MARCH 2010 DRAFT

DEPARTMENT OF ENVIRONMENTAL PROTECTION AND WATER MANAGEMENT DISTRICTS

ENVIRONMENTAL RESOURCE PERMIT

STORMWATER QUALITY APPLICANT'S HANDBOOK

DESIGN REQUIREMENTS FOR STORMWATER TREATMENT SYSTEMS IN FLORIDA

<insert effective date>

NOTE TO READERS AND REVIEWERS: While the DEP-WMD Stormwater Rule team is seeking comments on the entire draft Applicant's Handbook, there are several areas that are highlighted in yellow for which we are especially seeking comments or alternatives.

PART I – GENERAL CRITERIA

1.0 Introduction

Chapter 62-347, F.A.C., entitled "Stormwater Treatment Systems," provides statewide regulatory criteria for stormwater treatment systems which are designed and constructed to control stormwater pollutant loads. Stormwater treatment systems usually are components of a surface water management system. Together these systems may incorporate methods to collect, convey, store, absorb, inhibit, treat, use or reuse water to prevent or reduce flooding, overdrainage, environmental degradation and pollution, or otherwise affect the quality and quantity of discharges.

The regulation of stormwater treatment systems is established pursuant to Chapter 373, F.S. This rule is a technology-based rule which includes all of the following components:

(a) Performance standards (the minimum level of treatment for nutrients);

(b) Design criteria for best management practices (BMPs) used to treat stormwater;

(c) A presumption that a stormwater treatment system designed in compliance with the BMP design criteria within this rule will not cause or contribute to violations of surface water standards in chapters 62-4, and 62-302, F.A.C., and ground water standards in chapters 62-520, 62- 522, and 62-550, F.A.C., including any antidegradation provisions of sections 62-4.242(1)(a) and (b), 62-4.242(2) and (3), and 62-302.300, F.A.C., and any special standards for Outstanding Florida Waters and Outstanding National Resource Waters set forth in sections 62-4.242(2) and (3), F.A.C. For the purposes of this rule, nutrients (total nitrogen and total phosphorus) will serve as a surrogate pollutant. It is assumed that treatment efficiencies attained for nutrients will be sufficient to adequately treat other pollutants that would otherwise cause or contribute to water quality violations.

not necessarily true

1.1 Applicability

This Handbook applies to the design of stormwater treatment systems authorized pursuant to Chapter 373, F.S., that do not serve agricultural or silvicultural activities. Stormwater treatment systems are further defined in **Section 2** of this Handbook.

1.2 Off-site Stormwater Treatment

Off-site stormwater treatment may be used when on-site treatment is not sufficient to meet the required performance standards. The following criteria must be met when using off-site treatment:

(a) The off-site area must discharge to the same waterbody as the proposed project;

(b) The applicant shall use modeling, loading calculations, or other data analysis techniques to provide reasonable assurance that the off-site treatment system provides the required stormwater treatment; and

(c) A perpetual off-site treatment easement over the area being used for treatment shall be provided using Form XYZ to allow perpetual access, operation, maintenance, and repair of the off-site treatment area by the permit holder. An equivalent legal instrument may be allowed if necessitated by site specific conditions.

1.3 Best Management Practices (BMP) Treatment Train Nutrient Reduction Credits

It is frequently desirable that stormwater treatment systems be designed to include a combination of BMPs in series to achieve the required pollutant removal efficiency. This concept is called the "BMP Treatment Train". However, treatment efficiencies of BMPs in series must account for the reduced loading transferred to subsequent downstream treatment devices. After treatment occurs in the first system, a load reduction has occurred which is a function of the type of BMP used to provide treatment. After load reduction in the initial BMP, the remaining load consists of pollutant mass which was not removed. This mass is then treated by the second BMP with the nutrient reduction efficiency determined by the particular type of BMP used.

As stormwater pollutant concentrations are reduced in each BMP in the treatment train, the ability of a BMP to further reduce stormwater pollutant concentrations and loads is reduced. The treatment efficiency used for downstream BMPs must account for the diminishing effectiveness of stormwater treatment. Examples of how to calculate the overall pollutant load reduction effectiveness of a BMP Treatment Train, including where there are multiple inflow locations, are contained in the Design Example sections of this Handbook. Additionally, examples are provided in the Design Example sections when multiple wet ponds and multiple dry retention basins are used in series.

Perhaps two to five-year inspections (depending on BMP) to be submitted to WMD even if determined to be in compliance; this would capture every new site at least once during each NPDES permit cycle and each TMDL cycle

recommend "appropriate" instead "necessary" - gives more flexibility

Alternative Designs

An applicant may propose alternative designs to the presumptive BMP design criteria provided in this Handbook. Alternative designs will be considered by the Agency in determining whether, based on plans, monitoring data, test results, or other information, that the alternative design is necessary for the specific site conditions, and provides equivalent treatment to that required by the performance standards in this Handbook. In otherwise determining whether reasonable assurance has been provided for compliance with this paragraph, the Agency shall consider:

(a) Whether the proposed system will provide the level of treatment required by the performance standards in this Handbook; and

(b) Whether reasonable provisions have been made to ensure that the system will be effectively operated and maintained.

1.5 Inspection and Recertification of Stormwater Treatment Systems

Issue: The DEP-WMD stormwater team will be focusing over the next few months on how to best address OM of stormwater treatment systems. We are seeking input on the frequency of inspections, the requirements for inspections, the frequency of recertifying whether a stormwater treatment system is operating as designed and permitted, and whether the recertification forms should be submitted to the Agency or retained by the permittee. Also see Section 32 of this Handbook.

All stormwater treatment systems shall be inspected by the permittee on a regular basis as set forth in this Handbook for each of the individual BMPs to assure that it continues to function as permitted. In addition to the regular inspections required by each BMP, the permittee shall employ a registered professional to inspect the stormwater treatment system permitted under Chapter 62-347, F.A.C., and to submit a report describing the results of the inspection and recertifying that the stormwater treatment system is operating as designed and permitted as set forth in the table below. A report shall also be submitted to the Agency within 30 days of inspection, a system failure, or deviation from the permit. The results of all such inspections shall be filed with the Agency using Form 62-347.xyz, "Operation and Maintenance Inspection Certification." Inspection frequency can be modified as set forth in a permit or for systems within Sensitive Karst Areas.

Table 1.1 Stormwater Treatment System Recertification Frequency

TYPE OF STORMWATER TREATMENT SYSTEM	DURING THE FIRST TWO YEARS OF OPERATION	AFTER THE FIRST TWO YEARS OF SUCCESSFUL OPERATION
Retention basins	Annually	Once every 5 years
Exfiltration trenches	Annually	Once every 18 months? 24 months?
Underground retention	Annually	Once every 18 months? 24 months?
Underground vault/chambers	Annually	Once every 18 months? 24 months?
Swales	Annually	Once every 5 years
Vegetated Natural Buffers	Annually	Once every 18 months? 24 months?
Pervious pavements	Annually	Once every 18 months? 24 months?
Greenroof/cisterns	Annually	Once every 18 months? 24 months?
Wet detention basins	Annually	Once every 5 years
Managed aquatic plant systems	Annually	Once every 18 months? 24 months?
Stormwater harvesting	Annually	Once every 18 months? 24 months?
Wetland treatment trains	Annually	Once every5 years
Underdrain filtration	Annually	Once every 18 months? 24 months?
Low impact design	Annually	Once every 18 months? 24 months?
Alum injection	Annually	Once every 18 months? 24 months?

This is a very broad BMP; maybe clarify "as described in Section 18"

does this belong in this section?

All copies of plans and drawings, together with supporting calculations and documentation submitted to the Agency must be signed, sealed, and dated by a registered professional, as required by Chapters 471, 472, 481 or 492, F.S., as applicable, when the design of the system requires the services of a registered professional.

More frequent than 2 years may be unreasonable for permittee-recommend 2-5 years depending on BMP; in general, the WMD should track and manage inspection requirements - 5 year inspections that MUST be submitted will be more effective than 2 year inspections that depend on voluntary submittal only if out of compliance and sporadic enforcement

PART II – DEFINITIONS

2.0 Definitions

In the event of conflicts with other rules of the Department or water management districts related to stormwater quality, when applied to the design and permitting of stormwater treatment systems, the definitions in Sections 373.019, 373.403, 403.031, and 403.803, F.S, Chapter 62-347, F.A.C, and this Handbook will control. For the user's convenience, many of these definitions which are relevant to the design of stormwater treatment systems are included in Appendix A.

(1) "Agency" or "responsible agency" means the Department of Environmental Protection or a water management district established under Section 373.069, F.S., including any local governments delegated to implement the rules adopted under Part IV of Chapter 373, F.S., in accordance with Section 373.441, F.S.

(2) "Confining unit" means a strata or layer of clay, hardpan, organic mucks, or other material that restrict the movement of water below that strata or layer.

(3) "Control elevation" means the lowest elevation at which water can be released through a control device.

