

**INDIAN RIVER COUNTY, FLORIDA
M E M O R A N D U M**

TO: Members of the Development Review and Permit Process Advisory Committee

THROUGH: Stan Boling, AICP ^{MS}
Community Development Director

FROM: Roland M. DeBlois, AICP ^{RMD}
Chief, Environmental Planning & Code Enforcement

DATE: March 14, 2018

SUBJECT: **County Stormwater Pond/Lake Design and Littoral Zone Requirements**

It is requested that the Development Review and Permit Process Advisory Committee consider the following information at the Committee's meeting of March 21, 2018.

BACKGROUND & ANALYSIS

In conjunction with its mining and excavation regulations, Indian River County has required, since 1988, littoral zone plantings in association with stormwater pond/lake creation. A littoral zone is that portion of a pond or lake that is designed to contain rooted aquatic plants. Such zones are (and have been) required based on a number of public benefits, such as pollutant treatment, biological community enhancement, and residential subdivision amenity aesthetics.

Prior to 2007, the County required littoral zone plantings for any created or expanded waterbody greater than ½ acre in size, except in cases where the St. Johns River Water Management District (SJRWMD) had permitting jurisdiction and did not require littoral zones due to permanent pool volume design or other design parameters. At that time, the County required that, where used by applicants, littoral zones be planted on a 6:1 or flatter slope and cover 30% of the waterbody surface, consistent with SJRWMD requirements.

In March 2007, the County, in consideration of recommendations from the Pelican Island Audubon Society, adopted Ordinance 2007-012, which amended the County's littoral zone requirements to apply to expanded or created waterbodies on project sites exceeding 10 acres. Under the 2007 ordinance revisions, the County required littoral zones irrespective of SJRWMD's allowed alternatives to littoral zones, which requirement still applies today. The County's current littoral zone requirements, as revised in 2007 and further reviewed through a series of 2008 mining regulation workshops and hearings, also call for a 10:1 slope, a change from the 6:1 (or flatter) slope that was required by the County previous to 2007 and is still required by the SJRWMD when littoral zones are proposed.

Also in 2007, the County revised its landscape ordinance to require that, for proposed lakes/ponds or lake/pond systems that are one (1) acre in area or larger, the lake/pond bank must be designed in a "non-rectangular, irregular shape to provide an aesthetic amenity" (see County Code Section 926.10(3), Attachment 1 to this report).

County Code Section 934.06(2) sets forth the County's littoral zone planting and maintenance requirements (see Attachment 2). Those requirements allow for a variety of littoral zone planting configurations within a lake/pond system.

Pond/Lake Maintenance

In addition to providing criteria for littoral zone design and plantings, County Code Section 934.06(2) sets forth maintenance requirements for such zones and associated waterbodies, consistent with SJRWMD rules. Attachment 3 to this report is an excerpt from SJRWMD's Environmental Resource Permit Applicant's Handbook relating to wet detention pond design and performance, including littoral zone design and maintenance. Both the County and SJRWMD require 80% coverage of littoral zones by suitable native aquatic plants within a specified timeframe.

Indian River County recognizes the public benefits of littoral zones, as evidenced by the County's requirement of such zones for the past 30 years. Over those years, as a result of multiple ordinance workshops and public hearings, the County's littoral zone requirements have been tweaked, but the fundamental requirement of littoral zones associated with pond creation has remained, and staff continues to support that requirement or alternatives that provide comparable benefits.

Concerning littoral zone and overall pond/lake maintenance, the requirement under Section 926.10(3) that lakes/ponds "be designed in a non-rectangular, irregular shape to provide an aesthetic amenity" has been brought to staff's attention as a potential maintenance challenge, in that irregular shorelines may result in "nooks and crannies" that are difficult to maintain. On that issue, staff's position is that the irregular shape requirement is non-specific enough to allow for design flexibility to address potential maintenance concerns, such as allowing the opportunity to "cluster" littoral zone areas vs. even distribution throughout a pond shoreline, or to undulate the shoreline design in a gradual manner to account for and allow maintenance access once the pond is completed.

RECOMMENDATION

Staff recommends that the Committee review the County's littoral zone and pond design requirements, as codified in the County's code and consider whether or not any changes are warranted.

ATTACHMENT:

1. County pond/lake design and landscape criteria [LDR Section 926.10(3)]
2. County littoral zone requirements [LDR Section 934.06(2)]
3. Excerpt from SJRWMD's Environmental Resource Permit Applicant's Handbook

Section 926.10. - Nonvehicular area landscaping standards.

