

**Virginia Soil and Water Conservation Board**  
**Impounding Structure (Dam Safety) Technical Advisory Committee (TAC)**  
**Thursday, July 27, 2006**  
**Virginia Commonwealth University Student Commons**  
**Richmond, Virginia**

**Technical Advisory Committee Members Present**

Jay R. Day, Mountain Castles Soil and Water Conservation District  
Sara Bell, Dominion Generation  
Connie Bennett, York County  
Stephen M. Billcheck, Virginia Department of Emergency Management  
Jeff W. Booth, Western Virginia Water Authority  
William G. Browning, Department of Conservation and Recreation  
Scott P. Cahill, Watershed Services, Inc.  
David B. Campbell, Schnabel Engineering  
J. Michael Flagg, Hanover County  
Joseph S. Haugh, Mechanicsville  
Richard Jacobs, Culpeper Soil and Water Conservation District  
David Krisnitski, Virginia Department of Game and Inland Fisheries  
Daniel J. Mahoney, Federal Energy Regulatory Commission  
Joseph H. Maroon, Department of Conservation and Recreation  
Duncan McGregor, Marion  
Timothy A. Mitchell, City of Lynchburg  
David Ogle, Virginia Department of Transportation  
John W. Peterson, KEMPS Consulting, Inc.  
Dr. Peter Rainey, Lake of the Woods Association  
David S. Rosenthal, City of Norfolk  
Ray Scher, Caroline County

**Technical Advisory Committee Members Not Present**

Paul D. Castle, Lakefront Royal Property Owners Association  
Douglas L. Davis, Waynesboro Police Department  
Donald R. Demetrius, Fairfax County  
Connie Houston  
John W. Jones, Virginia Sheriffs Association  
Mathew J. Lyons, Natural Resources Conservation Service  
Mishelle R. Noble-Blair, City of Manassas

**Facilitator**

Barbara Hulburt, Director of Facilitation & Training, The McCammon Group

**Director of Conservation and Recreation Staff Present**

David Conniff, Dam Safety Engineer  
David C. Dowling, Director of Policy, Planning and Budget  
Michael R. Fletcher, Director of Development  
David Gunn, Floodplain Mapping Manager  
Tom Roberts, Dam Safety Engineer  
Jim Robinson, Dam Safety Program Manager  
Rob VanLier, Dam Safety Engineer  
Christine Watlington, Policy, Planning and Budget Analyst  
Ryan Brown, Office of the Attorney General

**Observers Present**

Jan Allen, Virginia Commonwealth University  
John S. Bailey, Lake of the Woods Association  
Robert Cooper, Williamsburg Environmental Group  
Susan Taylor Hansen, Virginia Soil and Water Conservation Board  
Dipmani Kumar, for Don Demtrius, Fairfax County  
Chie McCaughey, Virginia Commonwealth University  
Doug Rogers, Lake of the Woods Association  
Michael Woods, Troutman-Sanders

**Opening Remarks**

Ms. Hulburt called the meeting to order and welcomed attendees.

**Review of July 13<sup>th</sup> minutes**

Ms. Hulbert asked members to review the minutes from July 13<sup>th</sup> and to get any comments back to DCR by Wednesday, August 2.

**Review of agenda for today**

Ms. Hulburt reviewed the meeting agenda. She noted the committee would review the EAP language, look at Table 1 and begin a discussion about Alternative Procedures.

**Revisit EAP language**

Mr. Dowling addressed the July 27, 2006 version of the Discussion Draft. A copy of this version is attached as Attachment #1. The Emergency Action Plan section was the first area to be discussed.

**4VAC50-20-175. Emergency Action Plans**

A member asked if the term “property damage” should be removed from the first line of the section.

Ms. Hulburt asked if there was consensus among the group to remove the term.

Mr. Maroon said that property damage was at least a secondary consideration. He noted that there were two purposes to an EAP.

A member said that for consideration, after an EAP is activated, the first responders do not want people to be moving back in to take care of belongings. He said the sole purpose of the EAP should be to protect life.

A member said that the term also included public property and utilities, not just personal property. The member said that with regard to low hazard dams the term may have more significance.

Ms. Hulburt said that raised the question of whether taking out “and property damage” would lead to the decision that low hazard dams do not need an EAP.

Consensus among the group was to leave the term “property damage” in the first sentence of the EAP section as presented.

Ms. Hulburt noted that a primary question is what to do with low hazard dams relative to EAPs. She reminded members that the low hazard category was the former Class III and Class IV designation.

A member said the essence of the discussion is covered in the classification of the dam and that the priorities should be in protecting things that really matter.

Another member said that he believed the EAP was important regardless of the classification. If low hazard dams fail, there will be a problem. The member said with low hazard dams, notification is important. He said that he believed it a bad signal to tell a landowner that an EAP was not needed.

Ms. Hulbert directed members to the EAP chart to consider the EAP requirements for low hazard dams. She noted that the requirement of any of the elements would indicate the need for an EAP.

Items on the chart were:

- Notification Chart – a call list, telephone tree, emergency contacts
- Emergency Detection Evaluation and Classification
- Responsibilities
- Preparedness
- Dam Break Inundation Maps

- Appendices
- Certification
- Drill
- Table Top Exercises

A member said that while an EAP was needed, resources should not be tied up with a drill.

A member asked why the FEMA EAP exercise categories were not accepted.

Mr. Dowling said that in the first draft, the five FEMA categories were included. However, only the drill and table top exercise were added to the EAP requirements and the other exercises were removed. The drill is fundamental to regularly updating the phone numbers in the plan.

Ms. Hulburt noted that there was a distinction between drill and table top exercise.

A member said that a drill as described is an annual review to go over phone numbers. He said that without that the EAP is worthless.

