.

* Based on current designs and prevailing maintenance practices.
Source: *A Current Assessment of Urban Best Management Practices, Techniques for Reducing Non-Point Source Pollution in the Coastal Zone*. Metropolitan Washington Council of Governments, 1992.

ing a recycling facility on the island do not impact drainage and can be done independently of a drainage master plan. However, if water quality inlets are used as a means to improve stormwater quality, the flow catchment areas must be incorporated into the placement of the inlets. In most cases, this will be more easily evaluated during a master planning process. As in the case of the drainage goals, all water quality goals should acknowledge the existing constraints to large-scale or regional solutions.

The town should begin to develop a strategy for water quality monitoring in accordance with the commitments made in the NPDES Part 2 application. Although most NPDES requirements should be met through joint programs with Lee County, the town could address its special problems by testing the metal content in canal bottom sediments. This is a cost-effective way to screen for pollutant sources, particularly contaminated urban runoff. The monitoring program would also incorporate visual inspections of exposed outfalls during dry weather when flow is not anticipated. Inexpensive field test kits can be used to assess whether the unexpected flow (if found) is likely to be a wastewater or commercial/industrial source. The results, when coupled with the drainage facilities mapping, can be used to isolate potential sources. Periodic re-testing should be considered (e.g., 3-5 years). A history of sediment results could be used to assess the success of other water quality management strategies.

Grant funds are often available for innovative projects to improve stormwater quality. The town has begun to seek funding for retrofit projects such as installing porous paving in parking lots that are being redeveloped. A request for a $120,000 federal grant is pending before the South Florida Ecosystem Restoration Task Force. Such grants often require a 50% match; this match could be satisfied by the town's stormwater mapping or water quality monitoring programs as described above, or might be met by those initiating the redevelopment activity, or might be met by receiving credit for the previous replacement of asphalt by pervious pavement at Times Square.

Some drainage problems can be addressed through regulatory means. For instance, swimming pools are sometimes emptied directly onto the beach. This can damage sea turtle nests (violating Chapter 370.12, *F.S.*) or cause serious erosion, and may even violate a general prohibition against the discharge of toxic substances contained in Chapter 17-302.500 of the *Florida Administrative Code* because of high levels of chlorine and other chemicals in pool water. At the federal level, the discharge of swimming pool water is recognized as a potential problem in the NPDES permitting process; the presence of chlorine in a stormwater discharge is considered an indicator of an "illicit connection" to the drainage system.

If environmental agencies will not require such discharges to be eliminated, the town could do so itself by ordinance. In those locations where roadside swales have the capacity to accept swimming pool water, it could be discharged there instead of onto the beach. Alternatively, it could be discharged directly into the sewer system, which has ample treatment capacity (although some limits might be required during the peak season).

Funding for master planning, capital improvement projects, or maintenance of existing stormwater facilities can be from general revenue, or gas taxes in some cases, or through a dedicated source such as a stormwater utility as discussed in the next section.

STORMWATER UTILITY

The establishment of the new town government provides certain opportunities that are available to all independent municipalities. One such entity that the town may create is called a "stormwater utility," which provides a specific service, in some ways like a utility that provides drinking water or sewer service. Most of the rain that falls should be treated through an organized drainage system of ditches and pipes that collects, treats, and disposes stormwater runoff. To remain effective, this stormwater system has to be maintained by someone.

In most new developments, a homeowners' association is required to maintain whatever parts of the system are built by the original developer (such as the lakes or shallow "detention" areas). The local government typically maintains other parts of the system, such as ditches and underground pipes that run along the public road system.

When this drainage system also provides drainage for the road itself, this maintenance can be paid for with gasoline taxes. Unfortunately, funding for all other types of stormwater maintenance and improvements has to compete with all other needed government services. The unfortunate result is often neglect. Without a properly maintained drainage system, the quality of stormwater goes down, resulting in higher levels of pollution in the "receiving waters" such as Estero Bay. When a proper drainage system was never installed at all, as is the case with many parts of Fort Myers Beach, pollutant levels in runoff can be very high. Many communities allow such conditions to continue, either through lack of knowledge or a shortage of funds to analyze and improve their situation.

As the problems created by improper stormwater management have become better known, many communities are creating a stormwater utility, a branch of city or county government whose sole purpose is stormwater management. Its funds usually come from a separate fee that is charged to owners of developed property, based on a share of the benefit each will receive from the utility. These fees cannot be used for any other purposes. The base fee is often around $3 per month for a typical home. A fee of this level covers stormwater planning, routine maintenance, and minor improvements to the system. The fee is frequently listed on the water and sewer bill (which is obviously more difficult at Fort Myers Beach since the town doesn't bill for either service).

