SOUTH FLORIDA WATER MANAGEMENT DISTRICT

M E M O R A N D U M

TO: Environmental Resource Regulation Permit Review Staff

FROM: Robert M. Brown, Director, Environmental Resource Regulation Dept.

DATE: November 12, 2009

SUBJECT: Environmental Resource Permit Water Quality Evaluations for Discharges to Water Bodies that Do Not Meet State Water Quality Standards

This memo is an update to a previous memo dated June 11, 2004 regarding application of existing District rules in the evaluation of permit applications for projects which ultimately discharge to water bodies that do not meet state water quality standards. Such waters include, but are not limited to, "impaired waters" identified on the state's "Verified List" of impaired waters or has a state adopted Total Maximum Daily Load (TMDL). There may also be other water bodies that do not meet state water quality standards, but which have not yet gone through the formal state assessment process.

What is an "impaired water"?

An impaired water is a water body for which a water body assessment has been done using the methodology established by the Department of Environmental Protection (DEP) in 62-303, F.A.C. or other state adopted TMDL, and a determination has been made that the water body does not meet water quality standards and is impaired.

In accordance with the rule, DEP is continually evaluating water quality data for water bodies around the state (on a watershed planning group basis) to "verify" those water bodies that are impaired due to discharges of pollutants. Water bodies that have been assessed and determined to be impaired due to pollutant discharges are included on the "Verified List" adopted by DEP Secretarial Order. Water bodies on the "Verified List" can be determined from DEP's web site. The next step in restoration of these listed waters is the development of "Total Maximum Daily Loads" (TMDLs) by DEP and, ultimately, a Basin Management Action Plan (BMAP) to specify the activities, schedule and funding sources that point and non-point source discharges will undertake to restore the water body.

Relationship between "impaired waters" and District water quality rules

The DEP's impaired waters rule does not limit the applicability of existing rules and criteria under other provisions of Florida law. Consequently, the District must continue to implement its existing rules to ensure non-degradation of Outstanding Florida Waters (OFWs) and prevent further degradation of impaired waters, or other water bodies that do not meet state water quality standards, as a result of new stormwater discharges.

This memorandum highlights the requirements in the existing District Environmental Resource Permit (ERP) rules to meet water quality criteria. While the existing rules require an applicant to provide reasonable assurance to demonstrate that a proposed project will not degrade an OFW and will not contribute causative pollutants to an impaired water body, they do not provide design or operational criteria for the types of additional measures to be incorporated into a project design to provide the requisite reasonable assurance.

Staff is working with DEP, the other water management districts, and a Technical Advisory Committee on development of a proposed unified statewide stormwater rule to provide updated water quality criteria, concentrating on nutrient load reduction, and to provide consistent water quality protection throughout the state. In the interim, this memorandum provides guidance on the types of additional measures which may be considered, on a project by project basis, as necessary to provide reasonable assurance that a project will not degrade an OFW and will not contribute additional causative pollutants to an impaired water body or other water body that does not meet state water quality standards.

Existing ERP Water Quality Requirements and Evaluation

Although Section 5.0 Water Quality Criteria in the Basis of Review (BOR) contains the standard water quality design requirements for an ERP, they are not the only water quality requirements in the BOR. There are other sections of the BOR that must also be considered when determining the amount of water quality treatment and types of source control (i.e. best management practices) that need to be provided to protect a specific water body. The design requirements in Section 5 need to be applied in conjunction with the water quality requirements in Section 4.0 Environmental Criteria.

While it is recognized that additional levels of protection are required when projects discharge to OFWs, many are not aware that the District's BOR also requires additional protective measures if ambient water quality for a particular site doesn't meet state standards. The technical information supporting the Verified List demonstrates that the impaired waters on the List constitute a category of water bodies which require such additional protective measures. The Verified List is the starting point for identifying water bodies which require additional protective measures, but there may be other water bodies that do not meet water quality standards and also require such protective measures. Staff may review available data concerning the water quality in the water body including the technical information supporting the Verified Lists, information provided by the applicant or from any other source to determine whether water quality standards are being met.

Section 5.1 and 4.1.1(c) of the BOR require that projects be designed and operated so that off-site discharges will meet state water quality standards, including compliance with the anti-degradation provisions applicable to OFWs. Section 5.9.1 specifies a more detailed evaluation by the District staff for new developments which outfall to sensitive receiving waters. Such sensitive receiving waters include all OFWs as well as other water bodies specifically named in the rule.

Section 4.2.4 states:

> "…an applicant must provide reasonable assurance that the regulated activity will not violate water quality standards..."
>
> "Reasonable assurance….must be provided both for short term (during construction) and long term (during operation). The following requirements are in addition to the water quality requirements found in section five of this Basis of Review." (emphasis added)

In cases where a project is discharging to a water body that does not meet standards (i.e. an impaired water body or other water body that does not meet water quality standards), Section 4.2.4.5 requires that:

> "…the applicant must demonstrate that the proposed activity will not contribute to the existing violation."

Section 4.2.4.5 also states, "If the proposed activity will contribute to the existing violation, mitigation may be proposed as described in subsection 4.3.1.4."

Section 373.414(1)(a)3, F.S.
In addition, where the applicant is unable to meet water quality standards because existing ambient water quality does not meet standards, Section 373.414(1)(a)3, F.S. states that the Governing Board shall:

> "consider mitigation measures proposed by the applicant that cause net improvement of the water quality in the receiving body of water for those parameters which do not meet standards."

Required Analysis

In order to demonstrate that the proposed activities will not contribute to an existing impairment of a water body, will not degrade an OFW, or will provide a "net improvement," an applicant should provide reasonable assurance based on site specific information to demonstrate that discharges of the parameter or parameters which have caused the impairment do not have the potential to cause or contribute to water quality violations in the basin. This demonstration may be accomplished through the use of a site specific water quality evaluation.

Additional Source Controls, Best Management Practices and Other Protective Measures

Historically, the standard approach taken by applicants to provide such reasonable assurance for discharges to OFWs has been to provide an additional 50% water quality treatment. In light of the antidegradation requirements for OFWs and impaired waters applicants are encouraged to incorporate additional source controls, Best Management Practices (BMPs) and other protective measures in order to assist in providing reasonable assurance that the proposed activities will not contribute to an existing violation of water quality standards.

It is frequently desirable that stormwater treatment systems be designed in series as part of a BMP treatment train to increase the pollutant removal efficiency of the overall system. However, treatment efficiencies of BMPs in series must account for the reduced loading transferred to subsequent downstream treatment devices as well as irreducible concentrations of certain pollutants. After treatment occurs in the first system, a load reduction has occurred, which is a function of the type of treatment provided. After migrating through the initial treatment system, the remaining load consists of pollutant mass which was not removed in the initial system. This mass is then acted upon by the second treatment system with an efficiency associated with the particular type of BMP used until the irreducible concentration level is met.

When treatment systems are used in series, and a continuous model of the treatment systems is not used, the efficiency of the overall treatment train can be calculated using the following equation.

$$\textit{Treatment Train Efficiency} = Eff_1 + [(1 - Eff_1) \times Eff_2]$$

If using this equation, particular attention must be paid to the treatment efficiency used for each downstream BMP to account for the diminishing "treatability" of stormwater as concentrations are reduced.

In addition to the extra 50% treatment volume for discharges to OFWs, impaired waters or other water bodies that do not meet water quality standards, the following is a list of options that applicants are encouraged to incorporate when evaluating a particular permit application that discharges to OFWs, impaired waters or other water bodies that do not meet water quality standards. A combination of these or other protective measures should be incorporated based on the specific project, water body, and pollutant causing or contributing to the impairment of a water body that does not meet state water quality standards or that might degrade an OFW.

- Stormwater pollution prevention plan (SWPPP) for construction activities resulting in greater than 1 acre of land clearing, soil disturbance, excavation, or deposition of dredge material. The plan should be prepared in accordance with good engineering practices and should identify the potential sources of pollution that may reasonable be expected to affect the quality of stormwater discharge associated with the construction activity. (See attachment 1 for an example plan)
- Post-construction pollution prevention plan to be submitted as part of the permit application, which provides details of controls and practices to be implemented after construction is completed to reduce or eliminate the generation and accumulation of potential stormwater runoff contaminants at or near their source. A post construction pollution prevention plan should include plans for surface water management system operation and maintenance, nutrient and pesticide management, solid waste management, and/or animal/livestock waste storage and disposal, if applicable. Records of maintenance, operation and inspection should be kept by the permittee and should be available for inspection and copying by the District staff upon request. (See attachment 2 for an example plan)
- Increased average wet season hydraulic residence time of wet detention ponds to at least 21 days using a maximum depth of 12 feet from the control elevation to calculate the residence time.

- Source controls can include reduced turf coverage; native landscape plantings; stormwater harvesting and recycling; rooftop runoff management and recycling; pervious pavement (see attachment 3 for suggested procedures); and vegetated non-turf buffers around detention/retention ponds.
- Stormwater conveyance and pretreatment BMPs can include filter strips; vegetated stormwater inlets; vegetated swales; sediment trap structures such as baffle boxes; and dry retention or detention pretreatment.
- Stormwater treatment system enhancements can include the use of on-site created wetlands in a treatment train as a polishing cell after primary treatment; detention ponds with littoral berms, settling basins or phyto-zones within the detention areas; planted wetland filter marshes just upstream of project outfall structures; detention ponds with increased effective treatment time by use of internal levees and/or berms and/or location of inflow and outflow structures to increase the flow path distance.

The above list of additional protective measures are the types of source and structural controls to be considered in the evaluation of whether an applicant has provided reasonable assurance to demonstrate that a proposed activity will not degrade an OFW, or in the case of an impaired water or water body that does not meet water quality standards, will not contribute to a violation of the water quality standard. Such evaluation must take into consideration the particular water quality standard which is not being met in the water body and whether the proposed project will contribute to the continued violation. The above list of additional protective measures is not considered exhaustive, but is provided for guidance purposes. Applicants may propose other protective measures and provide the necessary detailed documentation to demonstrate reasonable assurance that water quality standards will be met during construction and during long term operation.

In cases where ambient water quality does not meet state standards (e.g. impaired waters or other water bodies that do not meet water quality standards) and it is determined that the proposed activity will contribute to the violation (e.g., the water body is impaired for nutrients and the proposed project will discharge an increased nutrient load), Section 373.414(1)(a)3, F.S. and the BOR Section 4.3.1.4 include provisions for water quality mitigation. Water quality mitigation can be accomplished in a variety of ways. The typical concept would be to provide water quality enhancement (e.g., net improvement) through implementation of a water quality treatment system or retrofit of an area that currently discharges untreated stormwater runoff to the same receiving body as the proposed project. The type of land use, runoff rates, removal efficiencies and the pollutants expected from the mitigation area all would have to be compared to the proposed activity to make sure the proposed mitigation is sufficient to cause a net improvement in the receiving waters. Any areas used for off-site treatment must include a perpetual easement over the off-site treatment area.

Cumulative Impacts

The concept of cumulative impacts does not just apply to wetland impacts. BOR Section 4.2.8 requires that impacts to water quality as set forth in 4.1.1(c) be evaluated. The proposed activity, in conjunction with future projects, must not result in a violation of state water quality standards. If, as described in the paragraph above, water quality mitigation measures are designed to result in a net improvement to the receiving water

body (which by definition would mean in the same hydrologic basin), the project will not cause unacceptable adverse water quality cumulative impacts in the drainage basin.

Monitoring

Section 5.9.1(b) of the BOR states that WQ monitoring will be required if the project discharges to a sensitive receiving body and the applicant is unable to provide adequate assurance that degradation of the receiving body will not occur. Based on our long term experience with current water management system designs, we have not routinely required permit-level water quality monitoring. However, on a project by project basis there may still need to be water quality monitoring conditions incorporated in some permits depending on such factors as project type, proximity to the OFW or impaired water, and water quality treatment system design.

Consult with your supervisor and/or technical manager as you encounter project specific questions regarding application of the District's water quality monitoring requirements.

Attachments: Example Construction Pollution Prevention Plan
Example Post-Construction Pollution Prevention Plan
Draft Pervious Pavement Guidance Memorandum

CONSTRUCTION POLLUTION PREVENTION PLAN
for

SITE DESCRIPTION			
Project Name and Location: (Latitude, Longitude, or Address)		Owner Name and Address:	
Description: (Purpose and Types of Soil Disturbing Activities)			

Construction in this project will generally consist of site clearing, lake excavation, and construction of roadways, utility infrastructure, golf course, and multi-use vertical construction.