- (1) *General landscaping treatment.* All nonvehicular open spaces, on any site proposed for development in all zoning districts, except for single-family dwellings shall conform to the landscaping requirements provided in Section 926.06. Nonvehicular open space is ground that is not covered by buildings, paving, or other structures.
- (2) *Canopy trees required.* Canopy trees shall be planted in the nonvehicular open space to meet the following requirements:
 - (a) Multiple-family residential zoning districts and mobile home residential zoning districts requiring site plan approval: a minimum of one tree per each one thousand (1,000) square feet of nonvehicular open space or fraction thereof;
 - (b) Commercial zoning districts (except "heavy commercial") and medical districts: a minimum of one (1) tree per each two thousand (2,000) square feet of nonvehicular open space or fraction thereof;
 - (c) Heavy commercial, and industrial zoning districts: a minimum of one (1) tree per each three thousand (3,000) square feet of nonvehicular open space or fraction thereof.
- (3) *Canopy trees required around lakes/ponds including stormwater retention/detention areas.* For proposed lakes/ponds or lake/pond systems that are one (1) acre in area or larger, the lake/pond bank must be designed in a non-rectangular, irregular shape to provide an aesthetic amenity. Regardless of size, all lakes/pond shall have at least three native, water tolerant trees planted per one hundred (100) feet of shoreline. The trees may be clustered along the upland shoreline in a manner that facilitates access for lake maintenance. Littoral zones shall be provided as required in Section 934.05. The common areas contiguous with and above the littoral zones are subject to the non-vehicular landscaping requirements set forth in 926.10, and the landward edges of the littoral zone shall be clearly delineated by a raised lip.

(Ord. No. 90-16, § 1, 9-11-90; Ord. No. 97-29, § 9, 12-16-97; Ord. No. 2007-012, § 1, 3-20-07)

Section 934.06. - Mining standards.

(1) *Procedural sequence.* Mining operations are subject to the following procedural sequence:

- (a) Discussion or "pre-application" meeting with SJRWMD.
- (b) Traffic impact methodology meeting with Public Works/Traffic Engineering.
- (c) Site plan pre-application conference.
- (d) Formal site plan submittal.
- (e) Initial TRC review.
- (f) Final TRC review.
- (g) Planning and Zoning Commission review and approval.
 1. Reviewed by Board of County Commissioners if appealed.
- (h) Initial annual mining permit.
- (i) "Pre-construction"/site work meeting with staff.
- (j) Annual mining permit renewal.
- (k) Site restoration and final inspection/closeout.

→ (2) *Littoral zone and water management.* On project sites exceeding ten (10) acres in area, any excavation or mining activity in the unincorporated county which results in the creation or expansion of a waterbody (as defined in Chapter 901) shall be subject to the following standards, except as specifically exempted in section 934.04. The requirements of this section shall not apply to small lot single-family subdivisions, which are intended to provide workforce or affordable housing.

- (a) A littoral zone(s) shall be established as part of the created waterbody. A design and management plan must be submitted which shall:
 1. Include a topographic map of the proposed littoral zone(s) showing the control elevation contour and the minus two-and-one-half-foot control water elevation contour, and include a cross-sectional view of the littoral zone(s) planting design, showing the required slopes from the top of the bank to a depth of two and one-half (2½) feet below the control water elevation;
 2. Specify how vegetation is to be established, including the extent, method, type and timing of any planting provided;
 3. Provide a description of any water management procedures to be followed in order to ensure the continued viability and health of the littoral zones;
 4. Include a plan view which documents the location and extent of the littoral zones, including the percentage of the waterbody surface area (at control elevation) covered by vegetated littoral zones.
- (b) The established littoral zone(s) shall consist of native vegetation, and shall be maintained permanently as part of the waterbody. All landscaping, littoral zone revegetation plans and lake management plans shall comply with St. John[s] River Water Management District rules.
- (c) Littoral zone design requirements:
 1. The slope for the planted littoral zone shall be no steeper than one (1) foot vertical to ten (10) feet horizontal to a distance of five (5) feet waterward of the designated planted littoral zone area. Excluding the planted littoral zones, slopes shall not exceed one (1) foot vertical to four (4) feet horizontal. Certified drawings of the littoral zone slopes must be sent to the planning division within thirty (30) days of slope construction.
 2. Littoral zones shall comprise at least thirty (30) percent of the waterbody surface area, or twenty-one (21) square feet per lineal foot of shoreline, whichever is less. Littoral zones must be located

between one (1) foot above ordinary water level (OWL) and two (2) feet below OWL, as determined by the applicant's engineer or designee unless otherwise approved by the community development director or his designee.

3. The littoral zone shall be provided with a minimum of six (6) inches of sand topsoil mix, unless otherwise approved, and planted with at least five (5) species at an average spacing of two (2) feet on center. Inter-plant spacing will vary with species, and must be depicted on the littoral zone vegetation plan.
4. A minimum of one (1) tree shall be provided for every five hundred (500) square feet of littoral zone coverage. The proposed trees must be a minimum of five (5) feet in height at time of planting (measured at planting depth) and consist of native, freshwater wetland varieties (e.g. red bay, red maple, bald cypress, loblolly bay).
5. Appropriate species for littoral zone plantings, including trees, are listed in Chapter 926, Appendix E.

(d) Conformance:

1. The planted littoral zone shall meet eighty (80) percent coverage within six (6) months, and be less than five (5) percent exotic or invasive non-native plant species after the first year. Monitoring reports are required, and must be submitted to staff at time zero (0), ninety (90) days, six (6) months, and one (1) year after planting. The applicant must notify the planning division forty-eight (48) hours prior to completion of littoral zone planting.
 2. For subdivision or affidavit of exemption projects, littoral planting zones shall be preserved and maintained as a common improvement, and shall be identified graphically and in writing in a restrictive covenant in a form acceptable to the county attorney's office. The plat or affidavit of exemption document shall reference the restrictive covenant. The restrictive covenant shall be reviewed by the planning division and county attorney's office prior to recording.
 3. Planting of the littoral zones shall be completed prior to issuance of a certificate of completion or the first certification of occupancy for any lot adjacent to or abutting the lake, whichever occurs first.
 4. All excavations must comply with "Best Management Practices for the Construction Industry."
 5. Planted littoral zones must be maintained in perpetuity in compliance with these planting requirements and with "Best Management Practices."
 6. For mining projects that propose agricultural use as part of the site restoration plan, installation of littoral zone plants, with the exception of shoreline trees as required in subsection 934.06(2)(c)4, shall not be required until the site is converted to a nonagricultural use. All other Littoral Zone and Water Management standards, including provision of littoral zone slopes, and installation of shoreline trees, shall be satisfied and completed at the time of mining site restoration.
- (e) The water management system, including swales and interconnected wetlands and lakes, must be specifically designed to inhibit siltation and eutrophication processes. To ensure this, the applicant must submit an environmental management and lake monitoring plan, specifying the method for monitoring the system and corrective actions should eutrophication and/or siltation occur.
- (f) A fifteen-foot-wide access maintenance easement shall be provided for every one thousand (1,000) feet of shoreline. This easement shall extend from below control elevation of the lake to a public or private road right-of-way, and shall be labeled and depicted on the site plan and stormwater management permit plans.
- (g) The littoral zone will be considered as fully creditable towards the 2:1 mitigation ratio for freshwater

emergent wetlands; (ref. Chapter 928, Wetland and Deepwater Habitat Protection).

- (h) Off-site discharge shall meet all applicable state and federal water quality standards, including standards for turbidity and other regulated constituents and parameters. The method for testing, collecting, and reporting baseline and monitoring data to the SJRWMD shall be noted, and testing/monitoring locations shall be depicted on the site plan and stormwater management permit plans.

(3) *Groundwater and environmental protection.*

- (a) All applicable state and federal groundwater and groundwater impact regulations shall be satisfied.
- (b) Excavation activity shall occur only above the confining layer.
- (c) All existing or proposed on-site wells that penetrate the confining layer shall either be ground and plugged in accordance with SJRWMD standards or brought up to current SJRWMD standards for such wells. Such wells shall be properly plugged or upgraded and properly monumented and flagged prior to issuance of the initial mining permit.
- (d) The following setbacks shall be maintained from excavation areas below the wet season groundwater level (excludes temporary recharge ditches and similar temporary excavations used for water recharge):
 1. Thirty (30) feet to any plugged or unplugged well that penetrates the confining layer.
 2. One hundred (100) feet to preserved on-site jurisdictional wetlands or native uplands.
 3. Three hundred (300) feet to known off-site jurisdictional wetlands, native uplands, and improved pasture lands.
 4. One thousand (1,000) feet to the nearest existing or proposed city or county public water supply well that uses the surficial aquifer (the aquifer that lies above the confining layer) as a source of potable water.
- (e) The mining operation shall not adversely affect the hydro-period of preserved jurisdictional wetlands on site or known off-site jurisdictional wetlands. The project site plan, stormwater management plans, and pollution prevention plans shall demonstrate how the hydro-period of on-site and known off-site jurisdictional wetlands will be maintained to the satisfaction of SJRWMD.
- (f) Extraction and on-site processing techniques that involve blasting or use of active chemical agents are prohibited. This prohibition is based on a finding that such techniques are not necessary to extract or process recoverable materials known to exist within Indian River County, and is intended to avoid potential adverse groundwater impacts as well as noise and vibration nuisances.
- (g) Any contaminated soils identified on site shall be handled in accordance with applicable state and federal standards, as directed by the Department of Health (DOH).
- (h) Project site plans and permit plans shall incorporate all appropriate recommendations and best management practices (BMPs) contained or identified within the project hydrology report. The county is authorized to engage professional services to review project hydrology reports and charge applicants the cost of such services.
 1. Upon receipt of a project hydrology report, the county has sixty (60) days to provide the applicant comments on the hydrology report. Prior to scheduling the project for consideration by the Planning and Zoning Commission, the applicant shall respond to each comment in writing.

(4) *Traffic and nuisance mitigation.*

- (a) The noise and nuisance requirements of Chapter 974 shall be satisfied. Normal operation of vehicles shall be deemed to meet Chapter 974 requirements.
 1. Pumps, crushers, and processing equipment (including portable equipment but not including vehicles) used on site shall be placed behind berms, located below surrounding ground level, or

A.

**ENVIRONMENTAL RESOURCE PERMIT
APPLICANT'S HANDBOOK, VOLUME II:
FOR USE WITHIN THE GEOGRAPHIC LIMITS
OF THE ST. JOHNS RIVER WATER MANAGEMENT DISTRICT**



October 1, 2013

ST. JOHNS RIVER WATER MANAGEMENT DISTRICT

**4049 Reid Street
Palatka, FL 32177-2529
(386) 329-4500**

ATTACHMENT 3

Attachment 5

8.0 Wet Detention Design and Performance Criteria

8.1 Description

These systems are permanently wet ponds which are designed to slowly release collected stormwater runoff through an outlet structure. A schematic of a typical wet detention system is shown in Figure 8-1.

There are several components in a wet detention system which must be properly designed to achieve the required level of stormwater treatment. A description of each design feature and its importance to the treatment process is presented below. The design and performance criteria for wet detention systems are discussed below.