(4) "Detention" means the collection and temporary storage of stormwater with subsequent gradual release of the stormwater.

(5) "Directly connected impervious area," or "DCIA" means the area covered by a building, impermeable pavement, and/or other impervious surfaces, which drains directly into the conveyance without first flowing across sufficient permeable vegetated land area to allow for infiltration of runoff.

(6) "Discharge" means to allow or cause water to flow to receiving waters or off-site properties.

(7) "Existing land use" means the land uses that exist on the project site as of the effective date of this Handbook.

(8) "Hydrologic Unit Code" or "HUC" means the hydrologic cataloging unit assigned to a geographic area representing a surface drainage basin.

(9) "Impervious" means land surfaces that do not allow, or minimally allow, the penetration of water; such as building roofs, non-porous concrete and asphalt pavements, and some fine grained or compacted soils.

The use of this version of "pre" may hinder development within already urbanized areas

(10) "Littoral zone" means that portion of a wet detention pond that is designed to contain rooted aquatic plants.

(11) "Natural vegetative community type" means the landscape that currently exists or is likely to have existed prior to disturbance based on the vegetation community associated with the natural soil type of the project area, using information such as soil surveys, aerial photographs, and the vegetation communities that can reasonably be expected to have existed on the site before disturbance.

(12) "Net improvement" means the performance standard for treating stormwater wherein the pollutant loads discharged from the existing land use of the project area are reduced.

(13) "Off-line" means the storage of a specified volume of stormwater so that subsequent runoff in excess of the specified volume does not flow into the BMP storing the initial volume of stormwater.

(14) "Operate" or "operation" means to cause or to allow a system to function.

(15) "Pre-development" means the natural vegetative community type of the project area.

(16) "Post-development" means the land use on the project area that will exist after the project is completed.

(17) "Permanent pool" means that portion of a wet detention pond that holds water between the normal water level and the top of the anoxic zone excluding any water volume claimed as wet detention bleeddown volume.

(18) "Post equals pre" or "post = pre" means the performance standard for treating stormwater in which the post-development average annual loading of total phosphorus and nitrogen does not exceed the loading from natural vegetative community types.

(19) "Project area" means the area being modified or altered in conjunction with an activity requiring a permit.

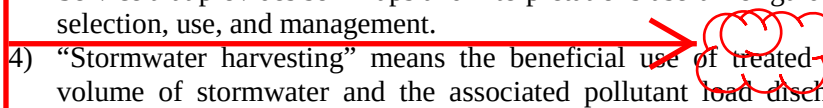
(20) "Redevelopment" means the construction of a stormwater treatment system on sites having existing commercial, industrial, institutional, or multi-family land uses where the existing impervious surface will be removed as part of the proposed activity.

(21) "Registered professional" means a professional registered or licensed by and in the State of Florida and who possesses the expertise and experience necessary for the competent preparation, submittal and certification of documents and materials, and performing other services required in support of permitting, constructing, altering, inspecting, and operating a proposed or existing activity regulated under Part IV of Chapter 373, F.S. Examples of registered professionals, authorized pursuant to Chapter 455, F.S., and the respective practice acts by which they are regulated, are professional engineers licensed under Chapter 471, F.S., professional landscape architects licensed under Chapter 481, F.S., professional surveyors and mappers under Chapter 472, F.S., and professional geologists licensed under Chapter 492, F.S.

(22) "Retention" means a stormwater treatment system designed to prevent the discharge of a given volume of stormwater runoff into surface waters by complete on-site storage of that volume.

does collected roof runoff qualify? (e.g., rain barrels or cisterns not part of a green roof system)

(23) "Soil Survey" means a document prepared by the U.S. Natural Resources Conservation Service that provides soil maps and interpretations useful for guiding decisions about soil selection, use, and management.



(24) "Stormwater harvesting" means the beneficial use of treated stormwater to reduce the volume of stormwater and the associated pollutant load discharged from a stormwater treatment system, but specifically does not include reclaimed water as defined in Chapter 62-610, F.A.C.

(25) "Seasonal high ground water table" (SHGWT) means the zone of water saturated soil at the highest average depth during the wettest season of the year during periods of normal rainfall, based upon site specific factors described in Section 21 of this Handbook.

(26) "Sensitive karst areas" means those areas described in Section 30 and **Appendix G** of this Handbook, where the Floridan aquifer is at or near the land surface.

(27) "Stormwater treatment system" means a system which is designed and constructed or implemented to reduce the discharge of pollutants in stormwater by incorporating methods to collect, convey, store, absorb, treat, use, or reuse stormwater.

PART III – STORMWATER QUALITY PERMITTING REQUIREMENTS

3.1 Performance Standards

Issue: What is the appropriate performance standard to assure that nutrients in stormwater discharges do not cause or contribute to violations of nutrient criteria, either individually or cumulatively? Since the post-development total phosphorus loading increases by a factor of about 10 above predevelopment loading and that total nitrogen post-development loading increases by a factor of about 4, should there be one performance standard for TP and a different one for TN? If so, what should they be?

A stormwater treatment system shall be designed to meet the following performance standards (the minimum level of treatment):

(a) Except as provided below, all stormwater treatment systems shall provide a minimum level of treatment sufficient to accomplish the lesser of the following:

(i) an 85% reduction of the post-development average annual loading of nutrients from the project; or,

(ii) a reduction such that the post-development average annual loading of nutrients do not exceed the nutrient loading from the project area's natural vegetative community types. (See Chapter 6 of the 2007 report "Evaluation of Current Stormwater Design Criteria within the State of Florida" for information on the amount of load reduction required to achieve post=pre).

(b) Stormwater treatment systems for activities within drainage basins defined by the 12 unit HUC of an Outstanding Florida Waters shall provide a minimum level of treatment that results in a reduction such that the post-development average annual loading of nutrients do not exceed the nutrient loading from the project area's natural vegetative community types (post=pre). The 12-unit HUC maps are available at: TO BE ADDED___

(c) Stormwater treatment systems serving redevelopment activities that occur on lands with two or less acres shall meet the appropriate minimum level of treatment set forth above. However, an applicant may request approval by the Agency of a lower level of treatment. The lower level of treatment will be determined by the applicant conducting and submitting a feasibility analysis which considers the applicability of currently available treatment technologies relative to:

- The current and proposed land use and level of imperviousness
- Physical site constraints such as soil and water table characteristics
- Hydraulic constraints such as tailwater elevations
- Connections to existing infrastructure
- Local government requirements (zoning, land use intensity, codes)
- Availability of regional facilities and opportunities for offsite treatment

The Agency shall review the feasibility analysis and determine the final level of treatment that will be required for the activity.

Too cumbersome? Why not have a lower base standard for redevelopment, and only require a feasibility analysis if that base standard cannot be met. As written, this may discourage redevelopment, so stormwater may remain untreated indefinitely at these locations

) Stormwater treatment systems for activities within drainage basins defined by the 12-unit HUC of a water body that does not meet water quality standards, including waters on the adopted Verified List of Impaired Waters, or for which a Total Maximum Daily Load (TMDL) or a Basin Management Action Plan (BMAP) has been adopted, shall provide:
(i) the level of stormwater treatment required in (a), (b), or (c) above, as applicable, and

(b) is too restrictive, especially in the case of redevelopment. Where BMAPs have already been completed, the existing load from these sites is already accounted for and covered by projects included in the BMAP - so why require the site itself to achieve the same percentage reduction? This is doublecounting and could hinder responsible redevelopment in highly urbanized areas. (a) is sufficient if the BMAP is completed. (b) should not be included at the State level but instead should be left up to the local government, which may prefer a lesser standard to encourage redevelopment and can cover the TMDL allocation with its own CIPs

reduce; level should be based on a net reduction from existing, not from pre- or post- for redevelopment

(ii) the greater of:
   a. net improvement for the pollutant that is not meeting water quality standards, or
   b. the percent reduction specified in an adopted TMDL or BMAP for the pollutant that is not meeting water quality standards.

Table 3.1 summarizes the Performance Standards in this rule.