Soil disturbing activities will include: clearing and grubbing, installing a stabilized construction entrance, perimeter berming and other erosion and sediment controls; grading; excavation for the storm water management lake, storm sewer, utilities, and building foundations; construction of curb and gutter, road, and parking areas; and preparation for final planting, sodding, seeding and mulching.

Runoff Coefficient:	
Site Area:	)

Sequence of Major Activities:

The order of activities will be as follows:

1. Installation of stabilized construction entrance.
1. Partial clearing and grubbing.
1. Install perimeter berm(s) or silt fences with straw bale barrier(s) adjacent to wetland areas.
1. Continue clearing and grading.
1. Construction storm water management lakes
1. Stockpile excavated soil.
1. Stabilize denuded areas and stockpiles within 21 days of last construction activity in that area.
1. Install utilities, storm sewer, curb and gutter.
9. Complete grading, subgrade and base course construction.
9. Complete final paving.
9. Complete landscape grading and install permanent seeding and plantings.
9. When all construction activity is complete and the site is stabilized, remove temporary earth berms, straw bale barriers and filter fences and re-seed any areas disturbed by their removal.

Name of Receiving Waters:	

CONTROLS

Erosion and Sediment Controls

Stabilization Practices

Temporary Stabilization: Top soil stock piles and disturbed portions of the site where construction activity temporarily cease for at least 21 days will be stabilized with temporary seed and mulch no later than 14 days from the last construction activity in that area. The seed shall be Bahia, millet, rye, or other fast-growing grasses. Prior to seeding, fertilizer or agricultural limestone shall be applied to each area to be temporarily stabilized. After seeding, each area shall be mulched with the mulch disked into place. Areas of the site which will be paved will be temporarily stabilized by applying limerock subgrade until bituminous pavement can be applied.

Permanent Stabilization: Disturbed portions of the site, where construction activities permanently cease, shall be stabilized with sod, seed and mulch, landscaping, and/or other equivalent stabilization measures (e.g., rip-rap, geotextiles) no later than 14 days after the date of the last construction activity. The sod shall typically be Floratam or Bahia sod. Prior to seeding, fertilizer or agricultural limestone shall be applied to each area to be temporarily stabilized. After seeding, each area shall be mulched with the mulch disked into place.

CONTROLS (Continued)

Structural Practices

Silt Fence / Straw Bale Barrier - will be constructed along those areas of the project that border adjacent wetlands. At a minimum, the silt fence and/or straw bale barrier will be placed along all wetland buffers and all Corps of Engineers jurisdictional wetland boundaries.

Straw Bale Drop Inlet Sediment Filter - will be placed around all constructed storm drain inlets immediately upon completion of construction and shall remain in-place until the contributing drainage area is stabilized. Alternatively, grate inlets can be covered with filter fabric material until stabilization.

Storm Water Management

The project will utilize a system of lakes to provide the required water quality treatment and attenuation. Discharges from the water management system will be regulated by a series of water control structures. These control structures will be used to maintain water levels in the detention facilities that will maintain or restore the hydroperiod in the wetlands and flowways. The water control structures will also be used to restrict the discharges from the project as described above. Dry pre-treatment will be provided for the golf course maintenance facilities and commercial parking lot runoff prior to discharge into the lake system.

Spreader swales will be used at appropriate locations to disperse flow and dissipate energy of runoff into wetlands. Spreader swales will also be used at appropriate locations to disperse flows discharged from the water management system into receiving flowways. Spreader swales will be heavily planted with native vegetation to help buffer the transition from the manmade lakes to the natural systems.

DISCHARGE RATES

OTHER CONTROLS

Waste disposal:

Waste Materials:

All waste materials will be collected and stored in a trash dumpster which will meet all local and State solid waste management regulations. All trash and construction debris from the site will be deposited in this dumpster. The dumpster will be emptied as required due to use and/or State and local regulations, with the trash disposed of at the appropriate landfill operation. No construction waste materials will be buried onsite. All personnel will be instructed regarding the correct procedure for waste disposal. Notices stating these practices will be posted in the construction office trailer.

Hazardous Waste:

All hazardous waste materials will be disposed of in the manner specified by local or State regulation or by the manufacturer. Site personnel will be instructed in these practices.

Sanitary Waste:

All sanitary waste will be collected from the portable units by a local, licensed, City of Fort Myers sanitary waste management contractor, as required by local regulation.

Offsite Vehicle Tracking:

A stabilized construction entrance has been provided to help reduce vehicle tracking of sediments. As they are completed, paved streets will be swept as needed to remove any excess muck, dirt, or rock tracked from the site. Dump trucks hauling material from the construction site will be covered with a tarpaulin.

TIMING OF CONTROLS/MEASURES

Installation of hay bail / silt fence barriers (around wetlands) and stabilized construction entrance will be constructed prior to extensive clearing or grading of any other portions of the site. Areas where construction activity temporarily ceases for more than 21 days will be stabilized with a temporary seed and mulch within 14 days of the last disturbance. Once construction activity ceases permanently in an area, that area will be stabilized with permanent sod, seed and mulch, landscaping, and/or other equivalent stabilization measures (e.g., rip-rap, geotextiles). After the entire site is stabilized, the silt fence / straw bale barriers can be removed.

CERTIFICATION OF COMPLIANCE WITH FEDERAL, STATE, AND LOCAL REGULATIONS

The storm water pollution prevention plan reflects the United States Environmental Protection Agency and the South Florida Water Management District (SFWWD) requirements for storm water management and erosion and sediment control, as established in the Chapter 40E-4 FAC and Chapter 373 FS.

MAINTENANCE/INSPECTION PROCEDURES

Erosion and Sediment Control Inspection and Maintenance Practices

These are the inspection and maintenance practices that will be used to maintain erosion and sediment controls.

- All control measures will be inspected at least once each week and following any storm event of 0.5 inches or greater.
- All measures will be maintained in good working order; if a repair is necessary, it shall be corrected as soon as possible, but in no case later than 7 days after the inspection.
- Built up sediment will be removed from silt fence when it has reached one-half the height of the fence.
- Silt fence will be inspected for depth of sediment, tears, to see if the fabric is securely attached to the fence posts, and to see that the fence posts are firmly in the ground.
- Temporary seeding and permanent sodding and planting will be inspected for bare spots, washouts, and healthy growth.
- A maintenance inspection report will be made after each inspection. A copy of the report form to be completed by the inspector is attached.
- The Owner will appoint one individual who will be responsible for inspections, maintenance and repair activities, and for completing the inspection and maintenance reports.
- Personnel selected for inspection and maintenance responsibilities will receive training from the site superintendent. They will be trained in all the inspection and maintenance practices necessary for keeping the erosion and sediment controls used onsite in good working order.

Non-Storm Water Discharge

It is expected that the following non-storm water discharges will occur from the site during the construction period:

- Water from water line flushings.
- Pavement wash waters (when no spills or leaks of toxic or hazardous materials have occurred).
- Uncontaminated groundwater (from dewatering excavation).
- All non-storm water discharges will be directed to the storm water management facilities prior to discharge.

INVENTORY FOR POLLUTION PREVENTION PLAN

The materials or substances listed below are expected to be present onsite during construction:

- Concrete
- Detergents
- Paints (enamel and latex)
- Metal Studs
- Asphalt
- Roofing Shingles
- Fertilizers
- Petroleum Based Products
- Cleaning Solvents
- Wood
- Masonry Block
- Clay or concrete bricks

SPILL PREVENTION

Material Management Practices

The following are the materials management practices that will be used to reduce the risk of spills or other accidental exposure of materials and substances to storm water runoff.

Good Housekeeping:

The following good housekeeping practices will be followed onsite during the construction project:

- An effort will be made to store only enough product required to do the job.
- All materials stored onsite will be stored in a neat, orderly manner in their appropriate containers, and if possible, under a roof or other enclosure.
- Products will be kept in their original containers with the original manufacturer's label.
- Substances will not be mixed with one another unless recommended by the manufacturer.
- Whenever possible, all of a product will be used up before disposing of the container.
- Manufacturers' recommendations for proper use and disposal will be followed.
- The site superintendent will inspect to ensure proper use and disposal of materials onsite.

Hazardous Products:

These practices are used to reduce the risks associated with hazardous materials:

- Products will be kept in original containers unless they are not resealable.
- Original labels and material safety data will be retained; they contain important product information.
- If surplus product must be disposed of, manufacturers' or local and State recommended methods for proper disposal will be followed.

Product Specific Practices

The following produce specific practices will be followed onsite:

Petroleum Products:

All onsite vehicles will be monitored for leaks and receive regular preventive maintenance to reduce the chance of leakage. Petroleum products will be stored in tightly sealed containers which will be clearly labeled. Any asphalt substances used onsite will be applied in accordance with the manufacturer's recommendations and standard construction practices.

Fertilizers:

Fertilizers will be applied only in the minimum amounts recommended by the manufacturer. Once applied, fertilizer will be worked into the soil to limit exposure to storm water. Storage will be in a covered shed. The contents of any partially used bags of fertilizer will be transferred to a sealable plastic bin to avoid spills.

Paints:

All containers will be tightly sealed and stored when not required for use. Excess paint will not be discharged to the storm sewer system but will be properly disposed of according to manufacturers' instructions and/or state and local regulations.

SPILL PREVENTION (Continued)

Spill Control Practices

In addition to the good housekeeping and material management practices discussed in the previous sections of this plan, the following practices will be followed for spill prevention and cleanup.

- Manufacturers' recommended methods for spill cleanup will be clearly posted and site personnel will be made aware of the procedures and the location of the information and cleanup supplies.
- Materials and equipment necessary for spill cleanup will be kept in the material storage area onsite. Equipment and materials will include--but not be limited to--rags, gloves, goggles, kitty litter, sand, and plastic and metal trash containers specifically for this purpose.
- All spills will be cleaned up as soon as possible after discovery.
- The spill area will be kept well ventilated and personnel will wear appropriate protective clothing to prevent injury from contact with a hazardous substance.
- Spills of toxic or hazardous material will be reported to the appropriate state or local government agency, regardless of the size.
- The spill prevention plan will be adjusted to include measures to prevent this type of spill from reoccurring and how to clean up the spill if there is another one. A description of the spill, what caused it, and the cleanup measures will also be included.
- The Contractor's site superintendent will be responsible for the day-to-day site operations and will be the spill prevention and cleanup coordinator. He will designate at least two other site personnel who will receive spill prevention and cleanup training. These individuals will each become responsible for a particular phase of prevention and cleanup. The names of responsible spill personnel will be posted in the material storage area and in the office trailer onsite.

POLLUTION PREVENTION PLAN CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signed: _____

Print Name:_____

Title:_____

Date:_____

CONTRACTOR'S CERTIFICATION

I certify under penalty of law that I understand the terms and conditions of the general National Pollutant Discharge Elimination System (NPDES) permit that authorizes the storm water discharges associated with industrial activity from the construction site identified as part of this certification.

Signature	For	Responsible for
_____ Date:_____ _____ Date:_____ _____ Date:_____ _____ Date:_____		

CONSTRUCTION POLLUTION PREVENTION PLAN
for

Inspection And Maintenance Report Form

(To be completed every 7 days and within 24 hours of a rainfall event of 0.5 inches or more)

INSPECTOR: _____ DATE: _____

INSPECTOR'S QUALIFICATIONS:

_____

_____

Days since last rainfall: _____ Amount of last rainfall _____ inches

STABILIZATION MEASURES

Area	Date Since Last Disturbed	Date of Next Disturbance	Stabilized? (yes / no)	Stabilized With	Condition

Stabilized required:

_____

_____

To be performed by: _____ on or before: _____

CONSTRUCTION POLLUTION PREVENTION PLAN
for

Inspection And Maintenance Report Form

Structural Controls

DATE: _____

SILT FENCE / STRAW BALE BARRIER

From	To	Is Silt Fence / Straw Bale Barrier in place?	Is there evidence of washout or over-topping?