8.2 Treatment Volume

For wet detention systems, the design treatment volume is the greater of the following:

- (a) one inch of runoff over the drainage area
- (b) 2.5 inches times the impervious area (excluding water bodies)

Additional treatment volume is required for systems which discharge directly to Class I, Class II, Outstanding Florida Waters, or Class III waters which are approved, conditionally approved, restricted, or conditionally restricted for shellfish harvesting (see section 8.13 of this Volume).

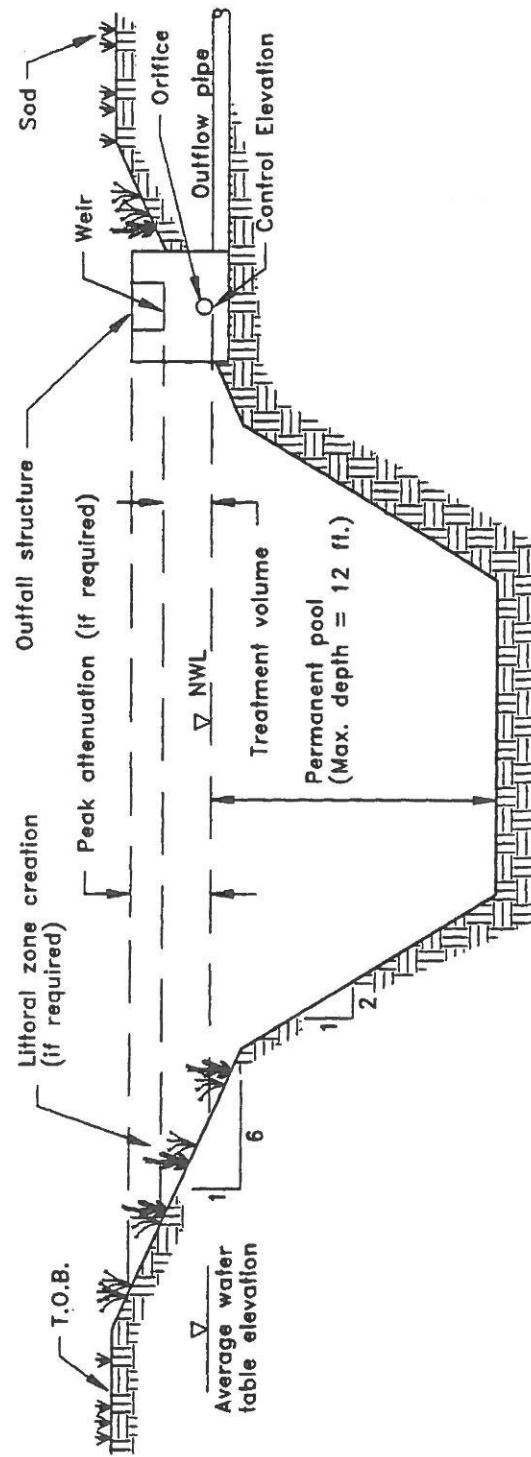


Figure 8-1. Wet detention (N.T.S.)

8.3 Recovery Time

The outfall structure shall be designed to drawdown one-half the required treatment volume within 24 and 30 hours following a storm event, but no more than one-half of this volume will be discharged within the first 24 hours.

8.4 Outlet Structure

The outlet structure generally includes a drawdown device (such as an orifice, "V" or square notch weir) set to establish a normal water control elevation and slowly release the treatment volume (see Figures 8-2 and 8-3 for schematics). The design of the outfall structure must also accommodate the passage of ground water baseflows and flows from upstream stormwater management systems (see Figure 8-4).

The control elevation shall be set at or above the design tailwater elevation so the pond can effectively recover the treatment storage. Also, drawdown devices smaller than 6 square inches of cross-section area that is 2 inches wide or less than 20 degrees for "V" notches shall include a device to eliminate clogging. Examples of such devices include baffles, grates, screens, and pipe elbows.

8.5 Permanent Pool

The permanent pool shall be sized to provide at least a 14-day average residence time during the wet season (June - October).

Additional permanent pool volume may be required for wet detention systems which directly discharge to Class I, Class II, or Outstanding Florida Waters (see section 8.13 of this Volume).