The Department of Emergency Management keeps copies of the EAPs on file.

A member said that he did not believe an EAP was needed for a low hazard dam. However, he noted that the local government should be involved to make sure they are aware of the class of dam. EAPs will require a lot of resources that could be better utilized elsewhere in improving dam safety.

A member noted that in a rural environment a farmer can have \$20-50K invested in one animal. He said a lot of people do not carry insurance for that. In an agriculture environment the one phone call would allow farmers to move animals to safety. That is a valid property consideration.

A member said that as a minimum for low hazard dams that the call list is needed to notify those downstream.

A member said that in his opinion, notification is different than an EAP.

It was suggested to remove the term “low” from any Emergency Action Plan requirement and create a new section dealing with emergency preparedness for low hazard dams. The concept was generally supported by the TAC.

It was suggested that emergency preparedness elements for low hazard dams include the following:

- Consultation with the local government to make them aware of dam.

- There should be a permanent contact name for the dam owner or responsible party.
- The dam owner should file a statement annually with DCR to verify the continued low hazard status of the dam. This would take into consideration changes below the dam.
- There should be a contact list for those below the dam.

It was noted that cooperation from local governments is needed to keep development out of the inundation zone.

Mr. Maroon noted that the development of an EAP or emergency preparedness plan is based on circumstances at the time of the permit. The Department and the Board do not review the dam again for six years. He said the likelihood is that an EAP for 2006 will not be what the dam is dealing with in 2012.

Mr. Maroon suggested placing the issue of downstream development in the discussion parking lot for consideration for legislation in 2007.

Mr. Browning said that a problem has been that the Commonwealth has been requiring localities to comply with many different programs, including dam safety, stormwater management, erosion and sediment control. He said that there is a need to consider how to handle these fairly and equitably. He noted the Commonwealth is moving towards a more cohesive approach in coordination of these programs.

Ms. Hulburt asked that with the changes contemplated to deal with emergency preparedness for low hazard dams if the TAC was ready to allow DCR staff to prepare a draft to bring back to the next meeting or were there other issues to be raised.

There was consensus to have DCR refine the EAP language.

A member asked that FEMA Publication 64 be referenced in the regulations.

Ms. Hulburt noted that drills and table top exercises were the only exercises required for high and significant dams.

Mr. Maroon asked how this compared to other states. A member responded that the existing statutes for other states vary. Many states are upgrading those particular provisions in accordance with FEMA Publication 64 or something very similar.

Ms. Hulburt asked if the TAC would like to discuss legislative recommendations. Mr. Maroon said the need was not immediate, but that he would welcome the discussion.

Ms. Hulburt said one of the issues that had been discussed was that happens when there is downstream development in the inundation zone. The suggestion had been made to make the localities responsible for the notification.

It was noted that Section 10.1-601.1 allows localities to map dam break inundation zones and to regulate or limit future development in the inundation areas. A member suggested it would be beneficial if localities would tie that to the flood plain ordinance.

Another member said that not all localities require the development review and that, particularly in rural localities, dam owners will be required to upgrade because someone has been allowed to build below the dam.

A member noted that the Soil and Water Conservation District Subcommittee on dams recently drafted a white paper discussing dam break inundation zone mapping. Mr. Dowling said that the draft copy of the white paper will be forwarded to the group.

A member noted that some of what the dam safety TAC was addressing might relate to floodplain management. The fact that a dam exists in a floodplain affects the management downstream.

A member noted that the inundation map would only be used by the jurisdiction in land use control. The landowner has no way to control development downstream. The jurisdiction needs to participate in the cost of the inundation map.

Mr. Browning noted that the floodplain program for the Commonwealth was also in DCR. He said there was a need to better coordinate floodplain management and dam safety program elements.

A member noted that with 500 or more Class III dams in the Commonwealth not all dam owners are doing to have the money to produce an inundation map or to provide a correct model from an engineering firm.

A member noted that the subcommittee had recommended that low hazard dams require a simple map generating the inundation zone.

Mr. Maroon suggested that with regard to legislation there could be a more detailed discussion of the issue outside the official TAC discussions.

A member asked if DCR coordinates the legislative package with DEQ. Is there coordination with Erosion and Sediment control and the impact of upstream development?

Mr. Maroon said that every agency begins reviewing the legislative package in the summer. The proposed legislation moves to the Secretary of Natural Resources and then to the Governor's office. Agencies do coordinate their efforts.

**Revisit Table 1 language**

Mr. Dowling gave a review of the changes to the Table 1 language. Proposed changes in Table 1 are outlined in the attached draft regulatory language.

Mr. Dowling noted that at the last meeting, there was concern expressed about the implications for having a road across or below a dam. The language was changed to “across.” The classification would take that into account roads below.

A member expressed concern that this would lead to an interpretation problem with regard to the road. He said that the hazard class should drive everything.

It was noted that at the last TAC meeting the conversation was not clear with regard to a road in an inundation zone.

A member asked what an inundation zone meant relative to downstream. Does that mean the road would be washed out or overtopped by a few inches.

A member noted that there are many dams with roads beneath that would be flooded with a sunny day break. Some of those are significant roadways.

It was noted that every site is unique with different circumstances. There will be judgment calls to make. It was suggested that this be addressed in guidance documents and not incorporated into the regulations.

DCR will look at this language and see what might work.

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### **Video of an activated spillway during the Madison Flood**

Members viewed a video report about the flood and dam break in Madison County in 1995.

### **Preliminary Discussion of Alternative Procedures (decision matrix) for SDF Reductions**

Ms. Hulburt noted that the TAC had previously discussed Alternative Procedures. She noted that two reports had been provided, one developed by the first Ad Hoc Dam Safety Study Committee and one by the workgroup created by the Board. A copy of the workgroup document summarizing their discussions is included as Attachment #2.