Maintenance required for silt fence / straw bale barrier:

_____

_____

_____

To be performed by: _____ on or before: _____

CONSTRUCTION POLLUTION PREVENTION PLAN
for

Inspection And Maintenance Report Form

Structural Controls

DATE: _____

EARTHEN PERIMETER BERM

From	To	Is berm stabilized ?	Is there evidence of washout or over-topping?

Maintenance required for perimeter berm:

_____

_____

To be performed by: _____ on or before: _____

CONSTRUCTION POLLUTION PREVENTION PLAN
for

Inspection And Maintenance Report Form

CHANGES REQUIRED TO THE POLLUTION PREVENTION PLAN:

REASONS FOR CHANGES:

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signature Date

Post-Construction Pollution Prevention Plan

1.0 Introduction

This document provides details of the Urban Stormwater Management Program for the (Project Name) in (location). This Plan discusses non-structural controls, intended to improve the quality of stormwater runoff by reducing the generation and accumulation of potential stormwater runoff contaminants at or near the respective sources for each constituent, along with significant structural components of the primary stormwater treatment system. Although many of the methodologies and procedures outlined in this document are general Best Management Practices (BMP's) which can be useful in attenuating pollutants in many types of urbanized settings, the implementation of these practices has been optimized, to the maximum extent possible, to reflect the unique character of the (Project name) and the surrounding hydrologic features.

Pollution prevention guidelines are provided for the areas of (1) nutrient and pesticide management; (2) street sweeping; (3) solid waste management; (4) operation and maintenance of the stormwater management and treatment system; (5) routine water quality testing; and (6) construction activities. A discussion of each of these activities is given in the following sections.

2.0 Nutrient and Pesticide Management

Nutrient and pesticide management consists of a series of practices designed to manage the use of fertilizers and pesticides so as to minimize loss of these compounds into stormwater runoff and the resulting water quality impacts on adjacent waterbodies. Implementation of a management plan will also maximize the effectiveness of the nutrients and pesticides that are applied.

Each homeowner must commit themselves to the practice of responsible and careful landscape design and maintenance of each lot to prevent contamination of surface waters. The guidelines included in this section are intended to help homeowners make educated environmental choices regarding the maintenance of individual yards within the community. These maintenance and management guidelines are meant to promote an attractive neighborhood that preserves the health of adjacent waterways and environmental features.

2.1 General Requirements

A landscape plan must be developed for each residence. The plan must be comprehensive in nature and follow the landscape design guidelines established by the Homeowners Association and must promote revegetation of each lot as quickly as possible.

Commercial applicators of chemical lawn products must register with the Homeowners Association annually and provide a copy of their current occupational license, proof of business liability insurance, and proof of compliance with applicable education and licensing requirements. Individual employees working under the direction of a licensed commercial applicator are exempt from the educational requirements.

Only registered commercial applicators and individual lot owners are permitted to apply chemicals within the property on a private lot. All chemical products must be used in accordance with the manufacturer's recommendations. The application of any chemical product within five (5) feet of any surface water including but not limited to ponds, lakes, drainage ditches or canals, is prohibited. The use of any chemical product in a manner that will allow airborne or waterborne entry of such products into surface water is prohibited. This rule shall not apply to the use of chemical agents, by certified lake management specialists, for the control of algae and vegetation within the stormwater lakes or ponds.

2.2 Nutrient Management Program

Management and application of nutrients and fertilizers in the (Project Name) will adhere to the following guidelines:

A. All fertilizers shall be stored in a dry storage area protected from rainfall and ponding.
B. No fertilizer containing in excess of 2% phosphate/phosphorus (P_2O_5) per guaranteed analysis label (as defined by Chapter 576, Florida Statutes) shall be applied to turf grass unless justified by a soil test.
C. Fertilizer containing in excess of 2% phosphate/phosphorus (P_2O_5) per guaranteed analysis label shall not be applied within 5 feet of the edge of water or within 5 feet of a drainage facility.
D. All fertilizer shall be applied such that spreading of fertilizer on all impervious surfaces is minimized.
E. Liquid fertilizers containing in excess of 2% phosphate/phosphorus (P_2O_5) per guaranteed analysis label shall not be applied thorough an irrigation system within 10 feet of the edge of water or within 10 feet of a drainage facility.
F. Liquid fertilizers containing in excess of 2% phosphate/phosphorus (P_2O_5) per guaranteed analysis label shall not be applied through high or medium mist application or directed spray application within 10 feet of the edge of water or within 10 feet of a drainage facility.

2.3 Pest Management Program

Proper maintenance of plants and turf areas will minimize the ability of pests to successfully attack landscaping. Several general guidelines follow:

A. Apply fertilizer and water only when needed and in moderate amounts. Excessive amounts of either can cause rapid growth that is attractive to insects and disease.
B. Mow St. Augustine grass to a height of 3-4 inches. If cut shorter, the plants may become stressed and more vulnerable to pest infestation. Each mowing should remove no more than one-third of the leaf blade, and those cuttings should remain on the lawn to decompose.
C. It is recommended that pesticides, fungicides, and herbicides be used only in response to a specific problem and in the manner and amount recommended by the manufacturer to address the specific problem. Broad application of

pesticides, fungicides and herbicides as a preventative measure is strongly discouraged.

The use of pesticides, fungicides, or herbicides is limited to products that meet the following criteria:

A. Must be consistent with the USDA-NRCS Soil Rating for Selecting Pesticides
B. Must have the minimum potential for leaching into groundwater or loss from runoff
C. Products must be EPA-approved
D. The half-life of products used shall not exceed seventy (70) days

3.0 Street Sweeping

This practice involves sweeping and vacuuming the primary streets to remove dry weather accumulation of pollutants, especially particulate matter, before wash-off of these pollutants can occur during a storm event. This practice reduces the potential for pollution impacts on receiving waterbodies by removing particulate matter and associated chemical constituents. Although street cleaning operations are frequently conducted primarily for aesthetic purposes, the primary objective of the street sweeping program for the (Project Name) is to improve the quality of stormwater runoff generated from impervious traffic areas. Street sweeping activities can be particularly effective during periods of high leaf fall by removing solid leaf material and the associated nutrient loadings from roadside areas where they could easily become transported within stormwater flow.

Street sweeping operations will be performed in the (Project Name) at a minimum frequency of one event every other month. A licensed vendor using a vacuum-type sweeping device will perform all street sweeping activities. Sweeping activities during each event will include all primary street surfaces. Disposal of the collected solid residual will be the responsibility of the street sweeping vendor.

4.0 Solid Waste Management

In general, solid waste management involves issues related to the management and handling of urban refuse, litter and leaves that will minimize the impact of these constituents as water pollutants.

Maintenance of adequate sanitary facilities for temporarily storing refuse on private premises prior to collection is considered the responsibility of the individual homeowner. Local requirements for refuse collection will be brought to the attention of every homeowner at closing for the sale of the property. Information will be distributed as necessary stating specifications for containers, separation of waste by type, where to place containers prior to collection, and established collection schedules.

Fallen tree leaves and other vegetation, along with grass clippings, may become direct water pollutants when they are allowed to accumulate in swales and street gutters. All homeowners will receive periodic educational materials that address proper disposal of leaves and other vegetation to minimize water quality impacts.

5.0 Stormwater Management and Treatment System

The stormwater management system for the (Project Name) is designed to maximize the attenuation of stormwater generated pollutants prior to discharge to the off-site wetland systems. Operational details and maintenance requirements of the various system components are given in the following sections.

5.1 Wet Detention Lakes and Lake Interconnect Pipes

The basic element of the stormwater management system consists of a series of interconnected wet detention ponds that provide stormwater treatment through a variety of physical, biological, and chemical processes. A wet detention pond acts similar to a natural lake by temporarily detaining stormwater runoff, allowing opportunities for treatment processes to occur, prior to slow controlled discharge of the treated water through the outfall structure. Pollutant removal processes in wet detention systems occur during the quiescent period between storm events. Significant removal processes include gravity settling of particulate matter; biological uptake of nutrients and other ions by aquatic plants, algae and microorganisms; along with natural chemical flocculation and complexation processes.

Maintenance of the wet detention ponds will consist of an annual inspection. During each annual inspection, the following items will be reviewed and corrected as necessary:

A. Inspect the outfall structure and orifices to ensure free-flowing conditions and overall engineering stability of the outfall system.
B. Review the banks of the lakes and canals to ensure proper side slope stabilization and inspect for signs of excessive seepage that may indicate areas of excessive groundwater flow and possible subsurface channeling.
C. Physically evaluate each of the lakes and canals for evidence of excessive sediment accumulation or erosion.
D. Inspect the planted aquatic vegetation in the littoral zone to ensure that the desired vegetation species, percent coverage, and density are maintained.

At the completion of the inspections, a written inspection report will be prepared, listing any deficiencies that need to be addressed or corrected by the Homeowners Association.

5.2 Stormwater Inlets, Pipes and Culverts

The grates should be unobstructed and the bottom, inside the inlet, should be clean. Check for any accumulation of sediment, trash such as garbage bags, or debris in the culverts connecting these inlets. Flushing out with a high-pressure hose may clean some sediment. Any noted blockage (due to a possible obstruction, or broken pipe, etc.) should prompt further investigation. Crushed or corroded culverts should be replaced with new ones of the same size.

5.3 Swales and Grassed Water Storage Areas

These provide for conveyance and/or above-ground (or surface) storage of stormwater. With age, these areas usually fill in with vegetation and sediment. Swales may need to be regraded and/or revegetated. It is a good idea to compare the existing slope and dimensions of the swale with the permitted design plans prior to the removal of excess sediment or regrading. Areas that show erosion should be stabilized with appropriate material such as sod, planting, rock, sand bags, or other synthetic geotextile material.

Regular mowing of grass swales is essential. These areas also improve water quality by catching sediment and assimilating nutrients, and recharge the underground water table. Remove any undesirable exotic vegetation. Culverts underneath driveways should be checked for blockage, and, if necessary, flushed with a high-pressure hose. After a storm, swales may remain wet for an extended period of time. This is normal and the water will recede gradually.

5.4 Ditches or Canals

Fill material, yard waste, clippings and vegetation, sediment, trash, appliances, garbage bags, shopping carts, tires, cars, etc. should be completely removed. Also check to make sure there are no dead trees or any type of obstructions which could block the drainage flow way.

Maintenance cleaning/excavation must be limited to the same depth, width and side slope as approved in the current permit. Making a ditch deeper or wider may trigger a need for a permit modification. Provisions must also be made to prevent any downstream silting or turbidity *(Contact the SFWMD Resource Compliance staff if you are unsure or need clarification.)* Be sure to dispose of all removed material properly so it won't affect any other water storage or conveyance system, environmental area, or another owner's property.

5.5 Outfall Structure (aka the Discharge Control Structure or Weir)

The outfall structure should be routinely inspected to determine if any obstructions are present or repairs are needed. Trash or vegetation impeding water flow through the structure should be removed. The structure should have a "baffle" or trash collector to prevent flow blockage and also hold back any floating oils from moving downstream. Elevations and dimensions should be verified annually with all current permit information. Periodic inspections should then be regularly conducted to make sure these structures maintain the proper water levels and the ability to discharge.

5.6 Earthen Embankments (Dikes and Berms)

Check for proper elevations, width and stabilization. Worn down berms - especially if used by all-terrain vehicles or equestrian traffic – and rainfall – created washouts should be immediately repaired, compacted and re-vegetated.

6.0 Water Quality Testing

To ensure proper operation of the overall treatment system, monitoring will be performed at one outfall (SW-1) from the (Project Name) if there is a flow over the weirs. According to the proposed Water Quality Monitoring Plan, monitoring may occur 3 times a year, once during the dry season (February/March) and twice during the wet season (August/September). A manual grab sample will be collected at the SW-1 outfall location and analyzed for various constituents and parameters as described in the Surface Water Quality Monitoring Plan. Trained and certified personnel will perform sample collection and laboratory analysis. The results of the laboratory analyses will be submitted to South Florida Water Management District as part of an annual water quality monitoring report by December 31 of each year.

7.0 Construction Activities

A Stormwater Pollution Prevention Plan (SWPPP) has been prepared for construction activities to minimize activities contamination that may be caused by erosion and sedimentation during the construction process. The plan includes provisions related to soil stabilization, structural erosion controls, waste collection disposal, offsite vehicle tracking, spill prevention and maintenance and inspection procedures. A copy of the SWPPP is attached hereto and made a part of hereof.