Table 3.1 Stormwater Treatment Performance Standards

NON-OFWs	OFWs	IMPAIRED WATERS	IMPAIRED WATERS WITH ADOPTED TMDL OR BMAP
REDEVELOPMENT SITES ≤ 2 ACRES **85% or Post=Pre, whichever is less unless feasibility analysis demonstrates lower level is appropriate**	**REDEVELOPMENT SITES ≤ 2 ACRES** **Post=Pre, unless feasibility analysis demonstrates lower level is appropriate**	**REDEVELOPMENT SITES ≤ 2 ACRES** **85% or Post=Pre, whichever is less unless feasibility analysis demonstrates lower level is appropriate AND Net improvement for pollutant not meeting water quality standards**	**REDEVELOPMENT SITES ≤ 2 ACRES** **85% or Post=Pre, whichever is less unless feasibility analysis demonstrates lower level is appropriate AND Net improvement or TMDL/BMAP % reduction, whichever is greater, pollutant not meeting water quality standards**
ALL OTHER ACTIVITIES **85% or Post=Pre, Whichever is less**	**ALL OTHER ACTIVITIES** **Post = Pre**	**ALL OTHER ACTIVITIES** **85% or Post=Pre, Whichever is less, or, if the water body is an OFW Post=Pre AND in either case net improvement for the pollutant not meeting water quality standards**	**ALL OTHER ACTIVITIES** **85% or Post=Pre, Whichever is less, or, if the water body is an OFW Post=Pre AND in either case net improvement or TMDL/BMAP % reduction, whichever is greater, for the pollutant not meeting water quality standards**

Clarify does this apply basinwide or only at the subbasin level (those sites discharging directly into an impaired waterbody), e.g., what if the site discharges to an unimpaired lake that then flows downstream into the impaired lake?

Using the "natural" definition of "pre", this may also hinder development in already urban areas - perhaps create a more flexible standard (such as pre = existing condition) for those areas that are within an urban service area boundary? Otherwise this may encourage more sprawl

to what consequence?

A showing by the applicant that a stormwater treatment system complies with the applicable BMP design criteria in Part IV of this Handbook, shall create a rebuttable presumption that the applicant has provided reasonable assurance that the proposed activity meets the requirements in **Section 3.1 (a) through (d)**, above.

This potentially adds a lot of flexibility but is very "gray" and open to interpretation

Alternatively, an applicant can provide site-specific information to demonstrate that total phosphorus and total nitrogen loadings discharged to waters do not have the potential, either individually or cumulatively with all other existing and reasonably anticipated projects and pollutant sources in the basin, to cause or contribute to water quality violations in the basin. When an applicant affirmatively demonstrates that nutrient discharges do not have the potential to cause or contribute to water quality violations in the basin, the applicant may propose an alternative treatment level that will reduce the annual nutrient loading such that the discharge will not cause or contribute to violations of state water quality standards, now or in the future.

3.2 Additional Permitting Requirements to Protect Ground Water

State water quality standards for ground water are set forth in Chapter 62-520, F.A.C. In addition to the minimum criteria, Class G-I and G-II ground water must meet primary and secondary drinking water quality standards for public water systems established pursuant to the Florida Safe Drinking Water Act, which are listed in Rules 62-550.310 and 62-550.320, F.A.C.

Only the minimum criteria apply within a zone of discharge, as determined by Rule 62-520.400**,** F.A.C. A zone of discharge is defined as a volume underlying or surrounding the site and extending to the base of a specifically designated aquifer or aquifers, within which an opportunity for the treatment, mixture or dispersion of wastes into receiving ground water is afforded. Generally, stormwater systems have a zone of discharge 100 feet from the system boundary or to the project's property boundary, whichever is less.

typo

Stormwater retention and detention systems are classified as moderate sanitary hazards with respect to public and private drinking water wells. Accoringly, stormwater treatment facilities shall not be constructed within 50 feet of a public or private drinking water supply well.

To assure protection of ground water quality, all stormwater treatment systems shall be designed and constructed to:

(1) Assure adequate treatment of stormwater before it enters any aquifer system used for potable water supply such that no violation of ground or drinking water standards exist outside the authorized Zone of Discharge (the property boundary).

(2) Avoid breaching an aquitard that will allow direct mixing of untreated water between surface water and an aquifer system used for drinking water. Where an aquitard is not present, the depth of the stormwater treatment system shall be limited to prevent any excavation within three (3) feet of the underlying limestone which is part of a drinking water aquifer.

"for LID components, see LID section"?

3.3 Calculating Required Nutrient Load Reduction

To determine the required stormwater nutrient load reduction for a project, the following steps should be undertaken:

- Determine the type of water body to which the stormwater will discharge and select the appropriate performance standard from **Section 3.1** of this Handbook.
- Calculate the project's post-development nutrient loading without treatment for both TN and TP.
- Calculate the required level of TP load reduction, either 85% or "post=pre", as appropriate.

Table 3.4 Summary of Literature-based Runoff Characterization Data for General Land Use Categories in Florida

Land Use Category	Event Mean Concentration (mg/l)	
	Total Nitrogen	Total Phosphorus
Low-Density Residential[1]	1.50	0.18
Single-Family	1.85	0.31
Multi-Family	1.91	0.48
Low-Intensity Commercial	0.93	0.16
High-Intensity Commercial	2.48	0.23
Light Industrial	1.14	0.23
Highway	1.37	0.17
Agricultural		
Pasture	2.48	0.70
Citrus	2.31	0.16
Row Crops	2.47	0.51
General Agriculture[2]	2.42	0.46
Mining/Extractive	1.18	0.15

1. Average of single-family and undeveloped loading rates
2. Mean of pasture, citrus, and row crop land uses

For detailed descriptions of the characteristics of each of the above land use categories and the data that was used in developing **Table 3.4**, please see **Appendix C.**

3.6 Oil and Grease Control

Systems that receive stormwater from areas with impervious area that are subject to vehicular traffic must include a baffle, skimmer, grease trap or other mechanism suitable for preventing oil and grease from leaving the stormwater treatment system in concentrations that would cause a violation of water quality standards. Designs must assure sufficient clearance between the skimmer and concrete structure or pond bottom to ensure that the hydraulic capacity of the structure is not affected. A typical illustration of a skimmer on an outlet structure is shown in **Figure 3.7**.

3. 7 Hazardous or Toxic Substances

Systems serving a land use or activity that produces or stores hazardous or toxic substances shall be designed to prevent exposure of such materials to rainfall and runoff to ensure that stormwater does not become contaminated by such materials. Such land uses may not be appropriate for certain BMPs such as retention basins to minimize introduction of such materials into the ground water.

3.8 Off-site Stormwater

The volume of runoff to be treated from a site shall be determined by the minimum level of treatment set forth in **Section 3.1** of this Handbook; the type of treatment system (i.e., retention, wet detention, etc.); and the meteorological region (rainfall zone) where the project is proposed. If stormwater runoff from off-site areas is allowed to co-mingle with on-site runoff, then the effects of runoff from these off-site areas must be considered in the load reduction calculations for the project site.

So would these offsite loads also have to be reduced to the standard? That would be unreasonable.

(b) Minimize both the extent of area exposed at one time and the duration of exposure;

(c) Schedule activities during the dry season or during dry periods whenever possible to reduce the erosion potential;

(d) Apply erosion control practices to minimize erosion from disturbed areas;

(e) Apply perimeter controls to protect disturbed areas from off-site runoff and to trap eroded material on-site to prevent sedimentation in downstream areas;

(f) Keep runoff velocities low and retain runoff on-site;

(g) Stabilize disturbed areas immediately after final grade has been attained or during interim periods of inactivity resulting from construction delays; and

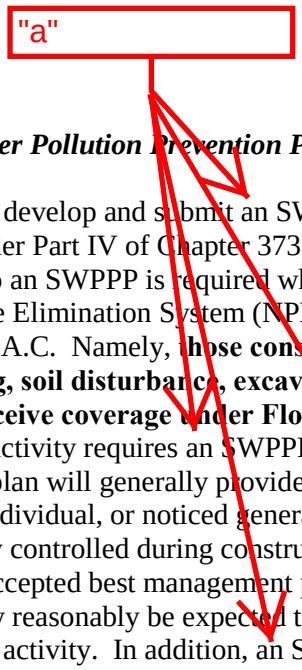
(h) Implement a thorough maintenance and follow-up program.

July 2008 version on dep website

These principles are usually integrated into a system of vegetative and structural measures along with other management techniques that are included in an erosion and sediment control plan to prevent erosion and control movement of sediment. In most cases, a combination of limited clearing and grading, limited time of exposure, and a judicious selection of erosion control practices and sediment trapping systems will prove to be the most practical method of controlling erosion and the associated production and transport of sediment. Permit applicants, system designers, and contractors can refer to the *State of Florida Erosion and Sediment Control Designer and Reviewer Manual (June 2007) and the Florida Stormwater, Erosion, and Sediment Control Inspector's Manual (FDEP 2005)*, for further information on erosion and sediment control. These manuals provide guidance for the planning, design, construction, and maintenance of erosion and sediment control practices. Copies of the *State of Florida Erosion and Sediment Control Designer and Reviewer Manual* are available from the University of Central Florida's Stormwater Management Academy's Internet site at: http://www.stormwater.ucf.edu/FLErosionSedimentManual_6_07.pdf. Copies of *The Florida Stormwater, Erosion, and Sediment Control Inspector's Manual* can be obtained upon request from the Florida Department of Environmental Protection, Nonpoint Source Management Section, M.S. 3570, 2600 Blair Stone Road, Tallahassee, Florida 32399-2400 (phone 850-245-7508). Copies of the above documents are also available on the Department's Internet site at: http://www.dep.state.fl.us/water/nonpoint/erosion.htm

4.2 Development of an Erosion and Sediment Control Plan

An erosion and sediment control plan must be submitted as part of the application as a way of providing reasonable assurance that water quality standards will not be violated. The plan must identify the location, relative timing, and specifications for all erosion and sediment control and stabilization measures that will be implemented as part of the project's construction. The plan must provide for compliance with the terms and schedule of implementing the proposed project, beginning with the initiation of construction activities. The plan may be submitted as a separate document, or may be contained as part of the plans and specifications of the construction documents.



