



**DAM SAFETY  
POLICY MEMORANDUM #8**

**TO:** Dam Owners, Operators, and Engineers

**FROM:** Stormwater, Dam Safety, and Flood Management Program  
Water and Science Administration

**DATE:** December 6, 2021

**SUBJECT:** Smart Pond Technology

*Policy Statement*

It is the policy of the Maryland Department of the Environment (the Department) that proper construction methods and oversight are critical to ensure the long-term performance and safety of dams and their appurtenant works. This policy memorandum provides clarification on the necessary studies, surveys, calculations, tests and data necessary to support permit applications where “smart pond technology” is proposed. “Smart pond technology” is defined as a system that monitors predicted and/or actual rainfall within a watershed and uses remote automation to adjust gates, valves or other components at a dam to augment spillway releases. This technology is provided by numerous vendors and may also be referred to as “continuous monitoring and adaptive control” (CMAC) technology.

*Additional Information*

Questions about this policy or other items relating to ponds and dams can be directed to the Chief of the Dam Safety Permits Division at 410-537-3552.

*Background*

In accordance with the Annotated Code of Maryland, Environment Article, §5-503:

“A person shall obtain a permit from the Department to construct, reconstruct, or repair any reservoir, dam, or waterway obstruction, to make, construct, or permit to be made or constructed any change or addition to any reservoir, dam, or waterway obstruction, to make or permit to be made any change in, addition to, or repair of any existing waterway obstruction, or in any manner to change in whole or part the course, current, or cross section of any stream or body of water within the State, except tidal waters. The permit is obtained upon written application to the Department.

A Dam Safety Permit issued by the Department’s Dam Safety Division is required when changing or

altering a dam or reservoir – including installation of smart pond technology. Where a small pond or dam is proposed to be constructed with, or retrofitted with smart pond technology, review and approval by the appropriate approval authority is required.

In accordance with Code of Maryland Regulations (COMAR) 26.17.04.04, governing construction on nontidal waters and floodplains, including dams and small ponds:

*An application to the Administration shall include all studies, surveys, calculations, tests, and data necessary for determining the adequacy of the project design. The degree of investigation needed for a specific project is a matter of the Administration's judgment based upon the magnitude and impact of the project and the complexity of the site.*

Further, COMAR 26.17.04.05 further specifies that;

*An application to construct, reconstruct, repair or alter a dam must include the final construction plans, specifications, and other information that may be required.*

This policy memorandum provides clarification on the necessary “studies, surveys, calculations, tests and data” necessary to support permit applications where “smart pond technology” is proposed.

### ***Supporting Information for Permitting***

The following “studies, surveys, calculations, tests and data” are necessary to support the use of “smart pond technology” on new or existing dams/small ponds:

- a. Documentation that the failure mode assumes that any valve/gate installed with the smart pond technology is in the closed position with control orifice blocked;
- b. Hydrologic and hydraulic analyses for pre- and post-smart pond technology installation to demonstrate that the structure will continue to function as originally designed for the appropriate design storm(s) (e.g., 10-year, 100-year, and adequate freeboard requirements);
- c. For any dam with slopes steeper than 2H:1V and for low hazard dams over 20 feet in height, a slope stability investigation and analysis that considers water loading conditions on the dam, slope stability, and seepage control needs and assures that the fluctuating water surface will not impact the stability of the slope (i.e., factor of safety  $\geq 1.5$ );
- d. A detailed operation and maintenance plan that includes standard operating procedures for ensuring proper function of valves and electronics;
- e. Assurance that smart pond draw-down of permanent pond elevation will not exceed one foot per day. More rapid draw-down reduces slope stability and increases the onset of embankment failure;
- f. Assurance that maximum smart pond draw-down velocities and rates are not erosive and will not cause downstream flooding; and

- g. An emergency spillway frequency investigation discussing whether the smart pond technology installation will result in more frequent emergency spillway activation. If more frequent activation is expected, a spillway erodibility analysis and armoring plan must be submitted.

The “studies, surveys, calculations, tests and data” listed above are in addition to the normally required information to support a permit application for construction, reconstruction, repair or alteration of a dam/small pond. The information normally required for a permit applications may include, but is not limited to the following:

- a. The application must demonstrate that the structure is in acceptable condition (or will be repaired to come into acceptable condition as part of the permitted project) and meets applicable regulatory criteria;
- b. Dam height, maximum storage volume, and drainage area (to be used to confirm the appropriate approval authority);
- c. Dam breach analysis submitted by the applicant and performed in accordance with the latest version of the Department’s dam breach guidance:  
<https://mde.maryland.gov/programs/Water/DamSafety/Pages/dambreakguidelines.aspx>
- d. Documentation showing that future upstream and downstream build-out land use scenarios and hazard creep were considered;
- e. For existing dams/small ponds, a condition assessment that considers whether there is existing seepage, holes, cracks, depressions, erosion, undercutting, sloughing of embankment on either the upstream or downstream slopes. The assessment must also consider the existing condition of the principal spillway and evaluate whether there are leaks, corrosion, cracks, inflow, off set joints, undermining, spalling, or blockages;
  - i. Location of trees or woody vegetation on the dam, within 15 feet of the downstream toe-of-slope, or within 25 feet of the control structure, and a plan to remove the woody vegetation (as necessary). Refer to the Dam Safety Division’s Policy Memorandum #1 regarding tree and woody vegetation removal;
  - ii. An investigation of appropriate geo-hazards (e.g., Karst terrain, steep slopes, active or abandoned mines). Where a geo-hazard is identified, a Geotechnical Engineering analysis must be conducted and a report must be prepared to evaluate the potential effect of the geo-hazard on the dam and appurtenant works. The report should consider potential failure modes and suggest appropriate defensive design measures (e.g., an impermeable liner, additional seepage control);
- f. Cold water resource protection strategies. Retrofits of dams and small ponds in cold water resource areas must consider design features that mitigate potential thermal impacts from the pond/dam. Retrofits within cold water resource areas shall not create or increase the volume of a permanent wet pool or allow for extended detention greater than 12 hours;
- g. Detailed construction plans;
- h. Project specifications;

- i. Basis of Design Report (to include the following items. Discipline specific reports should be included as an appendix, as needed, and must include all supporting calculations)
  - iii. Summary of proposed work and project goals
  - iv. Summary of design standards applicable to project
  - v. Hazard Classification Statement
  - vi. Dam Inspection Report (for existing dams)
  - vii. Hydrology & Hydraulics Report
  - viii. Dam Breach Analysis and Hazard Classification Report
  - ix. Geotechnical Engineering Report
  - x. Structural Engineering Report
- j. [Operation and Maintenance Plan](#)
- k. [New/Updated Emergency Action Plan](#) (High and Significant Hazard only);
- l. [Memorandum of Land Restrictions](#);
- m. [Engineer-in-Charge \(EIC\) Affidavit](#) and resume; and
- n. Construction bond, irrevocable letter of credit, or other security

### ***Smart Pond Technology at Significant and High Hazard Dams***

Smart Pond Technology is not currently acceptable for use on Significant or High Hazard dams. These structures, which generally have large drainage areas and storage volumes, are not suited for water level manipulation in advance of minor storm events without risking damage to the dam (rapid drawdown condition) or requiring significant release rates which may cause nuisance flooding and potential hazards to persons in/near a stream. In addition, the manipulation of water levels, specifically the potential to raise water levels, creates additional risk should the dam fail.

The limited number of high and significant hazard dams in Maryland with remotely operated gates maintain around-the-clock local staffing to ensure the gate(s) operate correctly, and to respond should a problem arise.