Mr. Dowling noted that the TAC had received an overview on this issue at the first meeting and proceeded to provide a summary of the issue. The NOIRA noted that the Board wanted the TAC to consider amendments to establish an alternative procedure.

The genesis of this concept was an April 30, 2005 report of the Ad Hoc Dam Safety Study Committee. A copy of that report is available from DCR.

The study committee made two recommendations:

- 1) Treat new and existing dams alike.
- 2) Provide an alternative procedure for existing dams for the SDF.

Ms. Hulburt said the consideration for the TAC was whether to have a conversation about exploring or considering these possible alternative procedures or others.

A member asked for a clarification of the difference between the incremental analysis and looking at an alternative procedure to reduce the SDF.

Mr. Dowling noted that as presented, Table 1 reaches a certain point, incremental analysis goes further and the alternative procedure would go beyond that with respect to determining SDF.

A member said that incremental analysis in the past was used with great care. The owner and the engineer had to show that the reduction was appropriate.

A member said he felt the incremental analysis covered what was needed to approve a design flood less than a full PMF.

A member said the only place to go after an incremental assessment was a full blown risk assessment. He said the incremental assessment recognizes the fact that PMFs are such an extreme event that in some situations downstream development is already inundated during a major storm event. If that is the case, then there is nothing else a dam breach could damage.

A member asked if there was a way to integrate a restrictive and risk based approach and come up with something reasonable.

Ms. Hulburt said the draft was an attempt to bring all the pieces together and to create a strawman.

A member said that the TAC was asking the state to indirectly assume the liability for dam failure.

Ms. Hulburt said the bottom line for the regulator is to protect public safety.

Mr. Browning noted that the engineering work that is done is between the owner and the owner's engineer. The Dam Safety regulators do not make those initial determinations.

Mr. Dowling noted that the incremental analysis section follows Table 1 and now applies to all dams. It was not eliminated in the draft, but moved for clarity purposes.

Mr. Maroon said that there was not a call for significant changes in the regulations. There may or may not be a need for an alternative procedure. He said that DCR was hoping to hear and learn from the committee with regard to what should be advanced. He noted the Board would review any recommendations. He said that the discussion was whether or not there was an interest in alternative procedures and if there was any value in proceeding to the next level.

A member said that the parameters need to be defined. He said that the TAC was moving toward a scenario where everyone submits their own argument anticipating that Dam Safety will approve.

A member said that incremental damage assessment should be open to all structures. He said the committee should not assume any less constraints.

It was suggested that guidance was needed to define alternative procedures.

Ms. Hulburt suggested it would be useful for a subcommittee to meet to discuss guidance language and the concept of incremental analysis.

Mr. Maroon said that in the discussion of alternative procedures it was a case of not knowing it until you see it.

Mr. Maroon said that Table 1 is very limited. He said that backing off of the SDF was not done lightly. He asked for the TAC to provide additional guidance as to the way incremental analysis should be addressed.

Consensus was that a subcommittee address the concept of alternative procedures and return with recommendations to the full TAC.

### **Code Required Language Changes to Regulations**

Mr. Brown reviewed the summary of 2006 Amendments to the Dam Safety Act (§10.1-604 *et seq.*) and the how the changes were incorporated into the regulations. A copy of this summary is available from DCR. Changes in the regulations resulting from the Code of Virginia changes are noted in green in Attachment #1.

### **Discussion of plans for future meeting(s)**

Future meetings were scheduled as follows:

- Monday, August 28<sup>th</sup> – subcommittee meeting on alternative procedures
- Wednesday, September 6<sup>th</sup>, full TAC
- Wednesday, October 11<sup>th</sup> – full TAC

Attachment #1

**Version: Thursday, July 27, 2006**  
**VIRGINIA IMPOUNDING STRUCTURE REGULATIONS (§ 4 VAC  
50-20)**

**Part I: General**

**4VAC50-20-10. Authority.**

This chapter is promulgated by the Virginia Soil and Water Conservation Board in accordance with the provisions of the Dam Safety Act, Article 2, Chapter 6, Title 10.1 (§10.1-604 et seq.), of the Code of Virginia.

Statutory Authority: §10.1-605 of the Code of Virginia.  
Historical Notes: Derived from VR625-01-00 §1.1, eff. February 1, 1989.

**4VAC50-20-20. General provisions.**

A. This chapter provides for the proper and safe design, construction, operation and maintenance of impounding structures to protect public safety. This chapter shall not be construed or interpreted to relieve the owner or operator of any impoundment or impounding structure of any legal duties, obligations or liabilities incident to ownership, design, construction, operation or maintenance.

B. Approval by the board of proposals for an impounding structure shall in no manner be construed or interpreted as approval to capture or store waters. For information concerning approval to capture or store waters, see Chapter 8 (§62.1-107) of Title 62.1 of the Code of Virginia, and other provisions of law as may be applicable.

C. In promulgating this chapter, the board recognizes that no impounding structure can ever be completely "fail-safe," because of incomplete understanding of or uncertainties associated with natural (earthquakes and floods) and manmade (sabotage) destructive forces; with material behavior and response to those forces; and with quality control during construction.

D. Any engineering analysis required by this chapter such as plans, specifications, hydrology, hydraulics and inspections shall be conducted by and bear the seal of a professional engineer licensed to practice in Virginia.

**E. Where subjectivity is permissible, determinations relative to this chapter shall be conducted utilizing competent, experienced, engineering judgment. xxxxx**

**E F.** The official forms as called for by this chapter are available from the director. **[CHECK]**

Statutory Authority: §10.1-605 of the Code of Virginia.  
Historical Notes: Derived from VR625-01-00 §1.2, eff. February 1, 1989.

