



July xx, 2023

**POLICY MEMORANDUM xx**  
**(0x-2023)**

TO: All Consultants, Developers, Regulatory Agencies and Others

FROM: Steven E. Darcey, CPESC  
Executive Director

SUBJECT: Determination of the Downstream Toe of Dam for Impoundment Facilities

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***Policy Statement***

Pursuant to USDA-Natural Resources Conservation Services (NRCS), Maryland Conservation Practice Standard Pond Code 378 (MD-378), and the Maryland Department of the Environment (MDE) policies and standards, a non-woody buffer is required at the downstream toe of certain dams and impoundments.

This policy establishes the methodology for determining the downstream toe of dams - embankment or partially excavated - or impoundments along the breachable section of their embankments for use in establishing the non-woody buffer and other critical dam features. The guidance provided herein supersedes all previous policies relating to this determination.

***Background***

The non-woody buffer is an area defined by a specific offset dimension from the determined toe of the downgrade dam embankment where woody vegetation is prohibited. This area is critical to the maintenance and inspection of the dam to identify and mitigate a multitude of failure processes/mechanisms. It also provides for added protection against root intrusion into the embankment which may precipitate seepage, internal deformation and ultimately dam failure. Monitoring instrumentation may also be installed in this area to provide early warning feedback towards upkeep obligations. Pursuant to COMAR 26.17.4.5.E., the owner is responsible for the safety of the dam, and for the necessary surveillance and inspections towards upkeep.

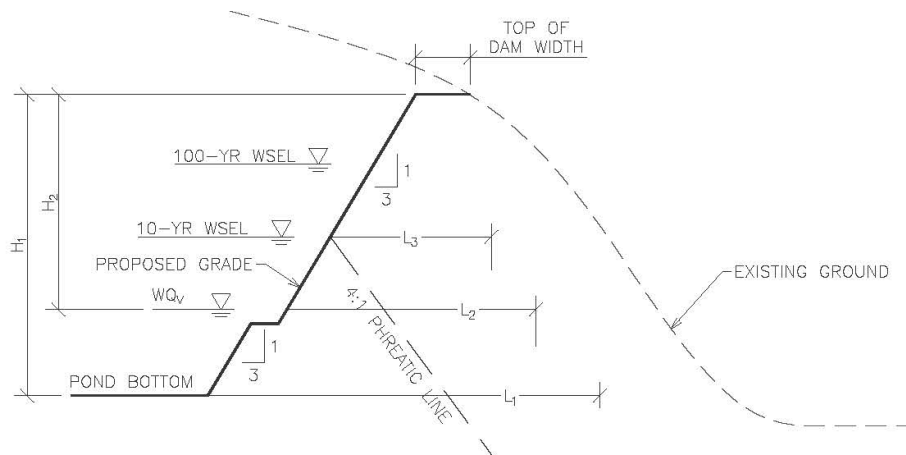
***Where this Policy Applies***

This policy shall apply to all small ponds and impoundments, including submerged gravel wetlands.

The following figures illustrate both acceptable determinations of the downgrade toe of dam. In all scenarios, the toe of dam is defined as the breachable section of dam characterized by an assessment of where a transition from an excavated to embankment section occurs. This shall be evaluated at all cross-sections perpendicular to the center line of the top of dam.