DRAFT

M E M O R A N D U M

TO: Environmental Resource Permit Review and Compliance Staff
Environmental Resource Regulation Department

THROUGH: Tony Waterhouse, P.E.
Deputy Director, Environmental Resource Regulation Department

FROM: Damon Meiers, P.E.
Director, Stormwater Improvement Division

DATE: Date ?????????

SUBJECT: **Guidance Regarding the Use of Pervious Pavement Systems as Part of Environmental Resource Permit Applications**

The intent of this memorandum is to provide guidance for staff in reviewing Environmental Resource Permit (ERP) applications that include the proposed use of pervious pavement systems. In the past, the water quality or quantity performance of these systems has not been incorporated into the permit application calculations because there were not sufficient reasonable assurances to address issues pertaining to parent soil compaction, proper construction specifications and maintenance concerns. As a result their efficacy in Florida and the potential benefits were historically not well established. However, during the last few years, independent research and analysis of these systems has better quantified the ability of these systems to percolate stormwater and identified practices and specifications to address the previous concerns.

The use of pervious pavement systems is proposed to be a quantifiable component of the proposed Unified Statewide Stormwater Rule. This rule is anticipated to be in the rulemaking process until mid 2010 or later. Given recent research, sufficient information exists so that the water resource benefits of pervious pavement systems can currently be quantified and incorporated in the design of surface water management systems. This memorandum is designed to provide guidance on the current review of applications proposing the use of pervious pavement systems. This document is not to be considered a rule, and other alternative forms of reasonable assurances to those set forth below may be considered by the District.

Pervious pavement systems can include several types of materials or designed systems including but not limited to pervious concrete, pervious paver systems, modular paver systems and pervious aggregate/binder products. Several recent studies of these systems are available on the University of Central Florida (UCF) Stormwater Management Academy's website http://stormwater.ucf.edu/

Studies at the UCF Stormwater Management Academy have not provided sufficient reasonable assurances to justify the use in the permitting context of pervious asphalt and pervious pavements utilizing crushed & recycled glass. Therefore, based on current

information pertaining to structural capability and hydraulic performance, the District does not anticipate that sufficient reasonable assurances exist to include these pavements in ERP calculations. These two systems may be allowed in the future pending improvements in their structural capability and hydraulic performance.

Pervious pavement systems may be proposed as part of a treatment train, with credit based on available storage volume, and the ability of the system to readily recover this storage volume. Pervious pavement design has two major components: structural and hydraulic. The pervious pavement system must be able to support the traffic loading while also (and equally important) functioning properly hydraulically. This document does NOT address the structural component of pervious pavement systems. ERP applicants should consult the product manufacture's pavement design standards to ensure that pervious pavements will be structurally stable, and not subject to premature structural failure.

Below are the types of practices, specifications, tools and potential conditions for review staff and applicants to consider for the use of pervious pavement systems. This is not intended to cover all potential designs. Professional judgment must be used in the review of proposed designs.

1. Location: Unless adequately addressed in the proposed design, pervious pavement systems should not be placed over poor draining soils (clay/hardpan, muck, etc.), in high traffic volume areas (public roadways), heavy wheel load areas, areas of frequent turning movements regardless of wheel loads (public roadways, drive thru lanes, around gas pumps, adjacent to dumpster pads, driveway entrances, etc.), or areas with high potential for hazardous material spills (auto maintenance, auto parts stores, chemical plants, etc.). Signage in pervious pavement areas should be posted to inform users with heavy wheel loads not to enter. If heavy wheel loads or other non-recommended conditions are proposed, then alternate methods of pavement design must be utilized (i.e. imported (hydraulically clean) fill, structural/permeable geo-fabrics, thicker pervious pavement sections, etc. above the parent soil). Pervious paver systems may have more ability to handle areas of frequent turning movements than other systems and should be considered depending upon the proposed use. The locations of pervious pavement systems should be clearly identified on the proposed construction plans and the acreage of pervious pavement should be identified in the staff report.

2. It is recommended that the Seasonal High Groundwater Table (SHGWT) elevation be greater than 24 inches below the bottom of the pervious pavement system in order to receive storm water quantity credit [i.e. lower NRCS Curve Numbers or Rational Method "C" values and (if applicable) any Required Attenuation Volume (RAV)]. The "system" is defined as the pervious pavement itself, the underlying storage reservoir, if utilized (i.e. pea rock, #57 stone, etc.), and the geo-fabric that wraps the underlying storage reservoir. For storm water quality storage credit [the Required Treatment Volume (RTV)], the SHGWT should be greater than 12 inches below the bottom of the pervious pavement system (refer to Figures 1, 2 and 3 for additional information).

It is not expected that reasonable assurances can be provided to allow storage credit in sub-grade soil void spaces due to the uncertainty of sub-grade soil compaction, estimated depths to the SHGWT and confining units (i.e. clay/hardpan), and the potential for "back to back" storm events (AMC 3 conditions).

3. A recovery/mounding analysis of the RTV/RAV should be submitted to provide reasonable assurances during review of the ERP application. Potential models can include: Modret©, PONDS©, ICPR Pond Pack© or equivalent software. Pre-construction soil testing should be submitted to the District at soil depths representative of the proposed system to obtain the necessary input parameters for the recovery/mounding analysis (depth to the SHGWT, depth to the confining unit and the vertical & horizontal hydraulic conductivity rates). The RTV should be recovered to the bottom of the pervious pavement system within 72 hours with a safety factor of two (2.0).

   For pervious pavement systems that provide additional storage in the underlying stone reservoir for flood control, one half (1/2) of the Required Attenuation Volume (RAV) should be recovered within 24 hours with a safety factor of two (2). As noted above, a recovery/mounding analysis should be utilized to demonstrate this recovery. Two possible ways to apply the safety factor are:

   (a) Reducing the design saturated hydraulic conductivity rates by half; or

   (b) Designing for the required RTV or RAV drawdown to occur within half of the required drawdown time.

   The safety factor of two (2.0) is based on the high probability of:

   - Soil compaction during clearing and grubbing operations,
   - Improper construction techniques that result in additional soil compaction under the retention BMP,
   - Inadequate long term maintenance of the retention BMP, and
   - Geologic variations and uncertainties in obtaining the soil test parameters for the recovery / mounding analysis (noted in subsequent sections below). These variations and uncertainties are especially suspect for larger retention BMPs.

   It is recommended that only the sustainable void spaces should be utilized for all RTV and RAV storage computations (including the stage/storage input for the mounding analysis). This information can be found on the Graphical Results tab of the *Pervious Pavement "Design Aid"* (in Excel® format), available at: **http://stormwater.ucf.edu/**

4. The applicant should provide reasonable assurances that the pervious pavement construction will be performed by a contractor certified by the product manufacturer to install the proposed pervious pavement system. A **Special Condition** should be added to the permit that requires the applicant to supply documentation of appropriate certification and conduct a pre-construction meeting with the District's compliance staff.

5. Suggested soil compaction: parent soil maximum compaction of 92% - 95% Modified Proctor density (ASTM D-1557) to a minimum depth of 24 inches. Redevelopment projects where the existing pavement section is to be removed; the compacted base should be removed and underlying soils should be scarified to a minimum 16 inch depth, re-graded, filled with hydraulically clean soils (if applicable), and proof rolled to a maximum suggested compaction of 92% - 95% Modified Proctor density (ASTM D-1557).

6. Runoff from adjacent landscaped areas should NOT be directed onto pervious pavement system areas unless the applicant demonstrates that the offsite areas that drain onto the pervious pavement will not increase sediment, silt, sand, or organic debris that increases the potential for clogging the pervious pavement. The design should reduce the likelihood of silts and sands from plugging the pavement void spaces (see Figures 5 – 8).

7. Except for pervious walks and bike paths, it is anticipated that curbing will be utilized around the pervious pavement to impede horizontal movement (refer to Figures 1, 2 and 3 for additional information). The curb around the pervious pavement system should extend at least eight (8) inches below the bottom of the pervious pavement material.

8. Except for pervious walks and bike paths, the system should be designed to allow nuisance ponding as an indicator that the pervious pavement system has failed. The nuisance ponding depth should be no more than two inches (see Figures 1 - 3). The permitted construction plans should delineate the areas that may be subject to nuisance ponding.

9. Other than pedestrian walks and bike paths, the maximum recommended slope for pervious pavements is 1/8 inch per foot (1.04%), zero % slope is preferred.

10. It is recommended that the applicant design the system to have an overflow at the nuisance ponding elevation to the down-gradient treatment system or outfall (see Figures 1 – 3).

11. With the exception of pervious walks and bike paths, the installation of Embedded Ring Infiltrometer Kits (ERIKs) or equivalent is recommended (see Figure 4 and 9). A minimum of two (2) ERIKs or equivalent per acre of pervious pavement is suggested. The permitted construction plans should delineate the location of all proposed ERIKs. ERIKs are not recommended to be placed at remote locations where subsequent testing may produce erroneous conclusions regarding the hydraulic function of the pervious pavement system. **Special Conditions** should be added to the permit that requires installation of any proposed ERIKs or equivalent, documentation of construction, and post-construction testing should be submitted as part of the construction completion certification (test results should be provided in report form, certified by the appropriate Florida registered/licensed Professional). It is not anticipated that the construction completion certification will be accepted if the vertical hydraulic conductivity is less than 2.0 inches/hour in any of the proposed ERIKs. For additional information on this in-situ infiltration monitor (ERIK), refer to

the UCF research paper *"Construction and Maintenance Assessment of Pervious Concrete Pavements,"* 2007 at http://stormwater.ucf.edu/research_publications.asp

12. Storage (S) within the pervious pavement system, reduced Curve Number (CN) and reduced Rational "C" values can be provided using the *Pervious Pavement "Design Aid"* (in Excel® format), available at: http://stormwater.ucf.edu/. If applicable, the credit can be applied to the different design storm routing calculations (CN, Rational "C" or S improvement), and/or as water quality & quantity retention volumes for the contributing area of the pervious pavement system. The values used (curve number, Rational "C" or system storage) should be documented in the permit staff report.

13. Maintenance: Periodic vacuum sweeping is recommended. For areas that have a condition of regular wind transported soil (near sand dunes or other coastal areas) or other conditions where excessive soil or other material deposition occurs, vacuum sweeping should be utilized (generally twice a year in June and December). If Embedded Ring Infiltrometer Kit (ERIK) or equivalent tests indicate vertical hydraulic conductivity less than 2.0 inches/hour or when nuisance ponding occurs, vacuum sweeping should be conducted. A **Special Condition** should be added to the permit requiring the submittal of a remediation plan should the vacuum operations fail to improve the vertical hydraulic conductivity to a rate greater than 2.0 inches/hour or resolve the nuisance ponding. The remediation plan should be prepared and submitted to the District's compliance staff for review and approval. Maintenance records should be retained by the permittee and made available to District staff upon request.