4.3 Development of a Stormwater Pollution Prevention Plan (SWPPP) for NPDES Requirements

Although the requirement to develop and submit an SWPPP under an NPDES permit is not a requirement for a permit under Part IV of Chapter 373, F.S., applicants are advised that preparation and adherence to an SWPPP is required where the permitted activity also requires a National Pollution Discharge Elimination System (NPDES) construction permit pursuant to subsection 62-621.300(4), F.A.C. Namely, **those construction activities resulting in greater than 1 acre of land clearing, soil disturbance, excavation, or deposition of dredge materials must also apply for and receive coverage under Florida's NPDES Stormwater Permitting program.** If the proposed activity requires an SWPPP for compliance with the NPDES construction permit, such a plan will generally provide the level of reasonable assurance needed as part of the review of an individual, or noticed general permit, to demonstrate that erosion and sediments will be adequately controlled during construction. Such SWPPPs must be prepared in accordance with generally accepted best management practices. An SWPPP identifies potential sources of pollution that may reasonably be expected to affect the quality of stormwater discharge associated with construction activity. In addition, an SWPPP describes and ensures the implementation of best management practices that will be used to reduce the pollutants in stormwater discharge associated with construction activities.

The details and scope of the SWPPP will depend on the potential for erosion. Projects with larger exposed areas, long duration of construction, steep slopes, erosive soils, or close proximity to streams and other watercourses generally require more detailed and comprehensive plans. The SWPPP must include consideration of the site-specific erosion potential, including slopes, soil erodibility, vegetative cover, and runoff characteristics.

4.3.1 Contents of an SWPPP

Sections 4.3.1.1 through **4.3.1.4** are excerpted from the requirements for a NPDES construction generic permit (http://www.dep.state.fl.us/water/stormwater/npdes/docs/cgp.pdf) and are provided here for the convenience of the reader. A SWPPP, as described in **Section 4.3**, that contains the elements discussed in **Sections 4.3.1.1** through **4.3.1.4,** below, will generally provide the reasonable assurance that turbidity, sedimentation, and erosion can be controlled during implementation of the project.

4.3.1.1 SWPPP Site Description

Each plan shall provide a description of pollutant sources and all of the following information.

(a) A description of the nature of the construction activity.

(b) A description of the intended sequence and schedule of major activities that disturb soils for major portions of the site. At a minimum, the following applicable phases must be addressed: clearing and grubbing, excavation, earthwork and site grading (including embankment earthwork), site utilities, roads, and stabilization. The schedule must include estimated starting dates and duration. The description must include the limits of areas impacted by each phase.

(c) Estimates of the total area of the site and the total area of the site that is expected to be disturbed by excavation, grading, or other construction activities.

PART V – BEST MANAGEMENT PRACTICES

Stormwater treatment systems are composed of best management practices (BMPs) that can be categorized into three basic types: retention BMPs, detention BMPs, and source control BMPs. Retention BMPs are also known as infiltration practices – the stormwater treatment volume is not discharged but is recovered through percolation into the soil, evaporation, and evapotranspiration. Infiltration BMPs include retention basins or trenches, exfiltration trenches, underground retention systems, underground retention vault/chamber, French drains, swales, vegetated natural buffers, pervious pavements, and greenroof/cistern systems. Detention BMPs are those that detain stormwater and discharge it at a specified rate, usually the predevelopment peak discharge rate. Detention practices include wet detention and underdrain filtration. Source control practices are nonstructural BMPs that are used to either minimize the amount of stormwater generated or minimize the amount of pollutants getting into the stormwater.

what category are baffle boxes, CDS, floating wetlands, etc?

5.0 RETENTION BASIN DESIGN CRITERIA

5.1 Description

A "retention system" is a recessed area within the landscape that is designed to store and retain a defined quantity of runoff, allowing it to percolate through permeable soils into the shallow ground water aquifer. This section discusses the requirements for retention systems, historically referred to as "dry retention basins", which are constructed or natural depressional areas, often integrated into a site's landscaping, where the bottom is typically flat, and turf, natural ground covers or other appropriate vegetation, or other methods are used to promote infiltration and stabilize the basin slopes (see **Figure 5.1**).

Soil permeability and water table conditions must be such that the retention basins can percolate the required treatment runoff volume within a specified time following a storm event. After drawdown has been completed, the basin does not hold any water, thus the system is normally "dry." Unlike detention basins, the treatment volume for retention systems is not discharged to surface waters.

Retention basins provide numerous benefits, including reducing stormwater volume, which reduces the average annual pollutant loading that may be discharged from the system. Additionally, many stormwater pollutants such as suspended solids, oxygen demanding materials, heavy metals, bacteria, some varieties of pesticides, and nutrients are removed as runoff percolates through the soil profile.

To accomplish the desired level of pollutant load reduction, retention basins shall be designed in accordance with the following design and performance criteria.

5.2 Required Treatment Level and Associated Treatment Volume

The Required Treatment Volume (RTV) necessary to achieve the required treatment efficiency shall be routed to the retention basin and percolated into the ground. The required nutrient load reduction will be determined by type of waterbody to which the stormwater system discharges and the associated performance standard as set forth in **Section 3.1** of this Handbook. Treatment volumes to achieve the necessary efficiencies shall be determined based on the percentage of directly connected impervious area (DCIA) and the weighted curve number for non-DCIA areas. **Appendix D** provides dry retention depths (inches of runoff over the drainage area) in order to achieve 85 percent removals for the various meteorological regions. For post=pre calculations, **Appendix F** provides performance efficiencies for dry retention runoff volumes for the various meteorological regions.

6.3 Calculating Load Reduction Efficiency for a Given Retention Volume

If exfiltration trenches are being used as part of a BMP treatment train to achieve some level of pollutant load reduction but not the total amount of the required nutrient load reduction, the tables in **Appendix F** shall be used.

6.4 Design and Performance Criteria

(a) Exfiltration trenches must have the capacity to retain the required treatment volume without a discharge and without considering soil storage.

If a condominium, does the HOA count as a "single owner."

(b) The required treatment volume initially shall be retained in the perforated/slotted pipe and the surrounding aggregate reservoir.

(c) Exfiltration trenches shall only be permitted for projects to be operated by entities with single owners or entities with full-time maintenance staffs.

(d) The exfiltration trench must provide the capacity for the required treatment volume of stormwater within 72 hours, with a safety factor of two, following a storm event assuming average antecedent runoff condition (ARC 2). In exfiltration systems, the stormwater is drawn down by natural soil infiltration and dissipation into the ground water table as opposed to underdrain systems which rely on artificial methods such as drainage pipes. A recovery analysis is required that accounts for the mounding of ground water beneath the exfiltration system. Details related to safety factors, mounding analysis and supporting soil testing is provided in **Section 21** of this Handbook.

(e) Minimum perforated or slotted pipe diameter shall be twelve (12) inches.

(f) Minimum aggregate reservoir trench width shall be three (3) feet.

(g) To assure recovery of the Required Treatment Volume (RTV), a dry exfiltration trench must be designed so that the invert elevation of the trench must be at least two feet above the seasonal high ground water table elevation unless the applicant demonstrates, based on plans, test results, calculations or other information, that an alternative design is appropriate for the specific site conditions. Refer to **Figure 6.1** for additional information.

(h) Because of the unique aquifer characteristics, wet exfiltration trenches will only be allowed within Miami-Dade County. Refer to **Figure 6.2** for additional information.

(i) To prevent surrounding soil migration into the aggregate reservoir, the reservoir must be enclosed on all sides by a permeable woven or non-woven filter fabric. The permeability of the filter fabric must be greater than the permeability of the surrounding soil.

(j) To facilitate inspection of proper operation and maintenance of the exfiltration system, the system must be designed with sufficient access for inspection. Appropriate inspection access is dependent on the design of the specific system, but all must provide the ability to determine whether the system is maintaining the design infiltration rate and storage volume. Examples of acceptable inspection methods include designing the system such that the terminal ends of any perforated/slotted pipe or storage areas either:

- Terminating in an accessible drainage inlet or manhole; or

(d) If underground storage and retention systems are proposed within Sensitive Karst Areas, they shall be designed in accordance with the requirements in **Section 29** of this Handbook. Additional geotechnical information will be required.

(e) Sustainable void spaces must be used in computing the storage volume in the aggregate reservoir. These aggregate void space values shall be the greater of the following:

- 35% of aggregate volume; or
- 80% of the measured testing lab values for the selected aggregate(s), if obtained and certified by a Florida licensed geotechnical professional.