Monthly billing avoids a large annual payment at tax bill time, and ensures the prompt and regular payments that the public gives to utility companies as a result of their blunt enforcement method—the service shut-off. (Other enforcement methods such as liens can also be used, but their administrative costs are very high relative to the small billing amount.)

The decision to create a stormwater utility can be made at any time, but most often just after certain events have taken place. These include the community accepting that all water pollution cannot be blamed on outsiders, and beginning to understand the nature of their own sources of pollution and the range of potential solutions. Fort Myers Beach is a logical candidate for a stormwater utility because there is a broad awareness of the increasing levels of pollution in the canals and in Estero Bay, along with a strong sentiment towards cleaning up pollution generally. The missing link for citizens to accept a stormwater utility fee is a full understanding of how current practices on Estero Island are contributing to a share of that pollution and what kinds of steps can be taken to improve the quality of stormwater runoff.

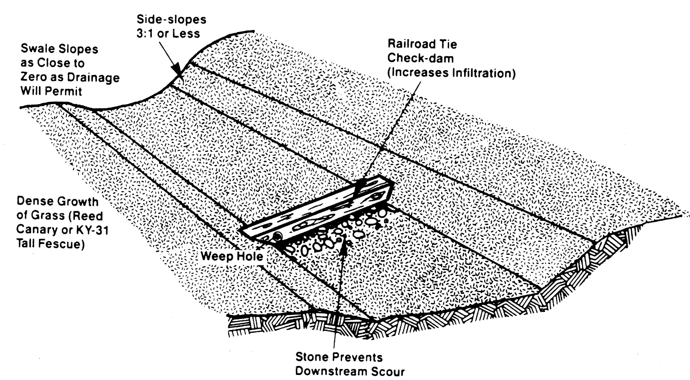


Figure 4, *Enhanced grassed swale*

GOALS - OBJECTIVES - POLICIES

Based on the analysis of stormwater management problems and solutions in this element, the following goals, objectives, and policies are adopted into the Fort Myers Beach Comprehensive Plan:

GOAL 9: To provide optimal flood protection and improved stormwater quality within the constraints imposed by location and existing land-use patterns.

OBJECTIVE 9-A CONTAMINATION — Reduce the level of contamination that occurs as rainfall flows toward tidal waters.

POLICY 9-A-1 Establish, fund, and implement a program to monitor the environmental impacts of stormwater runoff. This monitoring plan shall be designed to ensure that data collected will be useful in leading the town toward pollution-reducing strategies. If appropriate, this program may incorporate any monitoring requirements under the National Pollution Discharge Elimination System.

POLICY 9-A-2 Implement sound management practices to reduce contaminant levels in stormwater, such as:

i. storm drain stenciling to increase public understanding of the water quality impacts of careless drainage practices;
ii. cooperation with Lee County in providing recycling sites for used oil, batteries, unwanted household hazardous wastes, and other recyclable bulk materials;
iii. routine sweeping or vacuuming of streets and parking lots; or
iv. improved litter control in public places.

POLICY 9-A-3 Seek available grant funding and other potential revenue sources to retrofit the existing drainage pattern in redevelopment areas to reduce stormwater contamination.

OBJECTIVE 9-B RECHARGE — Increase groundwater recharge rates by reducing stormwater runoff.

POLICY 9-B-1 Create land development regulations that respond to the town's situation where existing development often was not designed to attenuate stormwater runoff.

POLICY 9-B-2 These regulations shall require improved handling of stormwater when property undergoes major redevelopment through techniques such as:

i. limitations on impervious coverage to improve existing conditions (and meet standards for new development where feasible); and
ii. encouragement of pervious pavement techniques through partial credits against impervious ratios (provided that ongoing maintenance will ensure its continued effectiveness).

POLICY 9-B-3 These regulations shall provide appropriate allowances where imposition of the highest level of stormwater management would hinder other important public policies such as maintaining the pedestrian character of public places or the historic character of designated districts.

OBJECTIVE 9-C EROSION — Reduce erosion caused by stormwater runoff.

POLICY 9-C-1 Reduce erosion from new discharges through techniques such as:

i. discouraging or prohibiting construction of swales that will not be vegetated;
ii. establishing maximum allowable discharge velocities for design storm(s) for new construction and redevelopment; and
iii. prohibiting discharge of stormwater onto beaches.

POLICY 9-C-2 Improve the management of existing conveyances through techniques such as:

i. prohibiting the use of herbicides in vegetated conveyances; and
ii. re-establishing vegetation in barren conveyances.

POLICY 9-C-3 Establish the following priorities for the discharge of swimming pool water, in order to minimize erosion and protect the quality of receiving waters and sea turtle nesting habitat:

i. discharge to roadside swales;
ii. discharge into the public sewer system (within any limits established by Lee County Utilities); and
iii. discharge directly to tidal waters only under extreme conditions and in conformance with all federal, state, and local regulations.