**4VAC50-20-30. Definitions.**

The following words and terms when used in this chapter shall have the following meanings unless the context clearly indicates otherwise:

"Acre-foot" means a unit of volume equal to 43,560 cubic feet or 325,853 gallons (one foot of depth over one acre of area).

"Agricultural purpose dams" means dams which are less than 25 feet in height or which create a maximum impoundment smaller than 100 acre-feet, ~~and are~~ certified by the owner on official forms as ~~constructed, maintained or~~ operated primarily for agricultural purposes, and are approved by the Director.

"Alteration" means changes to an impounding structure that could alter or affect its structural integrity. Alterations include, but are not limited to, changing the height or otherwise enlarging the dam, increasing normal pool or principal spillway elevation or physical dimensions, changing the elevation or physical dimensions of the emergency spillway, conducting necessary repairs or structural maintenance, or removing the impounding structure. Alterations do not include normal operation and maintenance.

"Alteration permit" means a permit required for ~~changes any alteration to an~~ impounding structure that could alter or affect its structural integrity. Alterations requiring a permit include, but are not limited to: ~~changing the height, increasing the normal pool or principal spillway elevation, changing the elevation or physical dimensions of the emergency spillway or removing the impounding structure.~~

"Board" means the Virginia Soil and Water Conservation Board.

"Conditional operation and maintenance certificate" means a certificate required for impounding structures with deficiencies.

"Construction" means the construction of a new impounding structure.

"Construction permit" means a permit required for the construction of a new impounding structure.

"Dam break inundation zone" means the area downstream of a dam that would be inundated or otherwise directly affected by the failure of a dam.

"Department" means the Virginia Department of Conservation and Recreation.

"Design flood" means the calculated volume of runoff and the resulting peak discharge utilized in the evaluation, design, construction, operation and maintenance of the impounding structure.

"Design freeboard" means the vertical distance between the maximum elevation of the design flood and the top of the impounding structure.

"Director" means the Director of the Department of Conservation and Recreation or his designee.

"Drill" means a type of emergency action plan exercise that tests, develops, or maintains skills in an emergency response procedure. During a drill, participants perform an in-house exercise to verify telephone numbers and other means of communication along with the dam owner's response. A drill is considered a necessary part of ongoing training.

"Emergency Action Plan or EAP" means a formal document that identifies potential dam emergency conditions and specifies preplanned actions to be followed to minimize loss of life and property damage. The EAP specifies actions the dam owner must take to minimize or alleviate safety issues at the dam. It contains procedures and information to assist the dam owner in issuing early warning and notification messages to responsible emergency management authorities. It shall also contain dam break

inundation zone maps as required to show emergency management authorities the critical areas for action in case of emergency.

“Emergency Action Plan Exercise” means an activity designed to promote emergency preparedness; test or evaluate EAPs, procedures, or facilities; train personnel in emergency management duties; and demonstrate operational capability. In response to a simulated event, exercises consist of the performance of duties, tasks, or operations very similar to the way they would be performed in a real emergency. An exercise may include but not be limited to drills and tabletop exercises.

"Height" means the structural height of an impounding structure. If the impounding structure spans a stream or watercourse, height means the vertical distance from the natural bed of the stream or watercourse measured at the downstream toe of the impounding structure to the top of the impounding structure. If the impounding structure does not span a stream or watercourse, height means the vertical distance from the lowest elevation of the outside limit of the barrier to the top of the impounding structure.

"Impounding structure" means a man-made **device structure**, whether a dam across a watercourse or other structure outside a watercourse, used or to be used to retain or store waters or other materials. The term includes: (i) all dams that are 25 feet or greater in height and that create an impoundment capacity of 15 acre-feet or greater, and (ii) all dams that are six feet or greater in height and that create an impoundment capacity of 50 acre-feet or greater. The term "impounding structure" shall not include: (a) dams licensed by the State Corporation Commission that are subject to a safety inspection program; (b) dams owned or licensed by the United States government; (c) dams ~~constructed, maintained or~~ operated primarily for agricultural purposes which are less than 25 feet in height or which create a maximum impoundment capacity smaller than 100 acre-feet; (d) water or silt retaining dams approved pursuant to §45.1-222 or §45.1-225.1 of the Code of Virginia; or (e) obstructions in a canal used to raise or lower water.

"Impoundment" means a body of water or other materials the storage of which is caused by any impounding structure.

~~"Inundation zone" means an area that could be inundated as a result of impounding structure failure and that would not otherwise be inundated to that elevation.~~

"Life of the impounding structure" and "life of the project" mean that period of time for which the impounding structure is designed and planned to perform effectively, including the time required to remove the structure when it is no longer capable of functioning as planned and designed.

"Maximum impounding capacity" means the volume in acre-feet that is capable of being impounded at the top of the impounding structure.

“Maximum impounding height” means the maximum retention height of an impounding structure. If the impounding structure spans a stream or watercourse, maximum impounding height means the vertical distance from the natural bed of the stream or watercourse measured at the upstream toe of the impounding structure to the top of the impounding structure. If the impounding structure does not span a stream or watercourse, maximum impounding height means the vertical distance from the lowest elevation of the inside limit of the barrier to the top of the impounding structure.

"Normal impounding capacity" means the volume in acre-feet that is capable of being impounded at the elevation of the crest of the lowest ungated outlet from the impoundment.

"Operation and maintenance certificate" means a certificate required for the operation and maintenance of all impounding structures.