FIGURE 1

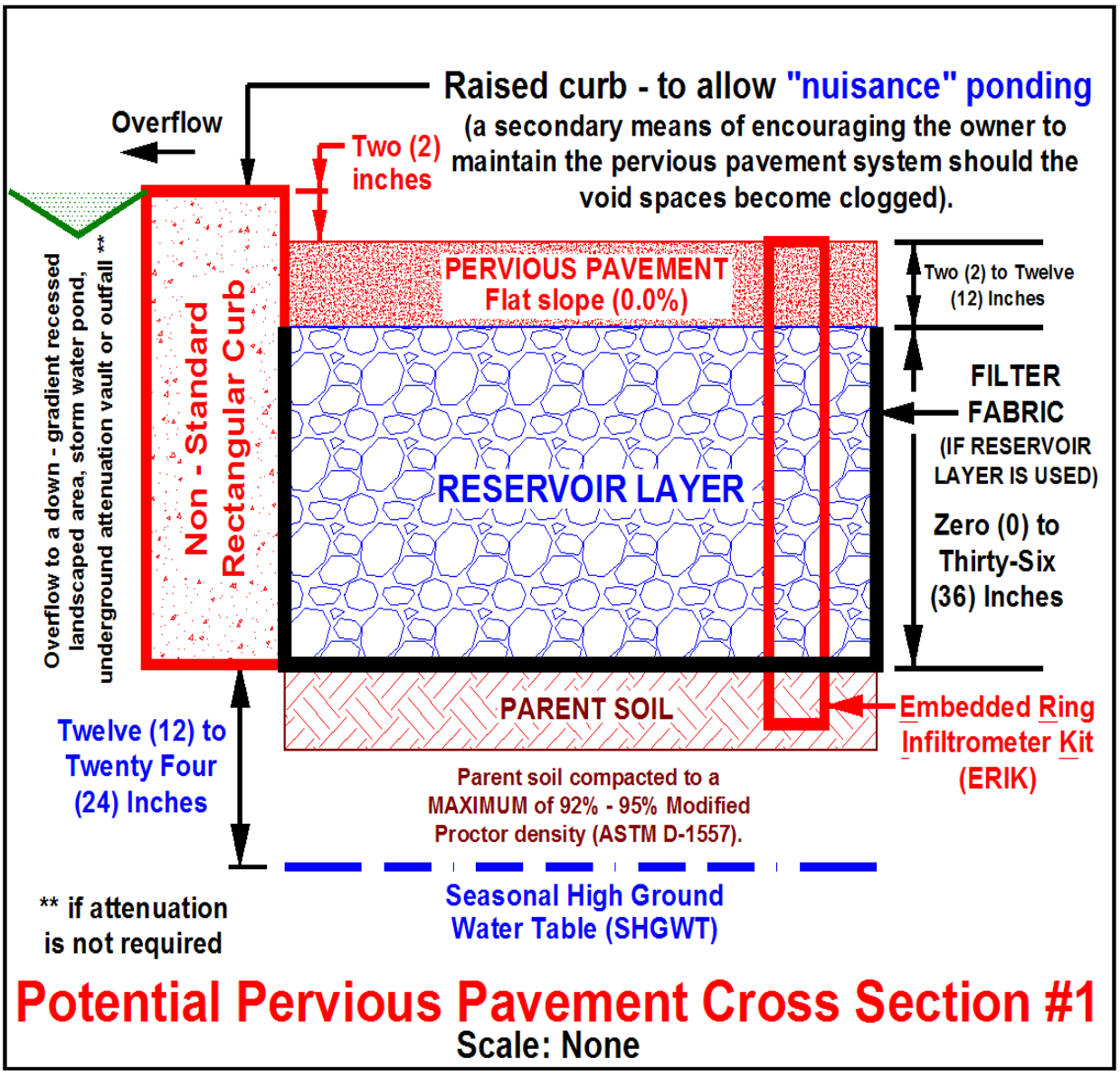
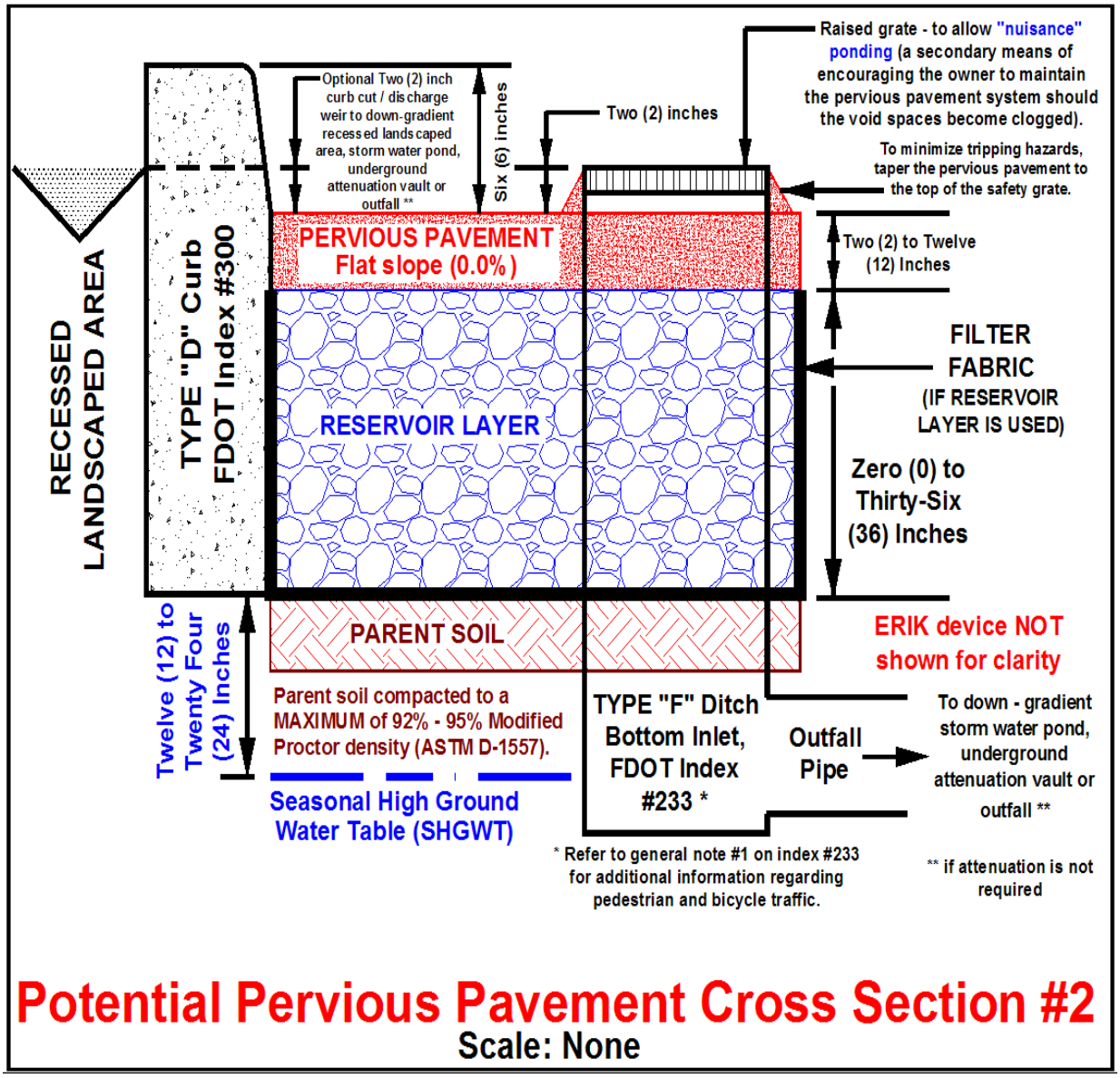

Raised curb - to allow "nuisance" ponding
(a secondary means of encouraging the owner to maintain the pervious pavement system should the void spaces become clogged).
Overflow
Two (2) inches
PERVIOUS PAVEMENT
Flat slope (0.0%)
Two (2) to Twelve (12) Inches
FILTER FABRIC
(IF RESERVOIR LAYER IS USED)
Zero (0) to Thirty-Six (36) Inches
Overflow to a down - gradient recessed landscaped area, storm water pond, underground attenuation vault or outfall **
Non - Standard Rectangular Curb
RESERVOIR LAYER
PARENT SOIL
Embedded Ring Infiltrometer Kit (ERIK)
Twelve (12) to Twenty Four (24) Inches
Parent soil compacted to a MAXIMUM of 92% - 95% Modified Proctor density (ASTM D-1557).
** if attenuation is not required
Seasonal High Ground Water Table (SHGWT)
Potential Pervious Pavement Cross Section #1
Scale: None

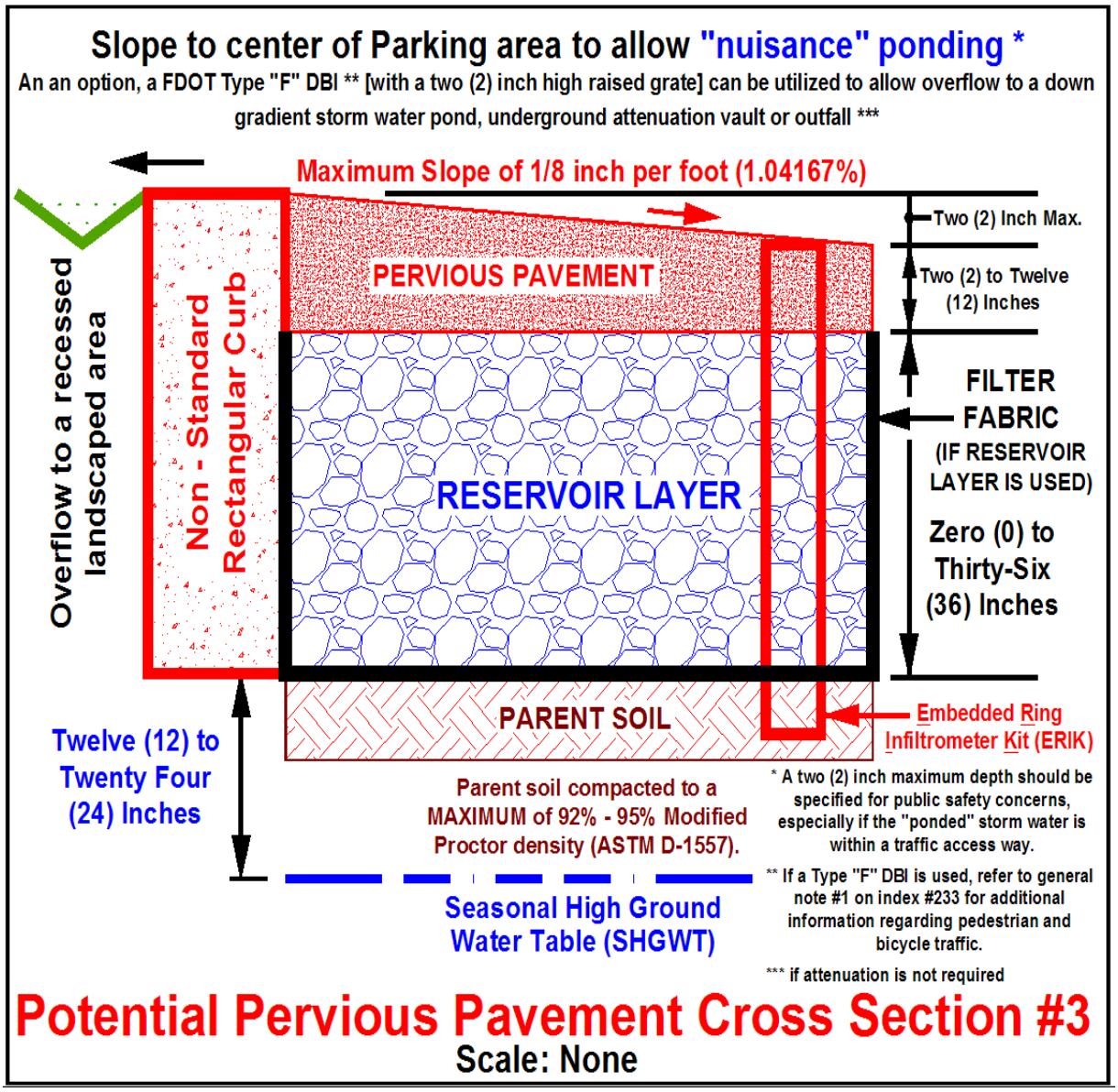
FIGURE 2



In-situ infiltrometer NOT shown for clarity.