(f) Minimum perforated or slotted pipe diameter of twelve (12) inches.

(f) Minimum aggregate reservoir trench width of three (3) feet.

(g) To minimize the loss of the Required Treatment Volume (RTV), the underground retention system must be designed so that the invert elevation of the trench must be at least two feet above the seasonal high ground water table elevation unless the applicant demonstrates, based on plans, test results, calculations or other information, that an alternative design is appropriate for the specific site conditions.

(h) To facilitate inspection/maintenance of the underground retention system, the terminal ends of the perforated/slotted pipe must either:

- Terminate in an accessible drainage inlet or manhole;
- Have an eight (8") inch minimum diameter inspection port installed at any terminal "dead end" of the perforated/slotted pipe; or
- Have an observation well that allows checking of the recovery of the RTV.

Refer to **Figure 8.3** for additional information and recommendations. Alternatively, the applicant may propose a system that is manufactured with an equivalent functional component that would provide for inspection and maintenance.

(j) To provide a collection space for trash and other inflow debris, a minimum 24-inch deep maintenance sump will be required for all system inlets and manholes. A minimum twelve inch (12") diameter weep hole shall be placed in the bottom of the maintenance sump to facilitate the infiltration of stormwater into the underlying soils after a rainfall event. Refer to **Figure 8.3** for additional information and recommendations. Alternatively, the applicant may propose a system that is manufactured with an equivalent functional component that would capture trash and other inflow debris and keep it out of the retention system.

and/or modular storage units?

(k) To reduce the potential for trash, debris and oil/grease inflow into the underground retention system; a baffle, trash tee or other equivalent device must be installed at the end of the perforated/slotted pipe(s) in all access inlets and manholes. Refer to **Figures 8.4** and **8.5** for additional information and recommendations. Alternatively, the applicant may propose a system that is manufactured with an equivalent functional component that would capture trash, debris, and oil/grease inflow into the underground retention system

(l) The Required Treatment Volume (RTV) shall be initially retained in the perforated/slotted pipe and the surrounding aggregate reservoir.

regions. For post=pre calculations, **Appendix F** provides performance efficiencies for dry retention runoff volumes for the various meteorological regions.

Underground vault/chamber systems must be designed to have the capacity to retain the required treatment volume without considering discharges to ground or surface waters.

8.3 Calculating Load Reduction Efficiency for a Given Retention Volume

If underground vault/chamber systems are being used as part of a BMP treatment train to achieve some level of pollutant load reduction but not the total amount of the required nutrient load reduction, the tables in **Appendix F** shall be used.

8.4 Design Criteria

(a) Underground vault/chamber systems must have the capacity to retain the required treatment volume without a discharge without considering soil storage.

(b) Underground vault/chamber systems shall only be permitted for projects to be operated by entities with single owners or entities with full time maintenance staffs.

Why not have "single owner" or "full time maintenance staff" option as in exfiltration instead? Is the issue replacement difficulty if the system completely fails?

(c) Underground vault/chamber systems cannot be used under buildings or other areas where there is not reasonable assurance of maintenance access for repair and replacement.

(d) The underground vault/chamber system must recover the Required Treatment Volume (RTV) of stormwater to the bottom of the vault / chamber system (the top of the sub-grade soil) within 72 hours, with a safety factor of two, following a storm event, assuming average Antecedent Runoff Condition (ARC 2). In underground vault / chamber systems, the stormwater is drawn down by natural soil infiltration and dissipation into the ground water table, as opposed to underdrain systems which rely on artificial methods like perforated or slotted drainage pipes. A drawdown or recovery analysis is required that accounts for the mounding of ground water beneath the underground vault / chamber system. Details related to safety factors, recovery/mounding analysis and supporting soil testing is provided in **Section 21** of this Handbook.

(f) The seasonal high ground water table shall be at least two feet beneath the bottom of the underground vault/chamber system unless the applicant demonstrates, based on plans, test results, calculations or other information, that an alternative design is appropriate for the specific site conditions.

(g) The underground vault/chamber system shall include inspection ports or an observation well to assess system function after storm events or prior to maintenance activities. Refer to **Figure 8.1** for additional information.

(h) The underground vault/chamber system shall include up-gradient sediment / trash removal devices prior to subsequent discharge into the underground vault / chamber system. Refer to **Figures 8.2 and 8.3** for additional information.

(i) Underground vault/chamber systems shall have sufficient access to allow maintenance of the underlying soil's ability to infiltrate the required treatment volume.

typo? demonstrates what? "demonstrates sufficient performance"?

(j) Underground vault/chamber systems shall have more than one access point for maintenance activities. It is recommended that one of the access points be a "trench grate" access system.

(l) Underground vault/chamber systems shall not have effluent underdrain detention / recovery systems within or directly beneath the vault / chamber due to the high degree of difficulty in long term maintenance and rehabilitation of the underdrains.

(m) Effluent underdrain detention/recovery systems, outside and adjacent to the vault / chamber shall not be allowed unless the applicant affirmatively demonstrates based on plans, test results, calculations, and assurances of adequate access and long term Operation and Maintenance (O&M) procedures. If used, these external effluent underdrain detention/recovery systems must meet the criteria specified in **Section 17.0** of this Handbook, including the nutrient load reduction requirements.

(n) Underground vault/chamber systems shall not be constructed within 50 feet of a public or private potable water supply well.

(o) If underground vault/chamber systems are proposed within Sensitive Karst Areas, they shall be designed in accordance with the requirements in **Section 29** of this Handbook.

8.5 Required Site Information

Design of an underground vault/chamber systems must consider site conditions including soil, geology, and water table conditions. Specific data and analyses required for the design of an underground vault/chamber systems are set forth in **Section 21** of this Handbook.

8.5 Construction requirements

Underground vault/chamber system construction procedures and the overall sequence of site construction are two key factors that can control their effectiveness and longevity. Concerns that must be addressed to ensure that the design infiltration rate is met include minimizing soil compaction during construction and minimizing the amount of sediment that enters the system.

The following construction procedures are required to avoid degradation of underground vault/chamber system infiltration capacity due to construction practices:

(a) The location and dimensions of the underground vault/chamber system shall be verified onsite prior to its construction. All design requirements such as distance to foundations, septic systems, and wells need to be verified.

(b) Excavation for the underground vault/chamber system shall be done in such a way as to minimize soil compaction of the bottom of the system.

(c) Excavated materials shall be placed a sufficient distance from the sides of the excavated area to minimize the risk of sidewall cave-ins and prevent the material from re-entering the system.

(d) Inflows to the system shall be temporarily blocked until the contributing drainage area is stabilized to prevent sediment from entering and clogging the system.

9.0 SWALES

9.1 Description

any additional bonus for converting to rain garden/ bioretention ?

Swales have been used for conveyance of stormwater along roads for decades. However, swales can also be used for stormwater treatment, especially as part of a BMP Treatment Train, when properly designed and maintained to provide retention and infiltration of stormwater.

Swales are defined in Chapter 403.803(14), Florida Statutes, as follows:
"Swale means a manmade trench which:

1. Has a top width to depth ratio of the cross-section equal to or greater than 6:1, or side slopes equal to or flatter than 3 feet horizontal to 1-foot vertical;
2. Contains contiguous areas of standing or flowing water only following a rainfall event;
3. Is planted with or has stabilized vegetation suitable for soil stabilization, stormwater treatment, and nutrient uptake; and
4. Is designed to take into account the soil erodibility, soil percolation, slope, slope length, and drainage area so as to prevent erosion and reduce pollutant concentration of any discharge."

Swales are online retention systems and their treatment effectiveness is directly related to the amount of the annual stormwater volume that is infiltrated. Swales designed for stormwater treatment can be classified into two categories:

- Swales with swale blocks or raised driveway culverts
- Swales without swale blocks or raised driveway culverts

9.2 Swales with Swale Blocks or Raised Driveway Culverts (Linear Retention Systems)

A swale with swale blocks or raised driveway culverts essentially is a linear retention system in which the treatment volume is retained and allowed to percolate. The treatment volume necessary to achieve the required treatment efficiency shall be routed to the swale and percolated into the ground before discharge. Linear retention swales are designed following the requirements in **Section 5** and the design criteria specific to swales in **Section 9.4** of this Handbook. This type of swale system is recommended when multiple inflows occur to a swale.