"Owner" means the owner of the land on which an impounding structure is situated, the holder of an easement permitting the construction of an impounding structure and any person or entity agreeing to maintain an impounding structure. The term "owner" includes the Commonwealth or any of its political subdivisions, including but not limited to sanitation district commissions and authorities. Also included are any public or private institutions, corporations, associations, firms or companies organized or existing under the laws of this Commonwealth or any other state or country, as well as any person or group of persons acting individually or as a group.

"Tabletop Exercise" means a type of emergency action plan exercise that involves a meeting of the dam owner and the state and local emergency management officials in a conference room environment. The format is usually informal with minimum stress involved. The exercise begins with the description of a simulated event and proceeds with discussions by the participants to evaluate the EAP and response procedures and to resolve concerns regarding coordination and responsibilities.

"Top of the impounding structure" means the lowest point of the nonoverflow section of the impounding structure.

"Watercourse" means a natural channel having a well-defined bed and banks and in which water flows when it normally does flow.

Statutory Authority: §10.1-605 of the Code of Virginia.

Historical Notes: Derived from VR625-01-00 §1.3, eff. February 1, 1989; Amended, Virginia Register Volume 18, Issue 14, eff. July 1, 2002.

Effect of Amendment: The July 1, 2002 amendment revised the definitions for "director" and "impounding structure".

#### **4VAC50-20-40. Classes of impounding structures.**

A. Impounding structures shall be classified in one of ~~four~~ three **hazard** categories according to size and hazard potential, as defined in subsection B of this section and Table 1. ~~Size classification shall be determined either by maximum impounding capacity or height, whichever gives the larger size classification.~~

B. For the purpose of this chapter, hazards pertain to potential loss of human life or property damage downstream from the impounding structure in event of failure or faulty operation of the impounding structure or appurtenant facilities.

~~1. Impounding structures in the Class I hazard potential category are located where failure will cause probable loss of life or serious damage to occupied building(s), industrial or commercial facilities, important public utilities, main highway(s) or railroad(s).~~

~~2. Impounding structures in the Class II hazard potential category are located where failure could cause possible loss of life or damage to occupied building(s);~~

~~industrial or commercial facilities, secondary highway(s) or railroad(s) or cause interruption of use or service of relatively important public utilities.~~

~~3. Impounding structures in Class III hazard potential category are located where failure may cause minimal property damage to others. No loss of life is expected.~~

~~4. Impounding structures in Class IV hazard potential category are located where the failure of the impounding structure would cause no property damage to others. No loss of life is expected.~~

5 C. Such size and hazard potential classifications shall be proposed by the owner and shall be subject to approval by the director. Present and ~~projected development of planned land-use in the dam break~~ inundation zones downstream from the impounding structure shall be considered in determining the classification.

6 D. Impounding structures shall be subject to reclassification by the Board as necessary.

Statutory Authority: §10.1-605 of the Code of Virginia.  
Historical Notes: Derived from VR625-01-00 §1.4, eff. February 1, 1989.

#### **4VAC50-20-50. Performance standards required for impounding structures.**

A. 1. In accordance with the definitions provided by Virginia Code § 10.1-604 and 4VAC50-20-30, an impounding structure shall be regulated if the dam is 25 feet or greater in height and creates a maximum impounding capacity of 15 acre-feet or greater, or the dam is six feet or greater in height and creates a maximum impounding capacity of 50 acre-feet or greater and is not otherwise exempt from regulation by the Code of Virginia. Impounding structures exempted are those that are:

a. licensed by the State Corporation Commission that are subject to a safety inspection program;

b. owned or licensed by the United States government;

c. operated primarily for agricultural purposes which are less than 25 feet in height or which create a maximum impoundment capacity smaller than 100 acre-feet;

d. water or silt retaining dams approved pursuant to §45.1-222 or §45.1-225.1 of the Code of Virginia; or

e. obstructions in a canal used to raise or lower water.

Impounding structures of regulated size and not exempted shall be constructed, operated and maintained such that they perform in accordance with their design and purpose throughout the life of the project. For ~~new~~ impounding structures, the spillway(s) capacity shall perform at a minimum to safely pass the appropriate spillway design flood as determined in Table 1 unless otherwise grandfathered pursuant to 4 VAC 50-20-130. For the purposes of utilizing Table 1, Maximum Impounding Capacity and Height shall be determined in accordance with the definitions provided in 4 VAC 50-20-30.

#### **TABLE 1--Impounding Structure Regulations**

Hazard Class of Dam <sup>2</sup>	Hazard Potential If Impounding Structure Fails	SIZE CLASSIFICATION		Spillway Design Flood (SDF) <sup>b 4</sup>
		Maximum Impounding Capacity (Ac-Ft) <sup>a 3</sup>	Height(Ft) <sup>a 3</sup>	
HIGH I	Probable Loss of Life; Excessive Economic Loss	All <sup>1</sup>	All <sup>1</sup>	PMF <sup>5</sup>
		Large $\geq 50,000$	$\geq 100$	PMF <sup>e</sup>
		Medium $\geq 1,000$ & $< 50,000$	$\geq 40$ & $< 100$	PMF
		Small $\geq 50$ & $< 1,000$	$\geq 25$ & $< 40$	1/2 PMF to PMF
SIGNIFICANT H	Possible Loss of Life; Appreciable Economic Loss	Large $\geq 50,000$	$\geq 100$	PMF
		Medium $\geq 1,000$ & $< 50,000$	$\geq 40$ & $< 100$	1/2 .50 PMF to PMF
		Small $\geq 50$ & $< 1,000$	$\geq 25$ & $< 40$	100-YR to 1/2 .50 PMF
LOW III	No Loss of Life Expected; Minimal Economic Loss	Large $\geq 50,000$	$\geq 100$	1/2 PMF to PMF 100-YR <sup>7</sup>
		Medium $\geq 1,000$ & $< 50,000$	$\geq 40$ & $< 100$	100-YR <sup>7</sup> to 1/2 PMF
		Small $\geq 50$ & $< 1,000$	$\geq 25$ & $< 40$	50-YR <sup>d6</sup> to 100-YR <sup>e</sup>
IV	No Loss of Life Expected; No Economic Loss to Others	$\geq 50$ -(non agricultural)	$\geq 25$ (both)	50-YR to 100-YR
		$\geq 100$ -(agricultural)		

2. Hazard classes of dams are as follows:

High Hazard Potential is defined where an impounding structure (dam) failure will probably cause the loss of life or serious economic damage to occupied building(s), industrial or commercial facilities, primary public utilities, major public roadways, railroads or personal property.