FDOT design standards (index drawings), available at:
http://www.dot.state.fl.us/rddesign/rd/RTDS/08/2008Standards.htm

FIGURE 3



FDOT design standards (index drawings), available at:
http://www.dot.state.fl.us/rddesign/rd/RTDS/08/2008Standards.htm

FIGURE 4

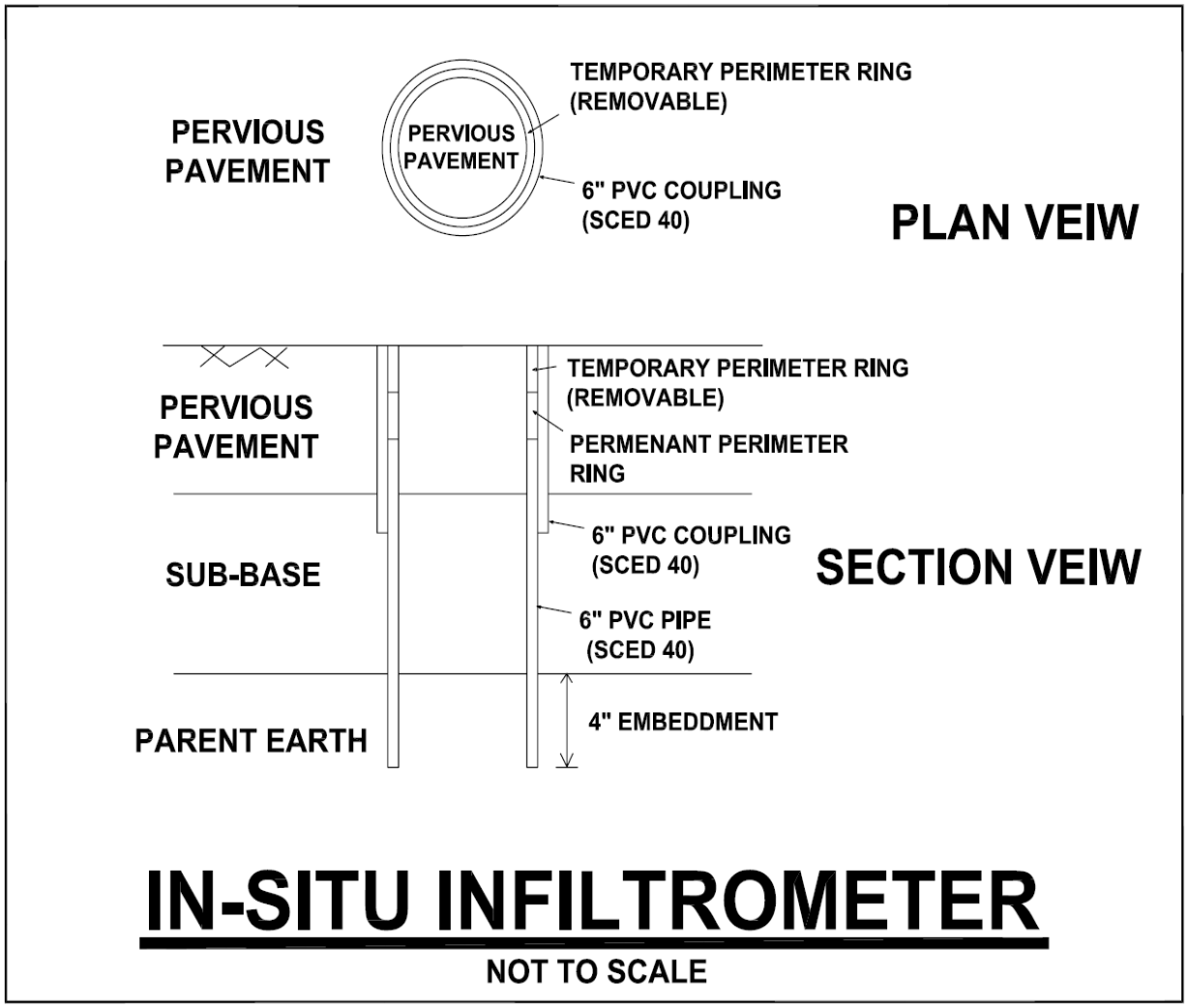

PERVIOUS PAVEMENT
PERVIOUS PAVEMENT
TEMPORARY PERIMETER RING (REMOVABLE)
6" PVC COUPLING (SCED 40)
PLAN VEIW
PERVIOUS PAVEMENT
SUB-BASE
PARENT EARTH
TEMPORARY PERIMETER RING (REMOVABLE)
PERMENANT PERIMETER RING
6" PVC COUPLING (SCED 40)
6" PVC PIPE (SCED 40)
4" EMBEDDMENT
SECTION VEIW
IN-SITU INFILTROMETER
NOT TO SCALE

FIGURE 5

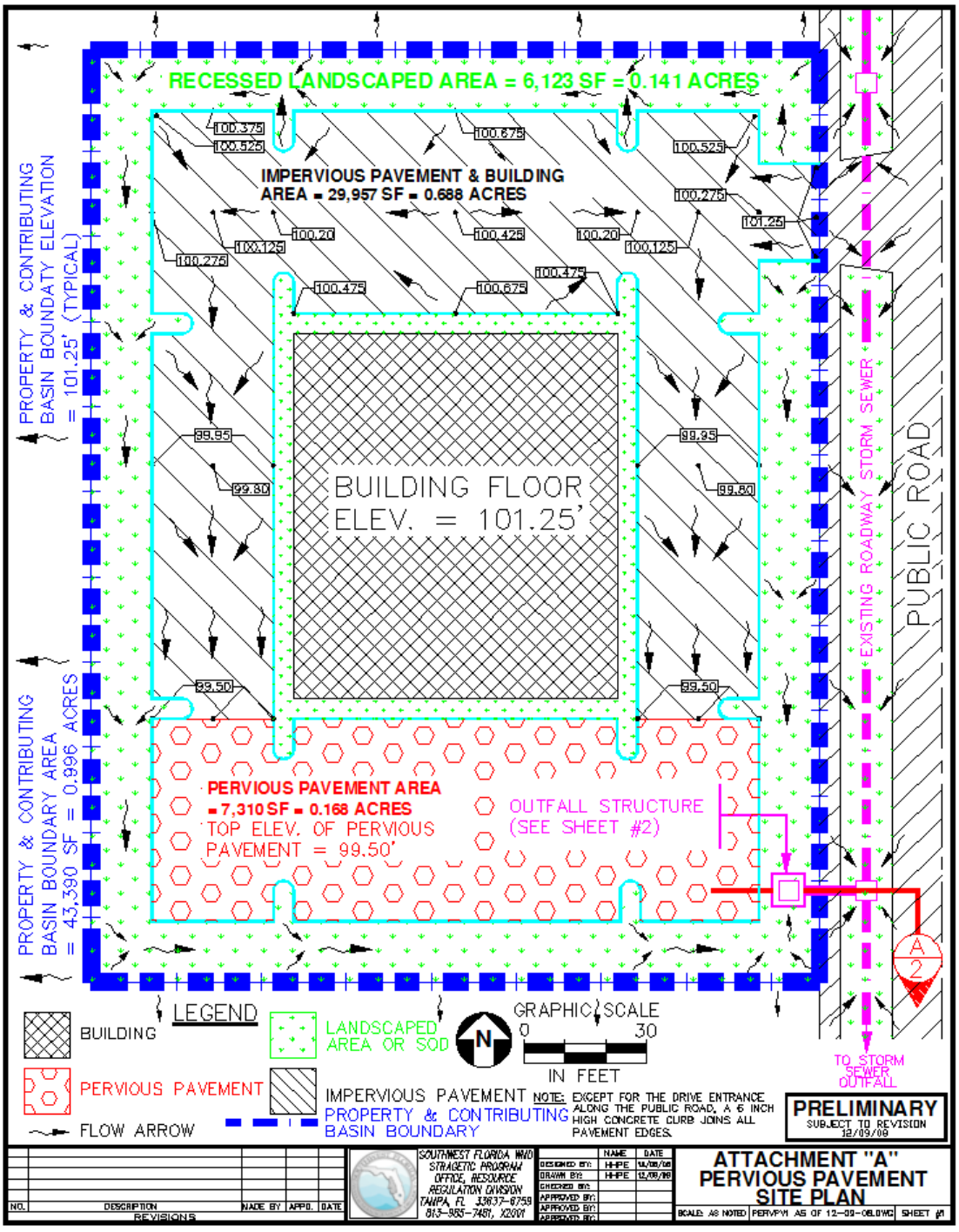

RECESSED LANDSCAPED AREA = 6,123 SF = 0.141 ACRES
IMPERVIOUS PAVEMENT & BUILDING
AREA = 29,957 SF = 0.688 ACRES
BUILDING FLOOR
ELEV. = 101.25'
PERVIOUS PAVEMENT AREA
= 7,310 SF = 0.168 ACRES
TOP ELEV. OF PERVIOUS
PAVEMENT = 99.50'
OUTFALL STRUCTURE
(SEE SHEET #2)
PROPERTY & CONTRIBUTING
BASIN BOUNDARY ELEVATION
= 101.25' (TYPICAL)
PROPERTY & CONTRIBUTING
BASIN BOUNDARY AREA
= 43,390 SF = 0.996 ACRES
EXISTING ROADWAY STORM SEWER
PUBLIC ROAD
TO STORM SEWER OUTFALL
LEGEND
BUILDING
LANDSCAPED AREA OR SOD
PERVIOUS PAVEMENT
IMPERVIOUS PAVEMENT
FLOW ARROW
PROPERTY & CONTRIBUTING BASIN BOUNDARY
GRAPHIC SCALE
0
30
IN FEET
NOTE: EXCEPT FOR THE DRIVE ENTRANCE ALONG THE PUBLIC ROAD, A 6 INCH HIGH CONCRETE CURB JOINS ALL PAVEMENT EDGES.
PRELIMINARY
SUBJECT TO REVISION
12/09/09
ATTACHMENT "A"
PERVIOUS PAVEMENT
SITE PLAN