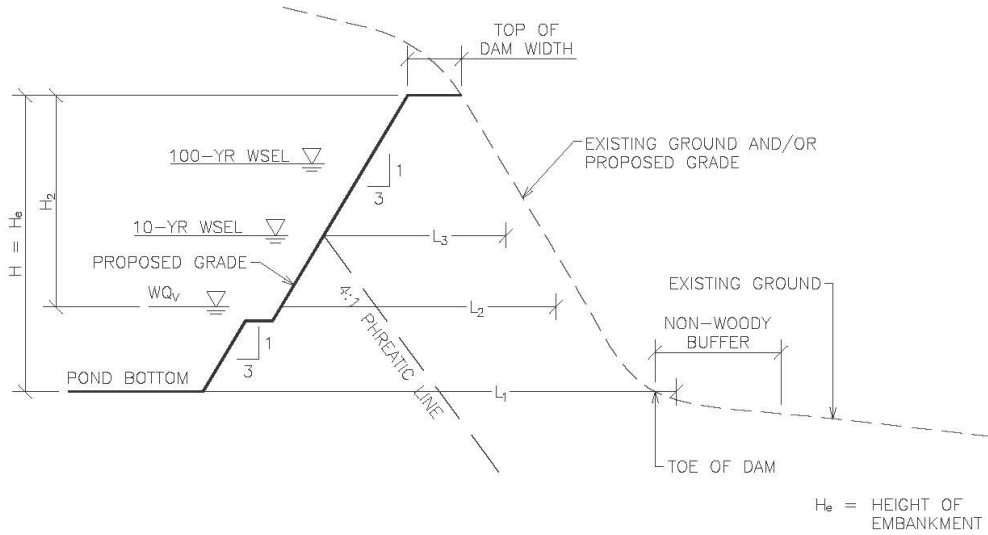
Pursuant to MD-378, embankments meeting a specific set of criteria may be considered excavated. The horizontal projection defined by  $10H+20=L$ , where 'H' is the height from the pond bottom to the top of the dam, and the downstream are ground slope are exemplified below. It should be noted, however, that excavated facilities are not exempt from small pond review and approval as noted in MD-378.

**Figure 1: An Excavated Facility**  
(Core and cutoff trench not typical for excavated facilities)

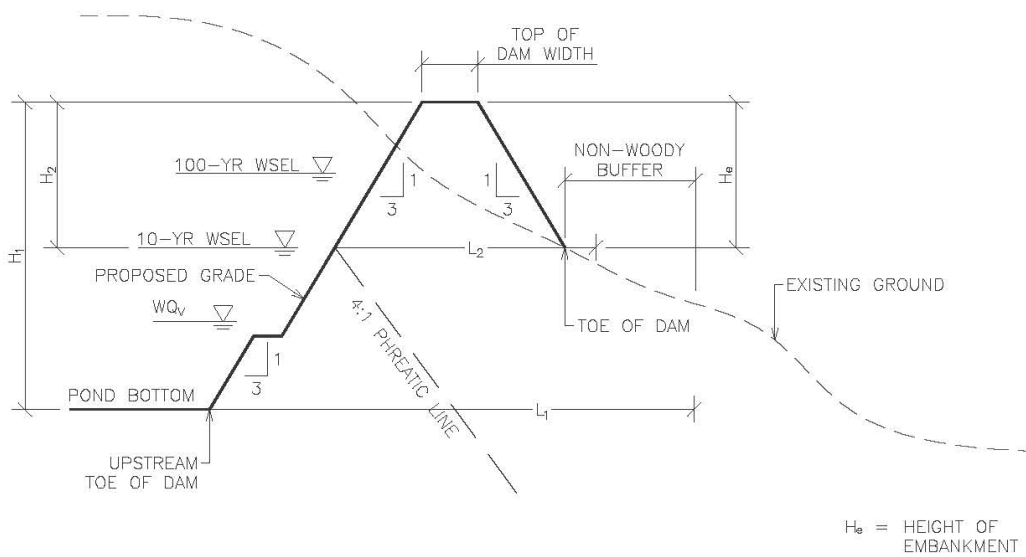


An excavated facility must also demonstrate that the longitudinal gradient at all cross-sections perpendicular to the center line of the top of dam within the projection of 'L' is less than 10%.