OBJECTIVE 9-D LEVELS OF SERVICE — Maintain interim levels of service for flood protection.

POLICY 9-D-1 Until replaced following the evaluation described under Objective 9-F, interim levels of service are hereby established for protection from flooding to be provided by stormwater and roadway facilities:

i. During a 3-day rainfall accumulation of 13.7 inches or less (3-day, 100-year storm as defined by SFWMD), one lane of evacuation routes should remain passable (defined as less than 6 inches of standing water over the crown). Emergency shelters and essential services should not be flooded.
ii. During a 3-day rainfall accumulation of 11.7 inches or less (3-day, 25-year storm as defined by SFWMD), all lanes of evacuation routes should remain passable. Emergency shelters and essential services should not be flooded.
iii. During coastal flooding of up to 4.0 feet above mean sea level, all lanes of evacuation routes should remain passable. Emergency shelters should not be flooded.

POLICY 9-D-2 The town will enforce these levels of service under the concurrency requirements of Florida law by requiring one of the following before issuance of development permits:

i. development orders or building permits will be issued subject to the condition that, at the time of the issuance of a certificate of occupancy, the necessary facilities and services must be in place and available to serve the development being authorized; or
ii. at the time development orders or building permits are issued, the necessary facilities and services are guaranteed to be in

place and available to serve the development at the time of issuance of a certificate of occupancy through an enforceable development agreement pursuant to Section 163.3220, *Florida Statutes*, or through an agreement or development order pursuant to Chapter 380, *Florida Statutes*.

POLICY 9-D-3 Identify by 1999 any emergency shelters and portions of evacuation routes subject to flooding during coastal flooding of 4.0, 5.0, and 6.0 feet above mean sea level.

POLICY 9-D-4 Identify options to improve flood-prone emergency shelters and evacuation routes, including but not limited to:

i. raising the elevation of low-lying roads;
ii. berming/diking/elevating shelter facilities; and
iii. installing flap-valves on stormwater discharges where appropriate.

POLICY 9-D-5 The quality of water to be discharged from new surface water management systems is and shall remain subject to state and regional permitting programs that determine compliance with state water quality standards. Stormwater management systems in new private and public developments (excluding improvements to existing roads) shall be designed to SFWMD standards (to detain or retain excess stormwater to match the predevelopment discharge rate for the 25-year, 3-day storm). Stormwater discharges from development must meet relevant water quality and surface water management standards as set forth in Chapters 17-3, 17-40, and 17-302, and rule 40E-4, *F.A.C.* New developments shall be designed to avoid increased flooding of surrounding areas.

OBJECTIVE 9-E PRELIMINARY DRAINAGE STUDY — Identify by 2009 all existing drainage facilities and poorly drained areas.

POLICY 9-E-1 Undertake a thorough effort to map all existing drainage facilities, including modern stormwater management systems, roadside swales, and remnants of systems that may no longer function. Use citizen volunteers to reduce the cost of this effort.

POLICY 9-E-2 Identify significant existing drainage problem areas through logs of citizen complaints and a public outreach effort.

POLICY 9-E-3 Identify any existing facilities that need immediate repair or replacement.

POLICY 9-E-4 Identify any partially submerged stormwater outfalls that could be retrofitted with grates to prevent manatees from entering the drainage system.

OBJECTIVE 9-F STORMWATER MASTER PLAN — Evaluate by 2010 the need to improve public stormwater management facilities.

POLICY 9-F-1 This evaluation shall determine the nature of potential improvements to the existing stormwater system to improve drainage and to reduce the level of contaminants running off into tidal waters.

POLICY 9-F-2 This evaluation shall include studies and/or models as needed to determine the capacity of existing facilities if they were fully maintained.

POLICY 9-F-3 This evaluation shall also be based on the initial results of the monitoring program, the inventory of existing facilities, the potential for improving drainage and water quality, the potential effects of future development, and the potential cost of the improvements.

POLICY 9-F-4 This evaluation shall determine what kind of improvements might better protect life and property against flooding from extreme tides and tropical storms.

POLICY 9-F-5 The interim levels of service shall be re-examined if any instances occur where they cannot be maintained.

POLICY 9-F-6 The Town Council shall establish a funding source within two additional years to begin carrying out the selected stormwater improvements. This funding source may include revenue from gas taxes, ad valorem collections, stormwater utility fees, or other recurring sources.