9.3 *Swales without Swale Blocks or Raised Driveway Culverts (Conveyance Swales)*

Conveyance swales are designed and constructed to required dimensions to properly convey and infiltrate stormwater runoff as it travels through the swale. Conveyance swales may be useable in some projects as part of a BMP treatment train to provide pre-treatment of runoff before its release into another BMP depending upon the site conditions, the location of inflows, and the land use plan. These swales are designed to infiltrate a defined quantity of runoff (the treatment volume) through the permeable soils of the swale floor and side slopes into the shallow ground water aquifer immediately following a storm event (**Figure 9.1**). Turf or other acceptable vegetation is established to prevent erosion, promote infiltration and stabilize the bottom and side slopes. Soil permeability and water table conditions must be such that the swale can percolate the required runoff volume. The swale holds water only during and immediately after a storm event, thus the system is normally "dry." These types of swales are "open" conveyance systems. This means there are no physical barriers such as swale blocks or raised driveway culverts to impound the runoff in the swale prior to discharge to the receiving water. In these types of swales, the inflow of stormwater occurs at the "top" of the swale system and the retention volume and associated stormwater treatment credit is based on the infiltration that occurs as the stormwater moves down the swale.

9.3.2 Calculating the Swale Length

The average flow rate through the swale and the length of swale needed to percolate a given volume of stormwater can be calculated using the two equations below.

Equation 9.3.1 Calculating the average flow rate:
This is calculated using the rational formula with the peak rate divided by 2 (average of triangular hydrograph).

Q = 0.5 CIA

define Q (cfs)

Where:
C = runoff coefficient
I = rainfall intensity (inches/hour) for the time of concentration
= desired treatment volume/Time of Concentration

Equation 9.3.2 Swale length for Trapezoidally Shaped Swales

$$L = \frac{43{,}200\ Q}{\left\{B + 2\left[\frac{1.068\ n\ Q\ (1 + Z^2)^{1/3}}{S^{1/2}\ Z^{2/3}\ 2[(1 + Z^2)^{1/2} - Z]}\right]^{3/8} (1 + Z^2)^{1/2}\right\} i}$$

Where K = 9900 if Z = 3
8500 if Z = 4
7500 if Z = 5
6750 if Z = 6
6150 if Z = 7

Where:
L = Length of swale (ft)
B = Bottom width (ft)
Q = Average flow rate to be percolated from Equation 9.3.1
n = Manning's Roughness Coefficient
Z = Side slope (horizontal distance for a one foot vertical change)
S = Longitudinal slope
i = Infiltration rate (inches/hour)

9.4 Design Criteria for Swales

(a) Conveyance swales will be designed to infiltrate the required volume of stormwater needed to achieve the desired level of nutrient load reduction before discharging to the downstream BMP. Linear retention swales shall be designed to infiltrate the required treatment volume as for retention systems as specified in **Section 5** of this Handbook.

(b) The seasonal high ground water table shall be at least two feet below the bottom of the swale unless the applicant demonstrates based on plans, test results, calculations or other information that a alternative design is appropriate for the specific site conditions.

(c) The minimum infiltration rate through the vegetation and soil shall be at least one inch per hour.

10.0 VEGETATED NATURAL BUFFERS

10.1 Description

Vegetated natural buffers (VNBs) are defined as areas with vegetation suitable for nutrient uptake and soil stabilization that are set aside between developed areas and a receiving water or wetland for stormwater treatment purposes. Under certain conditions, VNBs are an effective best management practice for the control of nonpoint source pollutants in overland flow by providing opportunities for filtration, deposition, infiltration, absorption, adsorption, decomposition, and volatilization.

VNBs are most commonly used as an alternative to swale/ berm systems installed between backyards and the receiving water. Buffers are intended for use to avoid the difficulties associated with the construction and maintenance of backyard swales on land controlled by individual homeowners. Potential impacts to adjacent wetlands and upland natural areas are reduced because fill is not required to establish grades that direct stormwater flow from the back of the lot towards the front for collection in the primary stormwater management system. In addition, impacts are potentially reduced since buffer strips can serve as wildlife corridors, reduce noise, and reduce the potential for siltation into receiving waters.

Vegetative natural buffers are not intended to be the primary stormwater management system for residential developments. They are most commonly used only to treat those rear-lot portions of the development that cannot be feasibly routed to the system serving the roads and fronts of lots. A schematic of a typical VNB and its contributing area is presented in **Figure 10.1.** The use of a VNB in combination with a primary stormwater management system for other types of development shall only be allowed if the applicant demonstrates that there are no practical alternatives for those portions of the project, and only if the VNB and contributing areas meet all of the requirements in this section of the Handbook.

10.2 Required Treatment

The treatment volume necessary to achieve the desired or required treatment efficiency shall be routed to the Vegetated Natural Buffer and percolated into the ground. The required nutrient load reduction will be determined by type of water body to which the stormwater system discharges and the associated performance standard as set forth in **Section 3.1** of this Handbook. Treatment volumes to achieve the necessary efficiencies shall be determined based on the percentage of directly connected impervious area (DCIA) and the weighted curve number for non-DCIA areas. **Appendix D** provides dry retention depths (inches of runoff over the drainage area) in order to achieve 85 percent removals for the various meteorological regions. For post=pre calculations, **Appendix F** provides performance efficiencies for dry retention runoff volumes for the various meteorological regions.

Natural areas adjacent to rear-lots that have good infiltration potential are candidates for use as VNBs. Runoff from the rear-lot areas must be designed to percolate a specified portion of runoff as indicated below.

Compare to 10.4(b) which appears more restrictive; recommend keep flexibility in 10.1 as some small lakefront commercial developments may have few other options

Figure 10.1 to be added? clarify length and width criteria (Sec 10.4)

Figure 10.1 Plan View Schematic of Typical Vegetative Natural Buffer

10.3 Calculating Load Reduction Efficiency for a Given Retention Volume

If Vegetated Natural Buffers are being used as part of a BMP treatment train to achieve some level of pollutant load reduction but not the total amount of the required nutrient load reduction, the tables in **Appendix F** shall be used.

Compare to more flexible language in 10.1 (preferred)

This isn't feasible for the entire buffer when adjacent to waterbody or wetland

10.4 Design Criteria

(a) Vegetated Natural Buffers shall be designed to infiltr t volume as specified in **Section 10.2** of this Handbook.

(b) The contributing area is defined as the area that drains to the VNB. Only rear-lots of residential areas are allowed to contribute runoff to a VNB and then only if routing the runoff from such areas to the primary stormwater management system serving the development is not practical.

(c) The seasonal high ground water table shall be at least two feet below the bottom of the vegetated natural buffer unless the applicant demonstrates based on plans, test results, calculations or other information that an alternative design is appropriate for the specific site conditions.

parallel or perpendicular?

(d) The minimum infiltration rate through the vegetation and soil shall be at least one inch per hour.

(e) The minimum buffer width (dimension parallel to flow direction) shall be 25 feet to provide adequate area for infiltration and the maximum VNB width shall be 100 feet to ensure sheet flow conditions and the integrity of the treatment system. Factors affecting the minimum width (measured parallel to the direction of runoff flow) of VNB include infiltration rate, ground slope, rainfall, cover and soil characteristics, depth to water table and overland flow length. Infiltration is the primary means of treatment in vegetated natural buffers. A sample calculation for designing a buffer to meet the above requirements is provided in **Section 28** of this Handbook

(f) The maximum slope of VNB shall not be greater than 6:1.

(g) The length of the buffer (measured perpendicular to the runoff flow direction) must be at least as long as the length of the contributing runoff area (see **Figure 10.1**).

(h) Runoff from the adjacent contributing area must be evenly distributed across the buffer strip to promote overland sheet flow. If the flow regime changes from overland to shallow concentrated flow, the buffer is effectively "short-circuited" and will not perform as designed.

(i) The Property Association Documents and Conditions Covenants and Restrictions (CC&R's) will require that the contributing area must be stabilized with permanent vegetative cover that is consistent with the Florida Friendly Landscaping program and which is fertilized only with Florida-friendly fertilizers.

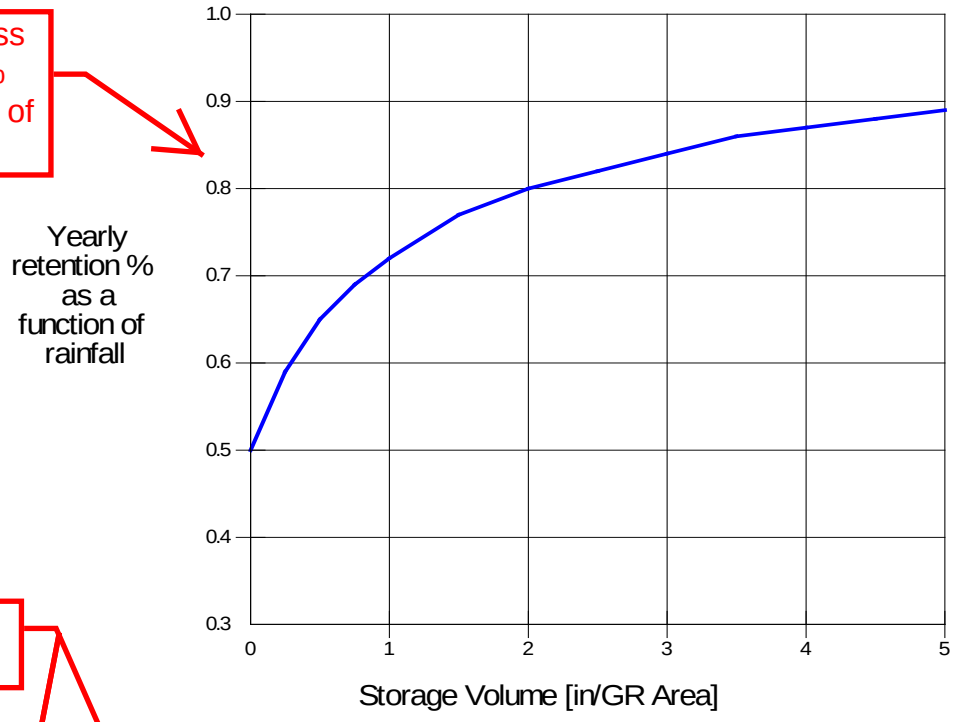
(j) A legal reservation, in the form of an easement or other limitation of use, must be recorded which provides preservation of entire area of the Vegetated Natural Buffer. The reservation must also include access for maintenance of the VNB unless the operation and maintenance entity wholly owns or retains ownership of the property.