FIGURE 6

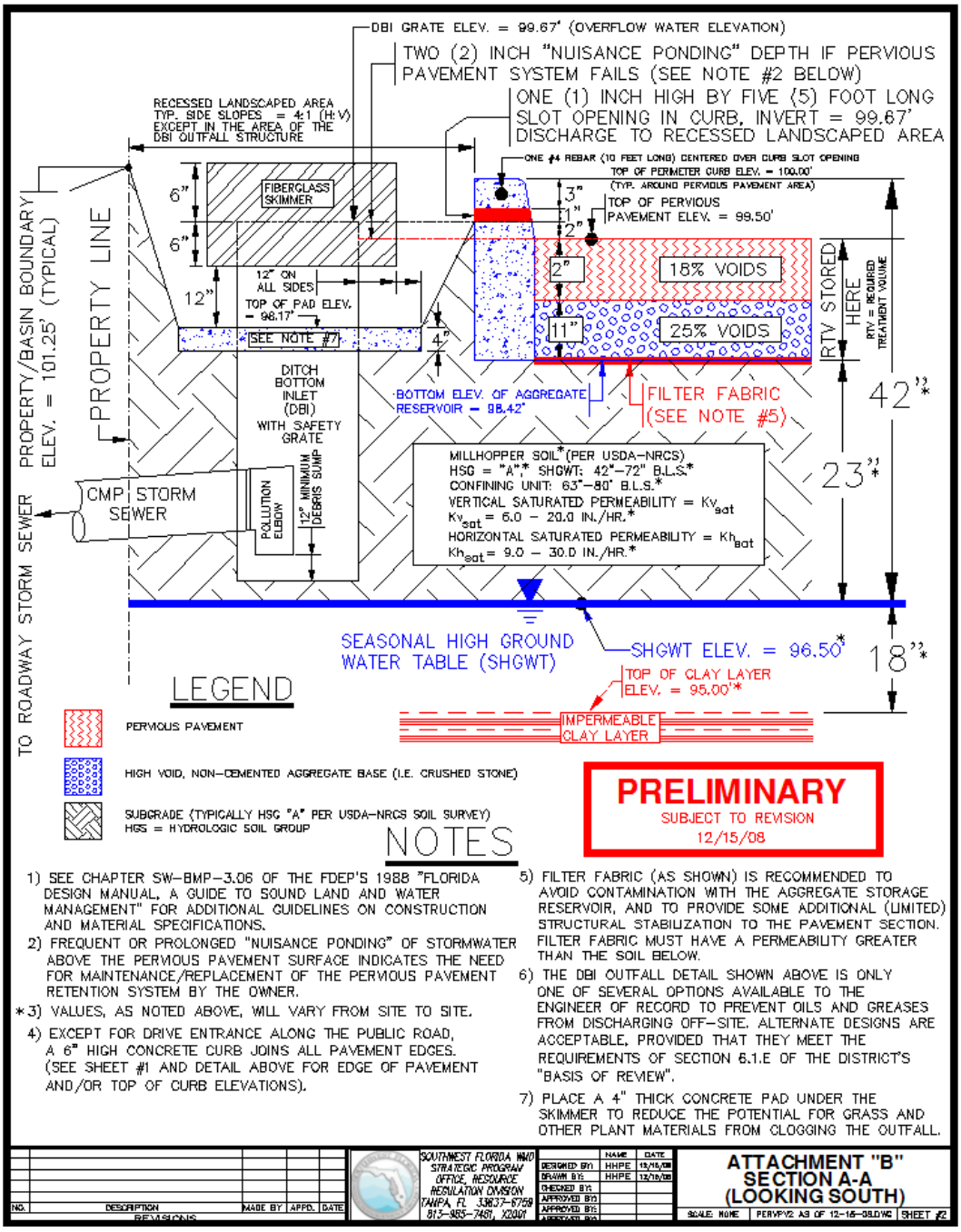

DBI GRATE ELEV. = 99.67' (OVERFLOW WATER ELEVATION)
TWO (2) INCH "NUISANCE PONDING" DEPTH IF PERVIOUS PAVEMENT SYSTEM FAILS (SEE NOTE #2 BELOW)
ONE (1) INCH HIGH BY FIVE (5) FOOT LONG SLOT OPENING IN CURB, INVERT = 99.67' DISCHARGE TO RECESSED LANDSCAPED AREA
RECESSED LANDSCAPED AREA TYP. SIDE SLOPES = 4:1 (H:V) EXCEPT IN THE AREA OF THE DBI OUTFALL STRUCTURE
ONE #4 REBAR (10 FEET LONG) CENTERED OVER CURB SLOT OPENING
TOP OF PERIMETER CURB ELEV. = 100.00'
(TYP. AROUND PERVIOUS PAVEMENT AREA)
TOP OF PERVIOUS PAVEMENT ELEV. = 99.50'
FIBERGLASS SKIMMER
6"
6"
12"
12" ON ALL SIDES
TOP OF PAD ELEV. = 98.17'
SEE NOTE #7
4"
3"
1"
2"
2"
18% VOIDS
11"
25% VOIDS
RTV STORED HERE
RTV = REQUIRED TREATMENT VOLUME
42"*
23"*
18"*
PROPERTY LINE
PROPERTY/BASIN BOUNDARY ELEV. = 101.25' (TYPICAL)
TO ROADWAY STORM SEWER
CMP STORM SEWER
DITCH BOTTOM INLET (DBI) WITH SAFETY GRATE
POLLUTION ELBOW
12" MINIMUM DEBRIS SUMP
BOTTOM ELEV. OF AGGREGATE RESERVOIR = 98.42'
FILTER FABRIC (SEE NOTE #5)
MILLHOPPER SOIL*(PER USDA-NRCS)
HSG = "A"* SHGWT: 42"-72" B.L.S.*
CONFINING UNIT: 63"-80" B.L.S.*
VERTICAL SATURATED PERMEABILITY = Kv_{sat}
Kv_{sat} = 6.0 - 20.0 IN./HR.*
HORIZONTAL SATURATED PERMEABILITY = Kh_{sat}
Kh_{sat} = 9.0 - 30.0 IN./HR.*
SEASONAL HIGH GROUND WATER TABLE (SHGWT)
SHGWT ELEV. = 96.50'*
TOP OF CLAY LAYER ELEV. = 95.00'*
IMPERMEABLE CLAY LAYER
LEGEND
PERVIOUS PAVEMENT
HIGH VOID, NON-CEMENTED AGGREGATE BASE (I.E. CRUSHED STONE)
SUBGRADE (TYPICALLY HSG "A" PER USDA-NRCS SOIL SURVEY)
HGS = HYDROLOGIC SOIL GROUP
PRELIMINARY
SUBJECT TO REVISION
12/15/08
NOTES
1) SEE CHAPTER SW-BMP-3.06 OF THE FDEP'S 1988 "FLORIDA DESIGN MANUAL, A GUIDE TO SOUND LAND AND WATER MANAGEMENT" FOR ADDITIONAL GUIDELINES ON CONSTRUCTION AND MATERIAL SPECIFICATIONS.
2) FREQUENT OR PROLONGED "NUISANCE PONDING" OF STORMWATER ABOVE THE PERVIOUS PAVEMENT SURFACE INDICATES THE NEED FOR MAINTENANCE/REPLACEMENT OF THE PERVIOUS PAVEMENT RETENTION SYSTEM BY THE OWNER.
*3) VALUES, AS NOTED ABOVE, WILL VARY FROM SITE TO SITE.
4) EXCEPT FOR DRIVE ENTRANCE ALONG THE PUBLIC ROAD, A 6" HIGH CONCRETE CURB JOINS ALL PAVEMENT EDGES. (SEE SHEET #1 AND DETAIL ABOVE FOR EDGE OF PAVEMENT AND/OR TOP OF CURB ELEVATIONS).
5) FILTER FABRIC (AS SHOWN) IS RECOMMENDED TO AVOID CONTAMINATION WITH THE AGGREGATE STORAGE RESERVOIR, AND TO PROVIDE SOME ADDITIONAL (LIMITED) STRUCTURAL STABILIZATION TO THE PAVEMENT SECTION. FILTER FABRIC MUST HAVE A PERMEABILITY GREATER THAN THE SOIL BELOW.
6) THE DBI OUTFALL DETAIL SHOWN ABOVE IS ONLY ONE OF SEVERAL OPTIONS AVAILABLE TO THE ENGINEER OF RECORD TO PREVENT OILS AND GREASES FROM DISCHARGING OFF-SITE. ALTERNATE DESIGNS ARE ACCEPTABLE, PROVIDED THAT THEY MEET THE REQUIREMENTS OF SECTION 6.1.E OF THE DISTRICT'S "BASIS OF REVIEW".
7) PLACE A 4" THICK CONCRETE PAD UNDER THE SKIMMER TO REDUCE THE POTENTIAL FOR GRASS AND OTHER PLANT MATERIALS FROM CLOGGING THE OUTFALL.
NO. DESCRIPTION MADE BY APPD. DATE
REVISIONS
SOUTHWEST FLORIDA WMD
STRATEGIC PROGRAM OFFICE, RESOURCE REGULATION DIVISION
TAMPA, FL 33637-6759
813-985-7481, X2001
NAME DATE
DESIGNED BY HHPE 12/15/08
DRAWN BY HHPE 12/15/08
CHECKED BY
APPROVED BY
APPROVED BY
ATTACHMENT "B"
SECTION A-A
(LOOKING SOUTH)
SCALE: NONE PERVPV2 AS OF 12-15-08.DWG SHEET #2

FIGURE 7

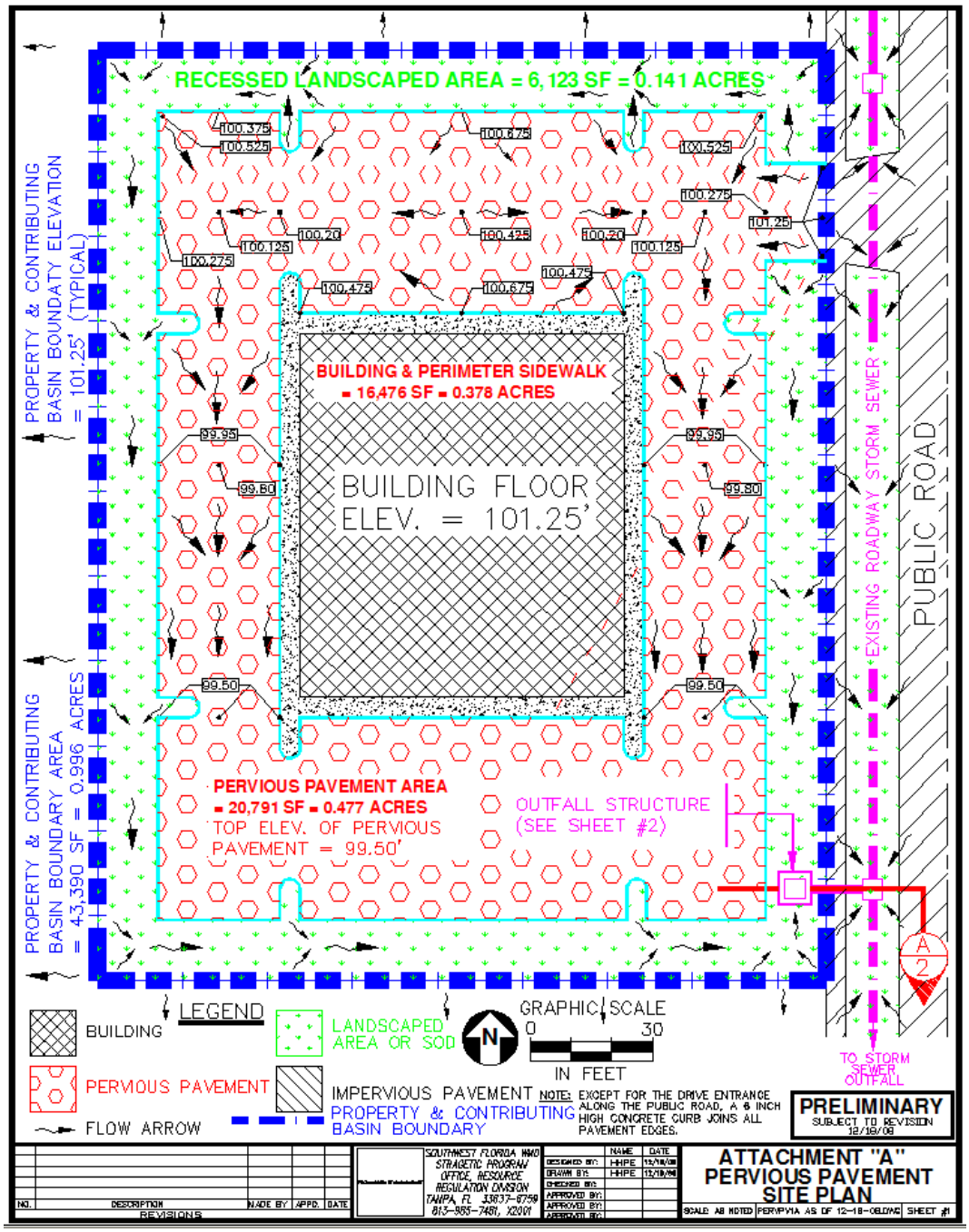

RECESSED LANDSCAPED AREA = 6,123 SF = 0.141 ACRES
BUILDING & PERIMETER SIDEWALK
= 16,476 SF = 0.378 ACRES
BUILDING FLOOR
ELEV. = 101.25'
PERVIOUS PAVEMENT AREA
= 20,791 SF = 0.477 ACRES
TOP ELEV. OF PERVIOUS
PAVEMENT = 99.50'
OUTFALL STRUCTURE
(SEE SHEET #2)
PROPERTY & CONTRIBUTING
BASIN BOUNDARY ELEVATION
= 101.25' (TYPICAL)
PROPERTY & CONTRIBUTING
BASIN BOUNDARY AREA
= 43,390 SF = 0.996 ACRES
EXISTING ROADWAY STORM SEWER
PUBLIC ROAD
LEGEND
BUILDING
LANDSCAPED
AREA OR SOD
PERVIOUS PAVEMENT
IMPERVIOUS PAVEMENT
PROPERTY & CONTRIBUTING
BASIN BOUNDARY
FLOW ARROW
GRAPHIC SCALE
0
30
IN FEET
TO STORM
SEWER
OUTFALL
PRELIMINARY
SUBJECT TO REVISION
12/18/09
ATTACHMENT "A"
PERVIOUS PAVEMENT
SITE PLAN