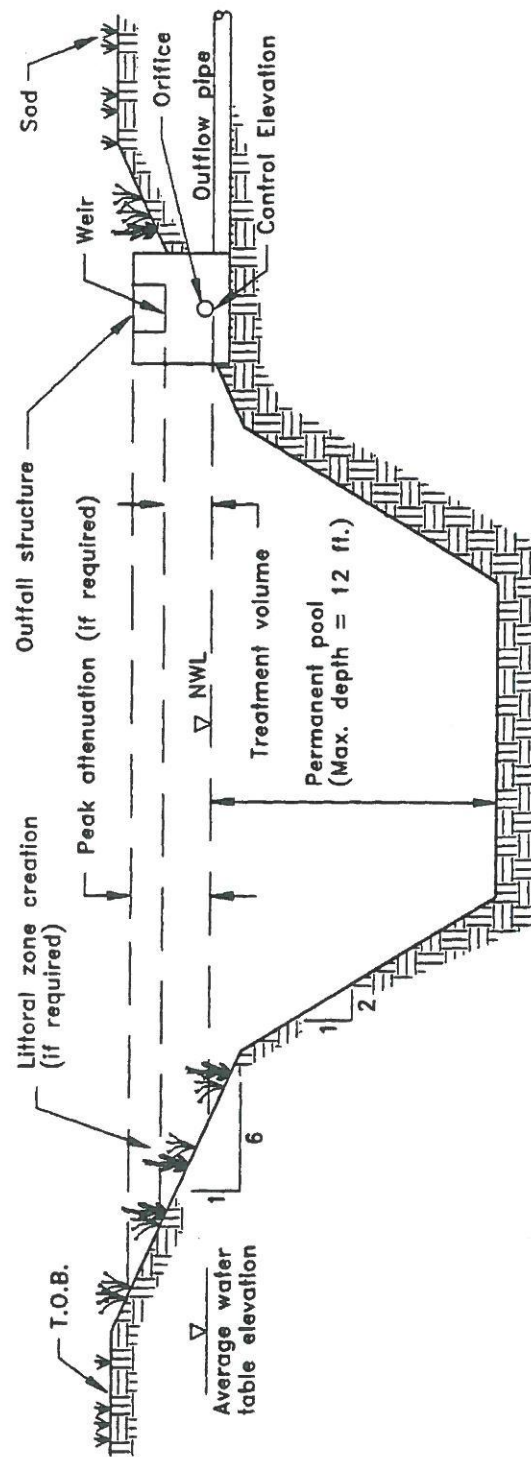


Figure 8-1. Wet detention (N.T.S.)

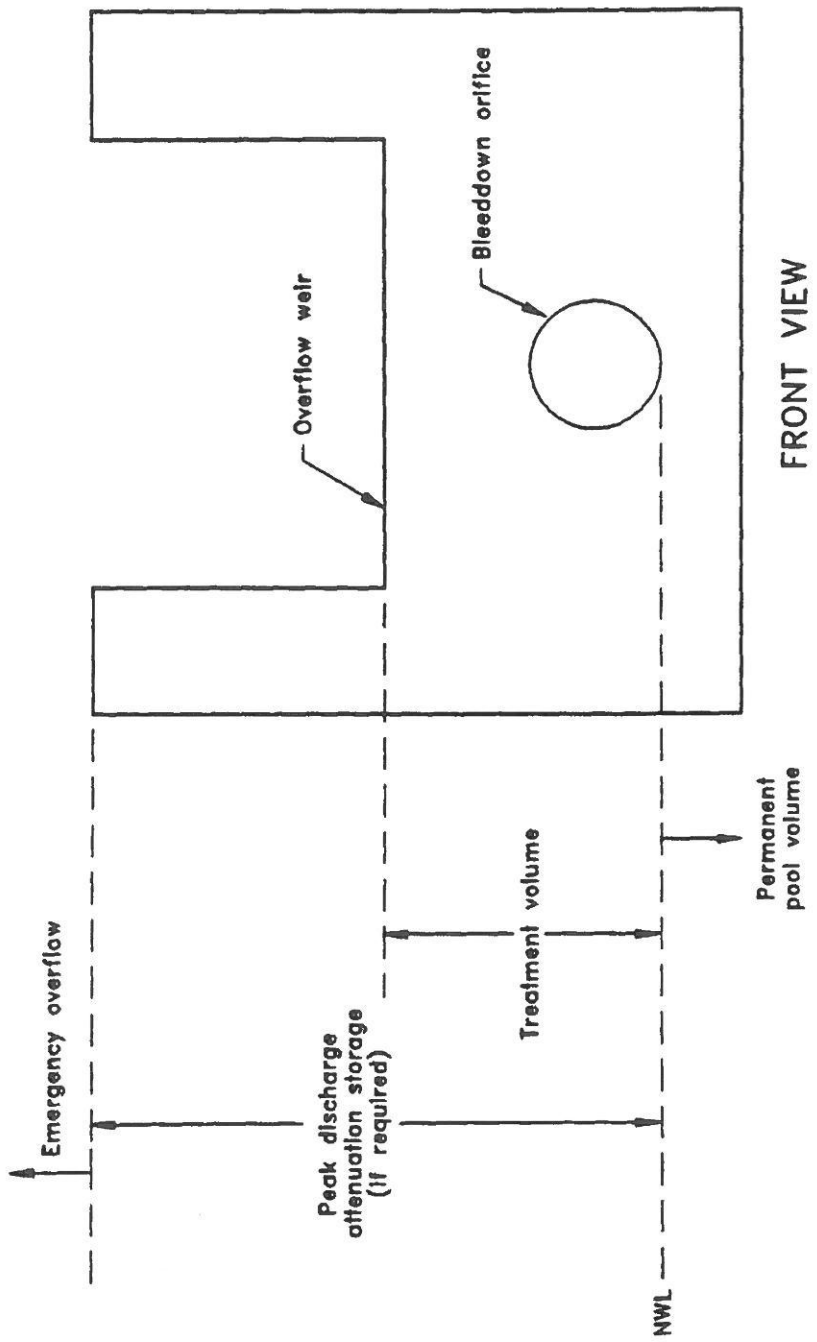


Figure 8-2. Typical wet detention outfall structure (N.T.S.)