(k) The VNB area will be an existing undeveloped area which contains existing or planted vegetation suitable for infiltrating stormwater and soil stabilization. The existing vegetation must not be disturbed during or after the construction of the project. If the VNB will be planted, the proposed list of Florida-friendly plants must be submitted to the Agency for

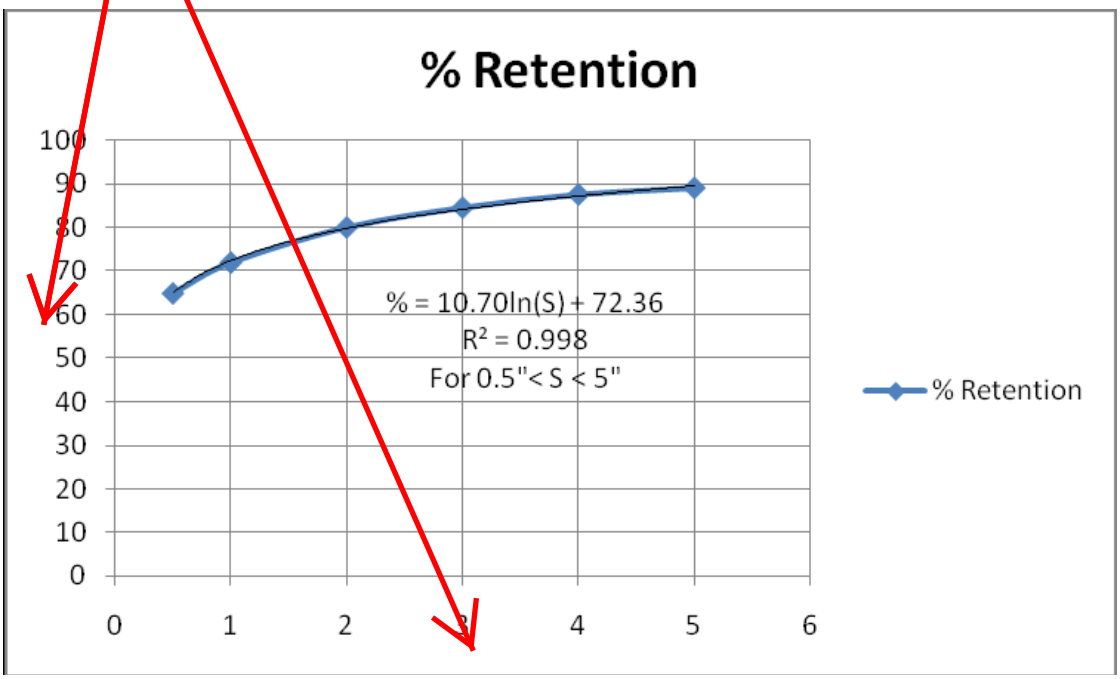
pdf formatting problem?

Greenroof Harvesting Design Curve for Belle Glade Florida Area
Using 48 years of data

relabel or express as %? (e.g. 70% not 0.7) - typical of multiple figures



label axes (typical multiple figures)



At Belle Glade, percent yearly retention by a greenroof with no cistern is 50%.

18.0 LOW IMPACT DESIGN BMPS – DESIGN AND LOAD REDUCTION CREDITS

To achieve the level of nutrient treatment required for the protection of Florida's surface and ground waters, greater emphasis must be placed on nonstructural BMPs, the first car in the BMP Treatment Train. When applied early in the design process, low impact design techniques can reduce stormwater volume and pollutants generated from development sites. The use of low impact design BMPs can reduce stormwater treatment and management BMP size requirements. Stormwater nutrient load reduction credits for low impact design BMPs are directly related to the amount of stormwater volume or pollutant load that is prevented. Not all credits will be available for each site, and certain site-specific conditions must be met to receive each credit. These minimum conditions include site factors such as maximum flow length or contributing area that avoid situations that could lead to runoff concentration and erosion. Stormwater load reduction credits associated with low impact design BMPs do not relieve designers from the normal standard of engineering practice of safe conveyance and stormwater management design.

Low impact design BMPs that are eligible for stormwater nutrient load reduction credits include:

- Natural Area Conservation
- Site Reforestation
- Disconnecting Directly Connected Impervious Areas
- Florida-friendly landscaping
- Rural subdivisions

penalizes small, urban sites; add flexibility for sites within an urban service area

Low Impact Design BMPs

18.1 Natural Area Conservation Credit

Natural area conservation protects natural resources and environmental features that help maintain the undeveloped hydrology of a site by reducing runoff, promoting infiltration and preventing soil erosion. The undisturbed soils and native vegetation of conservation areas promote rainfall interception and storage, infiltration, runoff filtering and direct uptake of pollutants. Natural areas are eligible for stormwater credit if they remain undisturbed during construction and are protected by a permanent conservation easement prescribing allowable uses and activities on the parcel and preventing future development. Examples of conservation areas include any areas of undisturbed vegetation preserved at the development site, such as forests, floodplains and riparian areas, steep slopes, and stream, wetland and shoreline buffers.

Calculation of Stormwater Treatment Credit

Natural areas that are placed into conservation shall be excluded from the runoff calculations used to determine the volume of stormwater that must be treated or to calculate pre- and post-development nutrient loads.

Conditions for Credit

Proposed conservation areas shall meet all of the conditions outlined below to be eligible for credit:

- The minimum combined area of all natural areas conserved at the site must exceed one acre.
- No disturbance may occur in the conservation area during or after construction (i.e., no clearing or grading except for restoration operations or removal of vegetation unless provided for within the conservation easement).

- The limits of disturbance around each conservation area shall be clearly shown on all construction or permit drawings.
- A long-term vegetation management plan must be prepared to maintain the conservation area in a natural vegetative condition. Managed turf is not considered an acceptable form of vegetation management, and only the passive recreational areas of dedicated parkland are eligible for the credit (e.g., ball fields and golf courses are not eligible).
- The conservation area must be protected by a perpetual easement which is filed in the public records prior to beginning construction.
- The credit cannot be granted for natural areas already protected by existing federal, state, local law, or existing conservation easement.

18.2 Site Reforestation Credit

Site reforestation involves planting trees on existing turf or barren ground at a development site with the explicit goal of establishing a mature forest canopy that will intercept rainfall and maximize infiltration. Reforested or restored sites that are protected and maintained under a perpetual conservation easement will be eligible for this load reduction credit.

Reforestation is accomplished through active replanting or natural regeneration of forest cover. A range of research has demonstrated the runoff reduction benefits associated with forest cover compared to turf cover. The runoff benefits include greater infiltration of stormwater, reduced soil erosion, and removal of stormwater pollutants. Forest soils actively promote greater infiltration rates through surface organic matter and macropores created by tree roots. Forests also intercept rainfall in their canopy, reducing the amount of rain that reaches the ground. Evapotranspiration by trees increases potential water storage in the soil.

Calculation of Stormwater Treatment Credit

Natural areas that are placed into conservation shall be excluded from the runoff calculations used to determine the volume of stormwater that must be treated or to calculate pre- and post-development nutrient loads.

penalizes small, urban sites; add flexibility for sites within an urban service area

Conditions for Credit

A proposed reforestation project shall meet all of the conditions outlined below to earn the stormwater treatment credit:

- The minimum contiguous area of reforestation shall be greater than 20,000 square feet (i.e., no credit is granted for planting of individual trees).
- A long-term vegetation management plan must be prepared and filed as part of the permit application to maintain the conservation area in a natural forest condition.
- The conservation area must be protected by a perpetual conservation easement recorded in the public record pursuant to Section 704.06, F.S.
- The method used for reforestation must achieve 75% forest canopy cover within ten years.
- The planting plan must be approved by the Agency, including any special site preparation needs.