FIGURE 8

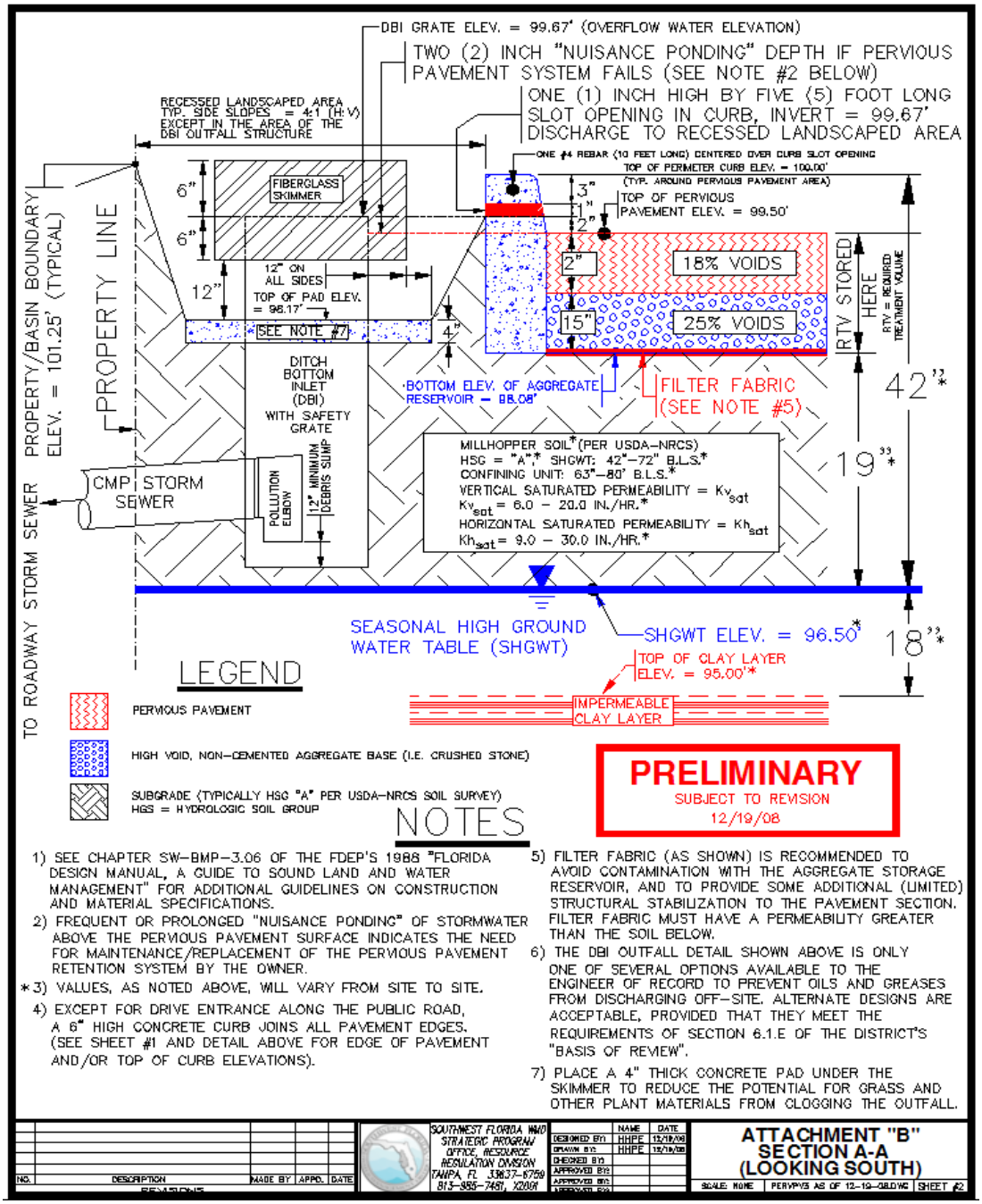
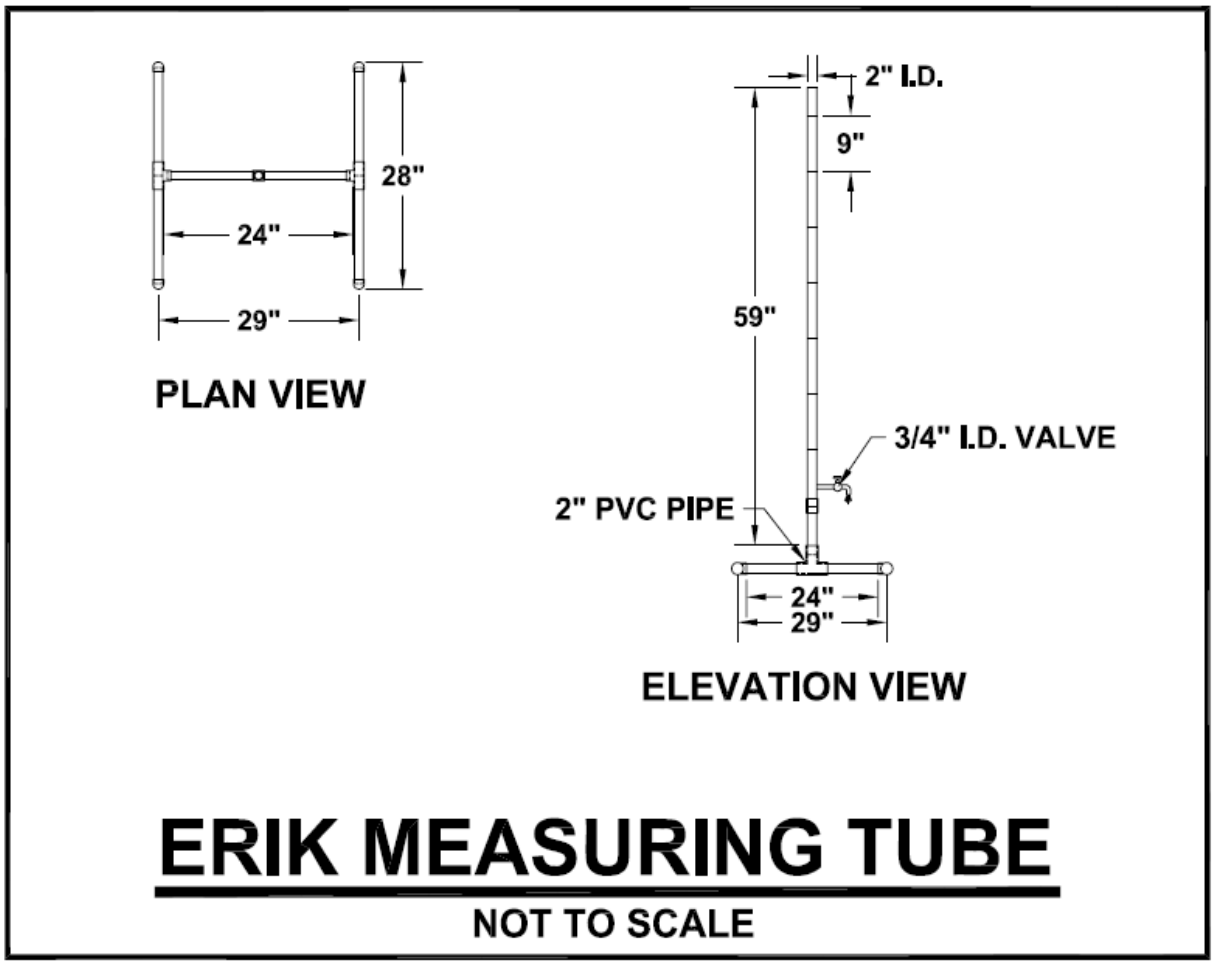

DBI GRATE ELEV. = 99.67' (OVERFLOW WATER ELEVATION)
TWO (2) INCH "NUISANCE PONDING" DEPTH IF PERVIOUS PAVEMENT SYSTEM FAILS (SEE NOTE #2 BELOW)
ONE (1) INCH HIGH BY FIVE (5) FOOT LONG SLOT OPENING IN CURB, INVERT = 99.67' DISCHARGE TO RECESSED LANDSCAPED AREA
RECESSED LANDSCAPED AREA TYP. SIDE SLOPES = 4:1 (H:V) EXCEPT IN THE AREA OF THE DBI OUTFALL STRUCTURE
ONE #4 REBAR (10 FEET LONG) CENTERED OVER CURB SLOT OPENING
TOP OF PERIMETER CURB ELEV. = 100.00'
(TYP. AROUND PERVIOUS PAVEMENT AREA)
TOP OF PERVIOUS PAVEMENT ELEV. = 99.50'
FIBERGLASS SKIMMER
6"
6"
12"
12" ON ALL SIDES
TOP OF PAD ELEV. = 98.17'
SEE NOTE #7
4"
3"
1"
2"
2"
18% VOIDS
15"
25% VOIDS
RTV STORED HERE
RTV = REQUIRED TREATMENT VOLUME
42"*
19"*
18"*
PROPERTY LINE
PROPERTY/BASIN BOUNDARY ELEV. = 101.25' (TYPICAL)
TO ROADWAY STORM SEWER
DITCH BOTTOM INLET (DBI) WITH SAFETY GRATE
BOTTOM ELEV. OF AGGREGATE RESERVOIR = 98.08'
FILTER FABRIC (SEE NOTE #5)
CMP STORM SEWER
POLLUTION ELBOW
12" MINIMUM DEBRIS SUMP
MILLHOPPER SOIL*(PER USDA-NRCS)
HSG = "A"* SHGWT: 42"-72" B.L.S.*
CONFINING UNIT: 63"-80" B.L.S.*
VERTICAL SATURATED PERMEABILITY = Kv_{sat}
Kv_{sat} = 6.0 - 20.0 IN./HR.*
HORIZONTAL SATURATED PERMEABILITY = Kh_{sat}
Kh_{sat} = 9.0 - 30.0 IN./HR.*
SEASONAL HIGH GROUND WATER TABLE (SHGWT)
SHGWT ELEV. = 96.50'*
TOP OF CLAY LAYER ELEV. = 95.00'*
IMPERMEABLE CLAY LAYER
LEGEND
PERVIOUS PAVEMENT
HIGH VOID, NON-CEMENTED AGGREGATE BASE (I.E. CRUSHED STONE)
SUBGRADE (TYPICALLY HSG "A" PER USDA-NRCS SOIL SURVEY)
HSG = HYDROLOGIC SOIL GROUP
PRELIMINARY
SUBJECT TO REVISION
12/19/08
NOTES
1) SEE CHAPTER SW-BMP-3.06 OF THE FDEP'S 1988 "FLORIDA DESIGN MANUAL, A GUIDE TO SOUND LAND AND WATER MANAGEMENT" FOR ADDITIONAL GUIDELINES ON CONSTRUCTION AND MATERIAL SPECIFICATIONS.
2) FREQUENT OR PROLONGED "NUISANCE PONDING" OF STORMWATER ABOVE THE PERVIOUS PAVEMENT SURFACE INDICATES THE NEED FOR MAINTENANCE/REPLACEMENT OF THE PERVIOUS PAVEMENT RETENTION SYSTEM BY THE OWNER.
*3) VALUES, AS NOTED ABOVE, WILL VARY FROM SITE TO SITE.
4) EXCEPT FOR DRIVE ENTRANCE ALONG THE PUBLIC ROAD, A 6" HIGH CONCRETE CURB JOINS ALL PAVEMENT EDGES. (SEE SHEET #1 AND DETAIL ABOVE FOR EDGE OF PAVEMENT AND/OR TOP OF CURB ELEVATIONS).
5) FILTER FABRIC (AS SHOWN) IS RECOMMENDED TO AVOID CONTAMINATION WITH THE AGGREGATE STORAGE RESERVOIR, AND TO PROVIDE SOME ADDITIONAL (LIMITED) STRUCTURAL STABILIZATION TO THE PAVEMENT SECTION. FILTER FABRIC MUST HAVE A PERMEABILITY GREATER THAN THE SOIL BELOW.
6) THE DBI OUTFALL DETAIL SHOWN ABOVE IS ONLY ONE OF SEVERAL OPTIONS AVAILABLE TO THE ENGINEER OF RECORD TO PREVENT OILS AND GREASES FROM DISCHARGING OFF-SITE. ALTERNATE DESIGNS ARE ACCEPTABLE, PROVIDED THAT THEY MEET THE REQUIREMENTS OF SECTION 6.1.E OF THE DISTRICT'S "BASIS OF REVIEW".
7) PLACE A 4" THICK CONCRETE PAD UNDER THE SKIMMER TO REDUCE THE POTENTIAL FOR GRASS AND OTHER PLANT MATERIALS FROM CLOGGING THE OUTFALL.
NO. DESCRIPTION MADE BY APPD. DATE
SOUTHWEST FLORIDA WMD
STRATEGIC PROGRAMS OFFICE, RESOURCE REGULATION DIVISION
TAMPA, FL 33637-6759
813-985-7481, X2008
NAME DATE
DESIGNED BY HHPE 12/19/08
DRAWN BY HHPE 12/19/08
CHECKED BY
APPROVED BY
ATTACHMENT "B"
SECTION A-A
(LOOKING SOUTH)
SCALE: NONE PERVPVS AS OF 12-19-08.DWG SHEET #2

FIGURE 9


28"
24"
29"
PLAN VIEW
2" I.D.
9"
59"
3/4" I.D. VALVE
2" PVC PIPE
24"
29"
ELEVATION VIEW
ERIK MEASURING TUBE
NOT TO SCALE