**Figure 2: An Embankment Facility**  
(Core and cutoff trench not shown for clarity)

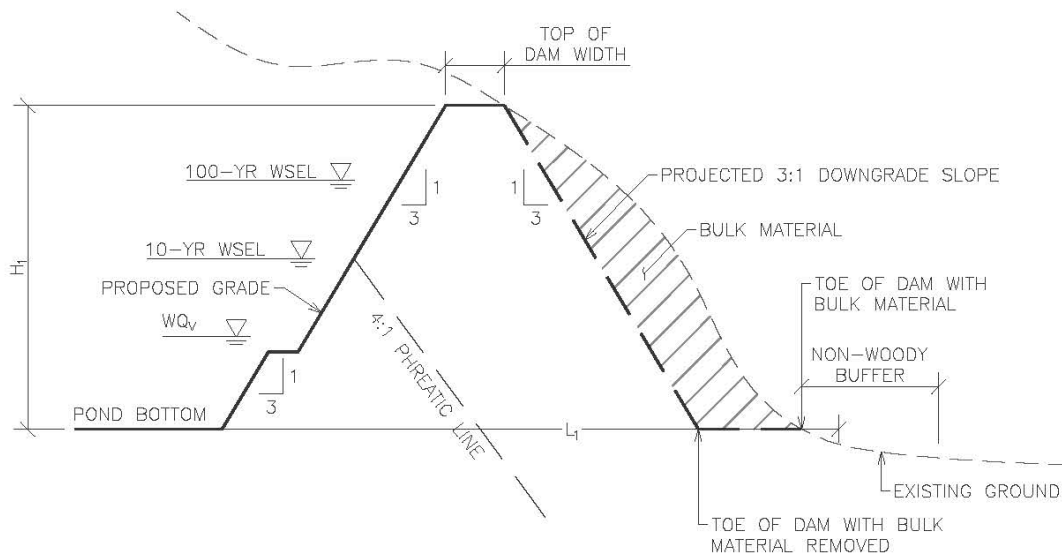


**Figure 3: A Hybrid Embankment Dam Section -**  
(Core and cutoff trench not shown for clarity)



The section of the hybrid dam considered as excavated in **Figure 3** must also demonstrate that the longitudinal gradient at all cross-sections perpendicular to the center line of the top of dam within the projection of 'L' is less than 10%.

**Figure 4: Embankment Dam Section with Bulk Material**  
(Core and cutoff trench not shown for clarity)



The principles illustrated in the previous figures are likewise applied to facilities adjacent to steep slopes. Steep slopes are defined as longitudinal slopes of 15% or greater.

Acknowledging the increased potential for seepage flow paths and internal deformation to extend beneath clay core/cutoff trenches and exit the downgrade slopes of facilities adjacent to steep slopes, the District reserves the right to require a seepage assessment where soils with high-piping potentials exist beneath the reservoir area and/or into the embankment area. A determination of the downgrade toe of dam shall be based on the assessed failure planes through the affected slope.

The engineer or consultant at all times must hold paramount the safety and welfare of the public and existing infrastructure, and ensure designs and construction methodologies proactively mitigate the failure and hazard potentials of dams.

### ***Impoundment Facilities Adjacent to Steep Slopes***

Impoundment facilities adjacent slopes present a unique series of design and construction challenges. One crucial dam safety concern is the elevated potential for seepage flow paths to develop and exit the face of downgrade embankment slopes below the installed clay core and cutoff trench. This condition is exacerbated where natural foundation materials with potentially high piping characteristics exist, such as Unified Classes GM, SM and ML.

In all cases, the highest point of the determined toe of dam, on the downgrade slope for impoundments (ponds and other similar structures), must be a horizontal projection from the lowest established elevation where a transition from the excavated section to an embankment occurs.

Guidance on minimum required setback requirements for establishment of the inside toe of dam is presented in the appropriate District policy document, MD-378, and MDE.

### ***Additional Information***

Please contact the District at 301.574.5162 EXT. 3 or [pgscd@co.pg.md.us](mailto:pgscd@co.pg.md.us) should you have questions or require additional information relating to this policy.