Florida friendly does not have to be native; recommend get input from FYN staff on this section

18.4 Florida-friendly Landscaping Credit

Our yards, landscapes, and neighborhoods are channels to our waterways. The yard is the first line of defense for preserving Florida's vulnerable and limited water resources. The health of Florida's estuaries, rivers, lakes, springs and aquifers depends partly on how our landscapes and yards are designed and maintained. Rain that falls on yards, roads and parking lots can wash into waterways or leach into ground water, carrying pollutants—including fertilizers, pesticides, animal waste, soil and petroleum products. Improperly applied fertilizers and pesticides from residential areas pose a serious threat to the health of Florida's surface and ground waters.

For decades, Florida landscaping has been portrayed as picture postcards of lavish resorts, tourist destinations and tropical gardens. But the pictures of natural Florida are quite different. The Florida Natural Areas Inventory identifies 82 different natural ecological communities in Florida, from wetlands to xeric uplands. Unfortunately, much of the state's original rich diversity has been replaced with impervious surfaces, such as asphalt and concrete, and housing developments with standardized yards that bear little resemblance to native Florida. Expanses of high-maintenance lawns have formed the dominant landscape in most of our communities for years, but that is changing. Florida-friendly landscaping and fertilizers are now being promoted as nonstructural BMP to reduce the need for fertilizers, pesticides, and irrigation through the Florida Yards and Neighborhoods and the Green Industry BMP program.

The ideal Florida-friendly Yard—the smart way to grow—should boast natural beauty that reflects the native landscapes of our state. But this beauty must be created and sustained by environmentally safe landscape practices. What are some of those practices? This integrated approach to landscaping emphasizes nine interrelated principles:

- **Right plant, right place**
- **Water efficiently**
- **Fertilize appropriately**
- **Mulch**
- **Attract wildlife**
- **Manage yard pests responsibly**
- **Recycle yard waste**
- **Reduce stormwater runoff**
- **Protect the waterfront**

In addition to Florida-friendly landscape design, proper use of fertilizers and pesticides is essential to protecting Florida's surface and ground waters. The recently adopted Urban Turf Fertilizer Labeling rule (Chapter 5E-1.003, F.A.C) adopted by FDACS specifies the types of fertilizers that can be sold in Florida for use on urban turf and establishes recommended application rates. The Florida Green Industry BMP Program is an education program developed cooperatively by DEP, the UF-IFAS, and the industry to reduce the impacts of landscape maintenance on our water resources.

Stormwater Treatment Credit

calculations or other information, that the proposed width is appropriate for the specific site conditions and will provide the required level of nutrient load reduction.

(d) The project shall maintain a minimum 75 foot buffer adjacent to all project boundaries;

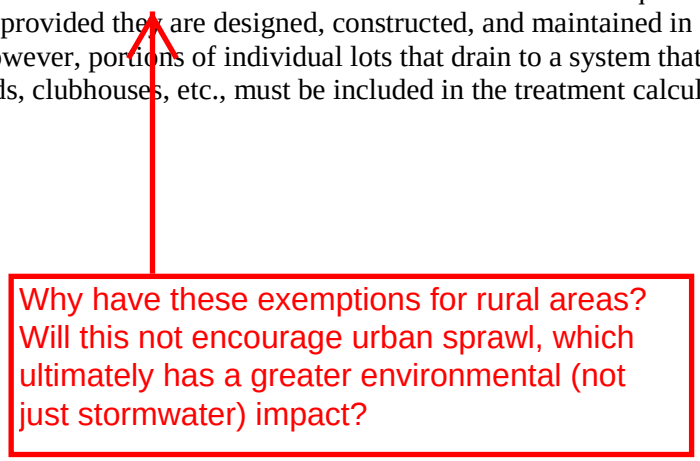
(e) If it is anticipated that property owners will keep animals, such as horses, cattle, or hogs on their land, then they shall:

- Not allow the animals into any vegetated natural buffers.
- Implement appropriate animal management BMPs to minimize the impacts of the animals and their associated wastes on waters or wetlands.
- These requirements shall be included in any declaration of covenants, conditions, easements and restrictions and shall be identified in all sales contracts by the developer.

(f) The boundaries of the surface water management system and buffers shall be recorded in plats or easements and included in any declaration of covenants, conditions, easements and restrictions and shall be identified in all sales contracts by the developer. These recorded documents shall be perpetual and applicable to all future sales of property within the development. Language shall also be contained in the recorded documents notifying all individual lot owners that permits are required if any of the following items are proposed:

1. Alteration to the surface water management system;
2. Encroachment into the wetlands, wetland buffers, or adjacent off-site property line buffers.

Drainage areas from individual lots in rural subdivision are not required to provide treatment of stormwater provided they are designed, constructed, and maintained in accordance with this section. However, portions of individual lots that drain to a system that serves other activities such as roads, clubhouses, etc., must be included in the treatment calculations for that system



20.0 URBAN STORMWATER RETROFIT PROJECTS

20.1 Description

An urban stormwater retrofit is a project that adds treatment to an existing stormwater management system serving existing land uses that results in reduced stormwater pollutant loadings. Retrofit projects do not serve new development or redevelopment. The applicant for a retrofit project must provide reasonable assurance that the retrofit project itself will not result in new adverse water quality and quantity impacts to receiving waters.

If the applicant has conducted, and the Agency has approved, an analysis that provides reasonable assurance that the proposed retrofit will provide the intended pollutant load reduction from the existing system or systems, the retrofit project will not be required to comply with the performance standards set forth in **Section 3.1** of this Handbook.

20.2 Goals and Performance Standards

Section 62-40.432(2)(c), F.A.C., states that pollutant loading from older stormwater management systems shall be reduced as necessary to restore or maintain the designated uses of waters. The applicant shall conduct a feasibility assessment to determine which BMP(s) and design criteria shall provide the greatest pollutant removal in the most cost-effective manner given the limitations of the project site.

20.3 Design and Selection of Applicable BMPs

When site conditions allow, stormwater retrofit BMPs shall be designed to the criteria set forth in this handbook. However, in many cases, site constraints commonly encountered in existing, developed areas can limit the type and size of stormwater BMPs used for retrofitting. In addition to the traditional treatment BMPs specified in this handbook, a number of other BMPs may be suitable for retrofitting. However, it is important to assure that the BMPs selected for stormwater retrofitting are effective in removing the pollutants of concern which, in most cases, will be nutrients.

Why mandate a feasibility analysis? Leave this to the local government's discretion; cost is not the only factor to be considered in retrofits!

EXEMPTIONS

What about single family residence and minimum impervious area thresholds (typical ERP exemptions) - do these apply?

From Section 373.406, Florida Statutes

The following exemptions shall apply:

(1) Nothing herein, or in any rule, regulation, or order adopted pursuant hereto, shall be construed to affect the right of any natural person to capture, discharge, and use water for purposes permitted by law.

(2) Nothing herein, or in any rule, regulation, or order adopted pursuant hereto, shall be construed to affect the right of any person engaged in the occupation of agriculture, silviculture, floriculture, or horticulture to alter the topography of any tract of land for purposes consistent with the practice of such occupation. However, such alteration may not be for the sole or predominant purpose of impounding or obstructing surface waters.

(3) Nothing herein, or in any rule, regulation, or order adopted pursuant hereto, shall be construed to be applicable to construction, operation, or maintenance of any agricultural closed system. However, part II of this chapter shall be applicable as to the taking and discharging of water for filling, replenishing, and maintaining the water level in any such agricultural closed system. This subsection shall not be construed to eliminate the necessity to meet generally accepted engineering practices for construction, operation, and maintenance of dams, dikes, or levees.

(4) All rights and restrictions set forth in this section shall be enforced by the governing board or the Department of Environmental Protection or its successor agency, and nothing contained herein shall be construed to establish a basis for a cause of action for private litigants.

(5) The department or the governing board may by rule establish general permits for stormwater management systems which have, either singularly or cumulatively, minimal environmental impact. The department or the governing board also may establish by rule exemptions or general permits that implement interagency agreements entered into pursuant to s. 373.046, s. 378.202, s. 378.205, or s. 378.402.

(6) Any district or the department may exempt from regulation under this part those activities that the district or department determines will have only minimal or insignificant individual or cumulative adverse impacts on the water resources of the district. The district and the department are authorized to determine, on a case-by-case basis, whether a specific activity comes within this exemption. Requests to qualify for this exemption shall be submitted in writing to the district or department, and such activities shall not be commenced without a written determination from the district or department confirming that the activity qualifies for the exemption.

(7) Nothing in this part, or in any rule or order adopted under this part, may be construed to require a permit for mining activities for which an operator receives a life-of-the-mine permit under s. 378.901.

(8) Certified aquaculture activities which apply appropriate best management practices adopted pursuant to s. 597.004 are exempt from this part.

(9) Implementation of measures having the primary purpose of environmental restoration or water quality improvement on agricultural lands are exempt from regulation under this part where these