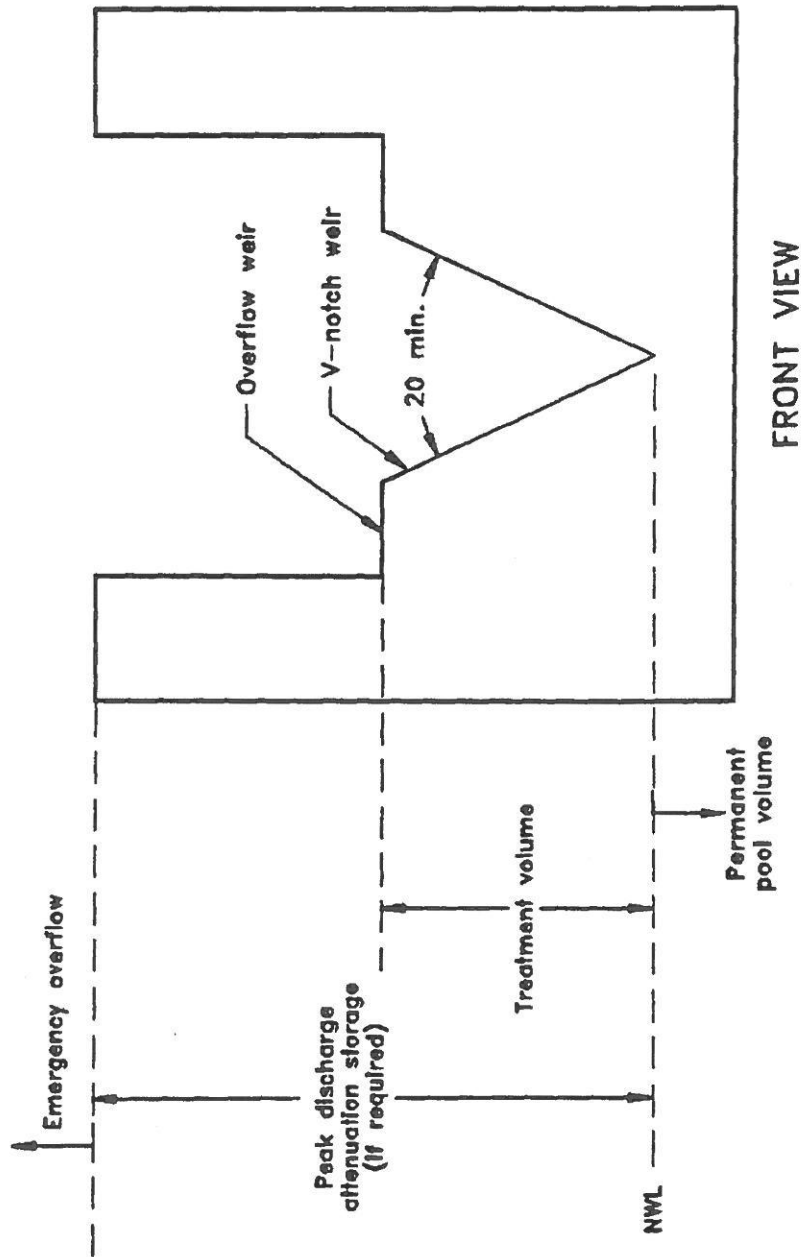


Figure 8-3. Typical wet detention outfall structure with "V"-notch weir (N.T.S.)