Significant Hazard Potential is defined where an impounding structure (dam) failure may cause the loss of life or appreciable economic damage to occupied building(s), industrial or commercial facilities, secondary public utilities, secondary public roadways, railroads or personal property.

Low Hazard Potential is defined where an impounding structure (dam) failure would result in no probable loss of life and would cause no more than minimal economic damage to occupied building(s), industrial or commercial facilities, secondary public utilities, secondary public roadways, railroads or personal property.

a 3. The factor determining the largest size classification shall govern. The appropriate size classification is determined by the largest size associated with the maximum impounding capacity and height of the impounding structure.

b 4. The spillway design flood (SDF) represents the largest flood that need be considered in the evaluation of the performance for a given project. The impounding structure shall perform so as to safely pass the appropriate SDF. Where a range of SDF is indicated, the magnitude that most closely relates to the involved risk should be selected. proportionalize the height and maximum impounding capacity within the appropriate size classification and apply the maximum proportion within the SDF range to determine the appropriate SDF. Reductions in the established SDF may be evaluated through the use of incremental damage assessment pursuant to 4 VAC 50-20-54. The SDF established for an impounding structure shall not be less than those standards established elsewhere in the Code of Virginia or its attendant regulations including but not limited to design

criteria for stormwater management facilities. The establishment in this chapter of rigid design flood criteria or standards is not intended. Safety must be evaluated in the light of peculiarities and local conditions for each impounding structure and in recognition of the many factors involved, some of which may not be precisely known. Such can only be done by competent, experienced engineering judgment, which the values in Table 1 are intended to supplement, not supplant.

e 5. PMF: Probable maximum flood. This means is the flood that might be expected from the most severe combination of critical meteorologic and hydrologic conditions that are reasonably possible in the region. The PMF is derived from the current probable maximum precipitation (PMP) available from the National Weather Service, NOAA. In some cases local topography or meteorological conditions will cause changes from the generalized PMP values; therefore, it is advisable to contact local, state or federal agencies to obtain the prevailing practice in specific cases. Any deviation in the application of established developmental procedures must be explained and justified by the owner's engineer. The owner's engineer must run the PMF for 6, 12 and 24 hour durations, using the inflow hydrograph that creates the largest peak inflow for non-failure and failure analyses. It is expected that generally the 6 hour storm duration applies to small, less than 10 square mile, drainage basins. Present and planned land-use conditions shall be considered in determining the runoff characteristics of the drainage area.

d 6. 50-Yr: 50-year flood. This means represents the flood magnitude expected to be equaled or exceeded on the average of once in 50 years. It may also be expressed as an exceedence probability with a 2.0% chance of being equaled or exceeded in any given year. For the purposes of determining compliance of an impounding structure with the Spillway Design Flood (SDF), it shall be acceptable to substitute 0.15 PMF for the 50-year flood value. Present and planned land-use conditions shall be considered in determining the runoff characteristics of the drainage area.

e 7. 100-Yr: 100-year flood. This means represents the flood magnitude expected to be equaled or exceeded on the average of once in 100 years. It may also be expressed as an exceedence probability with a 1.0% chance of being equaled or exceeded in any given year. For the purposes of determining compliance of an impounding structure with the Spillway Design Flood (SDF), it shall be acceptable to substitute 0.20 PMF for the 100-year flood value. Present and planned land-use conditions shall be considered in determining the runoff characteristics of the drainage area.

B. When there is a road across the dam or below the dam, the classification of the dam shall take into account the following:

1. If the road is public, state maintained, or used by several families others than those specified in subsection B2, then the dam is to be classified at a minimum as a Significant Hazard impounding structure; and
2. If the road is private, not maintained by the state and only used by the owner, owner's family and guests then the dam is to be classified at a minimum as a Low Hazard impounding structure.

Statutory Authority: §10.1-605 of the Code of Virginia.  
Historical Notes: Derived from VR625-01-00 §1.5, eff. February 1, 1989; Amended, Virginia Register Volume 18, Issue 14, eff. July 1, 2002.

Effect of Amendment: The July 1, 2002 amendment corrected the "greater than" and "equal than" signs in Table 1.

#### **4VAC50-20-52. Dam break inundation zone mapping.**

A. All dam owners must provide inundation maps representing the impacts that would occur should their dam fail. High and Significant Hazard dams shall provide detailed dam break inundation zone maps in accordance with the requirements set out in subsection B. Low Hazard dams shall require a simple map demonstrating the general inundation that results from a dam failure.

B. The requirements for a dam break inundation map for High and Significant Hazard dams are as follows:

1. Maps shall be developed for both the sunny day failure condition and the Spillway Design Flood failure condition to show the expected extremes in peak water surface elevations, travel times of the front of the dam break flood wave to critical locations, and distances downstream between the two scenarios. A sunny day failure must be modeled starting with the reservoir at normal pool and assuming that the total failure will take between 0.5 and 3 hours with a failure width of ½ to twice the height of the dam and side slopes of less than Horizontal/Vertical and failure beginning when the reservoir is near the storm generated peak reservoir elevation. Inundation mapping should extend downstream until the breach flood wave would be non-damaging.