STORMWATER MANAGEMENT APPENDIX
FEDERAL, STATE, REGIONAL
& LOCAL OBJECTIVES

Federal - The major objectives for EPA related to stormwater are included in the 1987 amendments to the Clean Water Act, and promulgated as regulations in the November 16, 1990, Federal Register. EPA has issued a National Pollutant Discharge Elimination System (NPDES) permit to Lee County and its co-applicants, with common and separate requirements for each municipality. The major objectives of the stormwater NPDES program pertinent to the Town of Fort Myers Beach are:

- eliminate non-stormwater discharges to the storm sewer system; and
- reduce pollutants discharged from municipal separate storm sewer systems (MS4s) to the maximum extent practicable (MEP).

Non-stormwater discharges, referred to as illicit connections or illegal dumping, are expressly prohibited from discharging to the storm sewer system, and a condition of the stormwater permit addresses the detection and removal of illicit connections.

Reducing pollutants to the MEP standards is not defined in the regulations. The permit conditions, which incorporate parts of the original application, completely define MEP. These conditions require the implementation of many different pollution reduction programs rather than impose numeric discharge limitations. Program elements that have been identified for municipalities include some or all of the following:

- Ordinances
- Toxic Materials Handling
- Maintenance
- Litter Control
- Monitoring
- Intergov. Agreements
- Street Sweeping
- Construction
- Public Education
- Stenciling Inlets
- Solid Waste Programs
- Illicit Connection Removal
- Stormwater Planning
- Road Repair

One of the program elements which is required as a permit condition is some form of water quality monitoring. The purposes of the monitoring are varied: to provide more detailed seasonal information for the estimation of pollutant loading from stormwater outfalls; to provide ambient sampling to show water quality improvements resulting from the implementation of the permit programs; and to provide information on the performance of best management practices.

State - Although there are many state regulatory agencies, the objectives of the State Water Resource Implementation Rule (Rule 62-40, *F.A.C.*) are the most pertinent because of the linkage to the development of local comprehensive plans. The State Water Policy is provided for the stated purpose of the management of the waters of the state "to conserve and protect the natural resources and scenic beauty" and to "realize the full beneficial use" of these resources. The intent of the Rule is to clarify the policies of Chapters 187, 373 and 403, FS, and to provide guidance to the Department of Environmental Protection and water management districts in the development of programs, rules, and plans.

First, §62-40.110, Declaration and Intent, requires that local governments consider the State Water Resource Implementation Rule in the development of comprehensive plans. This means that in the preparation of goals, objectives, and policies for the protection or enhancement of surface water quality, the provisions of the State Water Resource Implementation Rule must be considered. §62-40.432 provides specific surface water protection and management goals and guidelines. The first subsection defines five goals for surface water management:

- protect, preserve and restore the quality, quantity and environmental values of water resources;
- maintain the pre-development characteristics of a site; reduce channel erosion, pollution, siltation, sedimentation and flooding; reduce stormwater pollutant loadings to preserve/restore beneficial uses; to reduce freshwater losses by encouraging reuse; to improve stormwater recharge; to maintain estuarine salinity; and to address stormwater management on a watershed basis;
- eliminate the discharge of stormwater that has not been adequately treated and to minimize adverse impacts of such stormwater;
- reduce unacceptable pollutant loadings from older stormwater management systems (constructed before 1982); and
- develop comprehensive watershed management plans to prevent flooding and water quality problems as well as to improve existing conditions.

§62-40-432(3) describes the roles of the state, water management district, and local government in relationship to the State Comprehensive Plan, the Local Government Comprehensive Planning and Land Development Act, and the SWIM (Surface Water Improvement and Management) program. Issues which are to be considered for the issuance of surface water permits are identified in §62-40.432(4), and minimum stormwater treatment performance standards are identified in §62-40.432(5). Of particular interest regarding performance standards, the rule states that stormwater management systems must be designed to achieve at least 95 percent reduction of the average annual load of pollutants in Outstanding Florida Waters such as Estero Bay. These minimum standards may be modified based upon a basin-specific plan to achieve pollution loading reduction goals set by the water management districts.

Regional - On a regional basis, the South Florida Water Management District (SFWMD) is responsible for the protection and preservation of the areas water resources. Chapter 373, *Florida Statutes*, provides the enabling legislation under which the Water Management Districts operate. Mandates from Chapter 373 related to water quality include:

- cooperate with DEP in the collection of data;
- establish minimum flows and levels for ground and surface waters; and
- establish surface water improvement and management plans and programs to protect and restore water quality, habitat, recreation, and commercial uses of priority water bodies; and provide assistance to local governments to establish programs to address water quality and habitat issues.

All changes to surface water drainage within the Town of Fort Myers Beach will be regulated on the regional level by SFWMD regulations found in 40E-40 and 40E-41 FAC.

Local - In accordance with Chapter 163, *Florida Statutes*, Lee County adopted a comprehensive plan in 1989 which has been amended several times before becoming the interim comprehensive plan for Fort Myers Beach. The current plan has been examined for policies that should be retained in the new comprehensive plan.