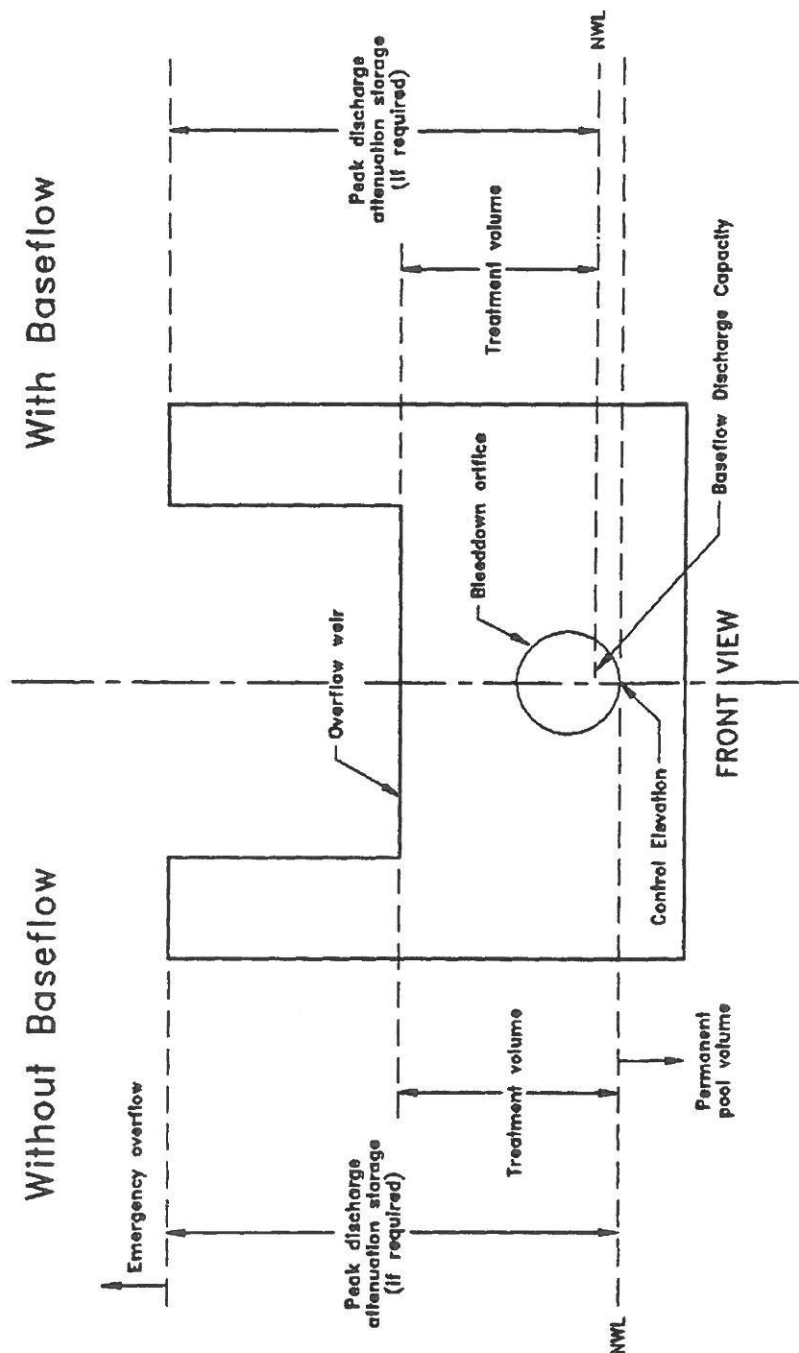


Figure 8-4. Typical wet detention outfall structure with and without baseflow conditions (N.T.S.)

8.6 Littoral Zone

The littoral zone is that portion of a wet detention pond which is designed to contain rooted aquatic plants. The littoral area is usually provided by extending and gently sloping the sides of the pond down to a depth of 2-3 feet below the normal water level or control elevation. Also, the littoral zone can be provided in other areas of the pond that have suitable depths (i.e., a shallow shelf in the middle of the lake).

The littoral zone is established with native aquatic plants by planting and/or the placement of wetland soils containing seeds of native aquatic plants. A specific vegetation establishment plan must be prepared for the littoral zone. The plan must consider the hydroperiod of the pond and the type of plants to be established. Livingston et al. (1988) has published a list of recommended native plant species suitable for littoral zone planting. In addition, a layer of muck can be incorporated into the littoral area to promote the establishment of the wetland vegetation. When placing muck, special precautions must be taken to prevent erosion and turbidity problems in the pond and at its discharge point while vegetation is becoming established in the littoral zone.

The following is a list of the design criteria for wet detention littoral zones:

- (a) The littoral zone shall be gently sloped (6H:1V or flatter). At least 30 percent of the wet detention pond surface area shall consist of a littoral zone. The percentage of littoral zone is based on the ratio of vegetated littoral zone to surface area of the pond at the control elevation.
- (b) The treatment volume should not cause the pond level to rise more than 18 inches above the control elevation unless the applicant affirmatively demonstrates that the littoral zone vegetation can survive at greater depths.
- (c) Within 24 months of completion of the system or as specified by permit condition, 80 percent coverage of the littoral zone by suitable aquatic plants is required.
- (d) Planting of the littoral zone is recommended to meet the 80% coverage requirement. As an alternative to planting, portions of the littoral zone may be established by placement of wetland top soils (at least a four inch depth) containing a seed source of desirable native plants. When utilizing this alternative, the littoral zone must be stabilized by mulching or other means and at least the portion of the littoral zone within 25 feet of the inlet and outlet structures must be planted.

8.7 Littoral Zone Alternatives

As an option to establishing and maintaining vegetative littoral zones as described in section 8.6, the applicant can provide either:

- (a) An additional 50% of the appropriate permanent pool volume as required in section 8.5 or 8.13, or
- (b) Pre-treatment of the stormwater prior to the stormwater entering the wet detention pond. The level of pre-treatment must be at least that required for retention, underdrain, exfiltration, or swale systems. See section 8.11 of this Volume for additional information on pre-treatment.

8.8 Pond Depth

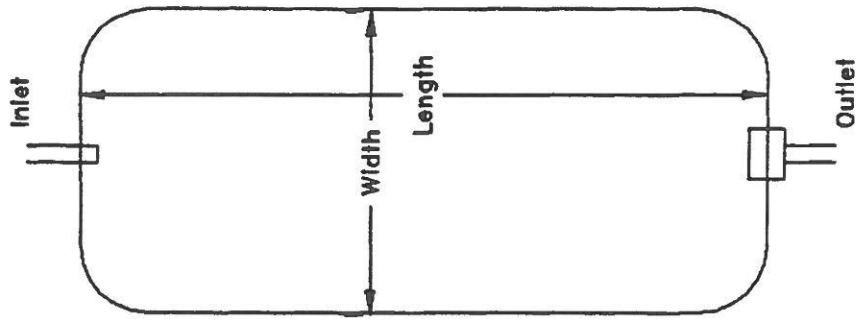
Wet detention systems shall provide for a maximum pond depth of 12 feet and a mean depth (pond volume divided by the pond area at the control elevation) between 2 and 8 feet.

8.9 Pond Configuration

The average length to width ratio of the pond must be at least 2:1.