2. The map(s) shall be developed at a scale sufficient to graphically display downstream inhabited areas and structures, roads, and other pertinent structures on the map within the identified inundation area that may be subject to possible danger. To the maximum extent practicable, the inundation maps should be supplemented with water surface profiles at critical areas showing the water surface elevation prior to failure and the peak water surface elevation after failure. The list of downstream residents with their telephone numbers should whenever possible be plotted on the map for easy reference in the case of emergencies.

3. Since local officials are likely to use the maps for evacuation purposes, a note should be included on the map to advise that, because of the method, procedures, and assumptions used to develop the flooded areas, the limits of flooding shown and flood wave travel times are approximate and should be used only as a guideline for establishing evacuation zones. Actual areas inundated will depend on actual failure conditions and may differ from areas shown on the maps.

4. The maps shall be signed and sealed by a professional licensed engineer.

#### **4VAC50-20-54. Incremental damage assessment.**

Once the owner's engineer has determined the required spillway design flood through application of Table 1, further analysis may be performed to evaluate the incremental damage assessment. This assessment may be used to lower the spillway design flood to the flood that would not cause additional death or property damage due to a dam failure over that which would occur without failure above which the incremental increase in water surface elevation downstream due to failure of a dam is no longer considered to present an unacceptable additional downstream threat. This analysis will require detailed computer modeling that produces water surface elevations at each

structure that may be impacted downstream of the dam. Water depths greater than two feet and overbank flow velocities greater than three feet per second shall be used to determine impacts to persons or property. Water depth changes less than two feet and overbank flow velocities less than three feet per second may be considered as ineffective to structures downstream of the dam.

**4VAC50-20-56. Alternative procedures (decision matrix) assessment.**

NOIRA placeholder: “establish an alternative procedure (decision matrix) which would allow for the evaluation of spillway design floods (SDF) less than the probable maximum flood (PMF) where there would be no unreasonable or significant increase in hazard to life and property”

**4VAC50-20-58. Local government notifications.**

For each certificate issued, the dam owner shall send to the appropriate local government a copy of the certificate and a description and map showing the area that could be affected by the breach. This notification would also serve to advise the locality that if development occurs in the dam break inundation zone that this could adversely affect the classification of the dam and require significant expenses to upgrade the dam.

**Part II: Permit Requirements**

**4VAC50-20-60. Required permits.**

A. No person or entity shall construct or begin to construct an impounding structure until the board has issued a construction permit.

B. No person or entity shall alter or begin to alter an existing impounding structure **in a manner which would potentially affect its structural integrity** until the board has issued an alteration permit, or in the case of an emergency, authorization **is** obtained from the director. The permit requirement may be waived if the director determines that the alteration of improvement will not substantially alter or affect the structural integrity of the impounding structure. **Alteration does not mean normal operation and maintenance.**

C. When the board receives an application for any permit to construct or alter an impounding structure, the director shall inform the government of any jurisdiction which might be affected by the permit application.

D. In evaluating construction and alteration permit applications the director shall use the most current design criteria and standards referenced in 4VAC50-20-320 of this chapter.

Statutory Authority: §10.1-605 of the Code of Virginia.  
Historical Notes: Derived from VR625-01-00 §2.1, eff. February 1, 1989.

**4VAC50-20-70. Construction permits.**

A. Prior to preparing the complete design report for a construction permit, applicants are encouraged to seek approval of the project concept from the director. For this purpose the applicant should submit a general description of subdivisions 1 through 4 of subsection B of this section and subdivisions 1 and 2 of this subsection:

1. Proposed design criteria and a description of the size, ground cover conditions, extent of current development of the watershed, jurisdictional comprehensive planning for development of the watershed, and the geologic and the geotechnical engineering assumptions used to determine the foundations and materials to be used.

2. Preliminary drawings of a general nature, including cross sections, plans and profiles of the impounding structure, proposed pool levels and types of spillway(s).

B. An applicant for a construction permit shall submit a design report on official forms. The design report shall be prepared in accordance with 4VAC50-20-240 and shall include the following information:

1. A description of the impounding structure and appurtenances and a proposed classification conforming with this chapter. The description shall include a statement of the purposes for which the impoundment and impounding structure are to be used.

2. A description of properties located in the dam break inundation zone downstream from the site of the proposed impounding structure, including the location and number of residential structures, buildings, roads, utilities and other property that would be endangered should the impounding structure fail.

3. A statement from the governing body of the local political subdivision or other evidence confirming that body is aware of the proposal to build an impounding structure and of the land use classifications applicable to the dam break inundation zone.

4. Maps showing the location of the proposed impounding structure that include: the county or city in which the proposed impounding structure would be located, the location of roads, access to the site and the outline of the impoundment. Existing aerial photographs or existing topographic maps may be used for this purpose.

5. A report of the geotechnical investigations of the foundation soils or bedrock and of the materials to be used to construct the impounding structure.

6. Design assumptions and analyses sufficient to indicate that the impounding structure will be stable during its construction and during the life of the impounding structure under all conditions of reservoir operations, including rapid filling and rapid drawdown of the impoundment.

7. Evaluation of the stability of the reservoir rim area in order to safeguard against reservoir rim slides of such magnitude as to create waves capable of overtopping the impounding structure and confirmation of rim stability during seismic activity.

8. Design assumptions and analyses sufficient to indicate that seepage in, around, through or under the impounding structure, foundation and abutments will be reasonably and practically controlled so that internal or external forces or results thereof will not endanger the stability of the impounding structure.