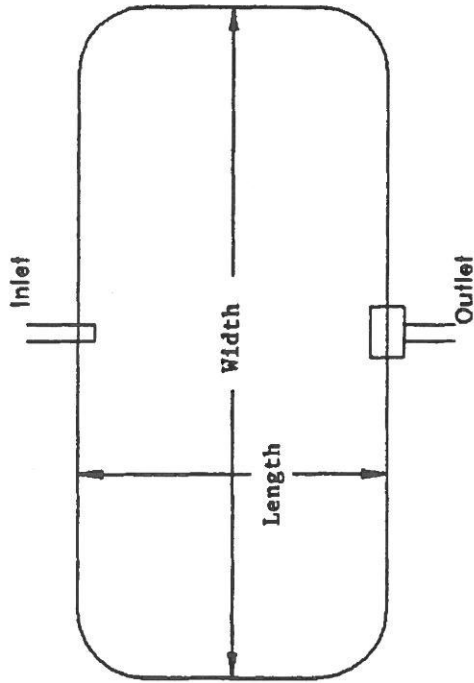
If short flow paths are unavoidable, the effective flow path can be increased by adding diversion barriers such as islands, peninsulas, or baffles to the pond. Inlet structures should be designed to dissipate the energy of water entering the pond. Examples of good and poor pond configurations are given in Figure 8-5.

Good Pond Configuration



Length : Width ratio > 2:1

Poor Pond Configuration



Length : Width ratio < 2:1

Figure 8-5. Examples of good and poor wet detention pond configurations (N.T.S.)

8.10 Ground Water Table

To minimize ground water contributions which may lower treatment efficiencies, the control elevation shall be set at or above the normal on-site ground water table elevation (Yousef et al. 1990). This elevation may be determined by calculating the average of the seasonal high and seasonal low ground water table elevations.

Ground water inflow (baseflow) must be considered when the control elevation is set below the normal ground water table elevation or the project utilizes underdrains (i.e., road underdrains) to control ground water conditions on-site. The design of the outfall structure must provide for the discharge of baseflow at the design normal water level in the pond. Baseflow rates must be included in the drawdown calculations for the outfall structure. Baseflow shall also be considered in the permanent pool residence time design. Establishment of the normal water level in the pond will also be influenced by baseflow conditions (see Figure 8-4).

8.11 Pre-treatment

"Pre-treatment" is defined as the treatment of a portion of the runoff prior to its entering the wet detention pond. Pre-treatment increases the pollutant removal efficiency of the overall stormwater system by reducing the pollutant loading to the wet detention pond. Pre-treatment may be used to enhance the appearance of the wet detention pond or meet the additional treatment criteria for discharges to receiving water which are classified as Class I, Class II, Outstanding Florida Waters (OFWs), or Class III waters which are approved, conditionally approved, restricted, or conditionally restricted for shellfish harvesting.

For developments where the appearance of the lake is important, pre-treatment can reduce the chances of algal blooms and slow the eutrophication process. Some types of pre-treatment practices include utilizing vegetative swales for conveyance instead of curb and gutter, perimeter swales or berms around the lake, oil and grease skimmers on inlet structures, retention storage in swales with raised inlets, or shallow landscaped retention areas (when soils and water table conditions will allow for adequate percolation).

For systems in which pre-treatment is utilized to meet the additional design criteria requirements for systems which direct discharge to Class I, Class II, OFWs, or Class III waters which are approved, conditionally approved, restricted, or conditionally restricted for shellfish harvesting, pre-treatment practices must meet the appropriate design and performance criteria for that BMP. Acceptable types of pre-treatment include the following:

- (a) Retention systems which meet the design and performance criteria in section 5,

- (b) Underdrain systems which meet the design and performance criteria in section 6,
- (c) Exfiltration trench section 7, or
- (d) Swales systems which meet the design and performance criteria in section 9.

Alternative pre-treatment methods will be evaluated on a case-by-case basis by the District. Applicants or system designers are encouraged to meet with District staff in a pre-application conference if alternative methods are proposed.

8.12 Pond Side Slopes

The pond must be designed so that the average pond side slope measured between the control elevation and two feet below the control elevation is no steeper than 3:1 (horizontal:vertical).

8.13 Direct Discharges to Class I, Class II, OFWs, or Shellfishing Waters

Wet detention systems which discharge to Class I, Class II, OFWs, or Class III waters which are approved, conditionally approved, restricted, or conditionally restricted for shellfish harvesting, must provide either:

- (a) An additional fifty percent of both the required treatment and permanent pool volumes
- (b) Pre-treatment of the stormwater prior to the stormwater entering the wet detention pond. The level of pre-treatment must be at least that required for retention, underdrain, exfiltration, or swale systems (see section 8.11 of this Volume).

8.14 References

Camp Dresser & McKee Inc (CDM). 1985. *An Assessment of Stormwater Management Programs*. Prepared for Florida Department of Environmental Regulation, Tallahassee, Florida.

Livingston, E.H., E. McCarron, J. Cox, P. Sanzone. 1988. *The Florida Land Development Manual: A Guide to Sound Land and Water Management*. Florida Department of Environmental Regulation, Nonpoint Source Management Section, Tallahassee, Florida.

Yousef, Y.A., M.P. Wanielista, L.Y. Lin, and M. Brabham. 1990. *Efficiency Optimization of Wet Detention Ponds for Urban Stormwater Management (Phase I and II)*. University of Central Florida, Orlando, Florida