9. Calculations and assumptions relative to design of the spillway or spillways. Spillway capacity shall conform to the criteria of Table 1.

10. Provisions to ensure that the impounding structure and appurtenances will be protected against deterioration or erosion due to freezing and thawing, wind and rain or any combination thereof.

11. Other pertinent design data, assumptions and analyses commensurate with the nature of the particular impounding structure and specific site conditions, including when required by ~~the director~~ this chapter, a plan and profile of the dam break inundation zones.

12. Erosion and sediment control plans to minimize soil erosion and sedimentation during all phases of construction, operation and maintenance. Projects shall be in compliance with local erosion and sediment control ordinances.

13. A description of the techniques to be used to divert stream flow during construction so as to prevent hazard to life, health and property. Such diversion plans shall also be in accordance with applicable environmental laws.

14. A plan of quality control testing to confirm that construction materials and methods meet the design requirements set forth in the specifications.

15. A proposed schedule indicating construction sequence and time to completion.

16. Plans and specifications as required by 4VAC50-20-310.

17. An emergency action plan ~~on official forms~~ developed in accordance with 4VAC50-20-175 and evidence that ~~a copy~~ the required copies of such plan ~~has~~ have been filed with the Department, the local organization for emergency management and the State Department of Emergency Management. The plan shall include a method of providing notification and warning to persons downstream, other affected persons or property owners and local authorities in the event of a flood hazard or the potential or impending failure of the impounding structure.

18. A proposed impoundment and impounding structure operation and maintenance plan on official forms certified by a licensed professional engineer. This plan shall include a safety inspection schedule and shall place particular emphasis on operating and maintaining the impounding structure in keeping with the project design, so as to maintain its structural integrity and safety during both normal and abnormal conditions which may reasonably be expected to occur during its planned life.

19. Placeholder for stormwater construction permit requirement language.

20. Placeholder for cultural and historic resources????????

C. The director or the applicant may request a conference to facilitate review of the applicant's proposal.

D. The owner shall certify in writing that the operation and maintenance plan as approved by the board will be adhered to during the life of the project except in cases of unanticipated emergency requiring departure therefrom in order to mitigate hazard to life and property. ~~At such time~~ In the case of an emergency, the owner's engineer, ~~and the director~~, and other specified contacts shall be notified in accordance with the emergency action plan developed in accordance with 4VAC50-20-175.

E. If the submission is not acceptable, the director shall inform the applicant within 60 days and shall explain what changes are required for an acceptable submission.

F. Within 120 days of receipt of an acceptable design report the board shall act on the application.

G. Prior to and during construction the owner shall notify the director of any proposed changes from the approved design, plans, specifications, or operation and maintenance plan. Approval shall be obtained from the director prior to the construction or installation of any changes that will affect the stability of the impounding structure.

H. The construction permit shall be valid for the construction schedule specified in the approved design report. The construction schedule may be amended by the director for good cause at the request of the applicant.

I. Construction must commence within two years after the permit is issued. If construction does not commence within two years after the permit is issued, the permit shall expire, except that the applicant may petition the board for extension of the two-year period and the board may extend such period for good cause.

J. The director may ~~revoke a construction permit~~ issue a temporary stop work order pursuant to § 10.1-612.1 of the Code of Virginia and take any other action authorized by the Dam Safety Act (§ 10.1-604 et seq. of the Code of Virginia) if any of the permit terms are violated, or if construction is conducted in a manner hazardous to downstream life or property. ~~The director may order the owner to eliminate such hazardous conditions within a period of time limited by the order. Such corrective measures shall be at the owner's expense. The applicant may petition the board to reissue the permit with such modifications as the board determines to be necessary.~~

K. The owner's licensed professional engineer shall advise the director when the impounding structure may safely impound water. The director shall acknowledge this statement within 10 days after which the impoundment may be filled under the engineer's supervision. The director's acknowledgement shall act as a temporary operation and maintenance certificate until an operation and maintenance certificate has been applied for and issued in accordance with 4VAC50-20-110.

Statutory Authority: §10.1-605 of the Code of Virginia.

Historical Notes: Derived from VR625-01-00 §2.2, eff. February 1, 1989; Amended, Virginia Register Volume 18, Issue 14, eff. July 1, 2002.

Effect of Amendment: The July 1, 2002 amendment, in the second sentence of subsection A, changed "items" to "subdivisions" twice, inserted "of this section" and "of this subsection", and deleted "below" after "1 and 2"; in subsections B and K, and in paragraph B 16, deleted "of this chapter" after the VAC citation; and, in paragraph B 17, inserted "organization for emergency management", inserted "the" before "State Department", and changed "Services" to "Management" after "Emergency".

#### **4VAC50-20-80. Alterations permits.**

A. Application for a permit to alter an impounding structure in ways which would potentially affect its structural integrity shall be made on official forms. The application shall clearly describe the proposed work with appropriately detailed plans and specifications.

B. Alterations which would potentially affect the structural integrity of an impounding structure include, but are not limited to, changing ~~its the~~ height or otherwise enlarging the dam, increasing ~~the~~ normal pool or principal spillway elevation or physical dimensions, changing the elevation or physical dimensions of the emergency spillway, conducting necessary repairs or structural maintenance, or removing the impounding structure.

C. Where feasible an application for an alteration permit shall also include plans and specifications for a device to allow for draining the impoundment if such does not exist.

D. If the submission is not acceptable, the director shall inform the applicant within 60 days and shall explain what changes are required for an acceptable submission.

E. Within 120 days of receipt of an acceptable application, the board shall act on the application.

F. Each alteration permit shall contain an expiration date that shall not extend past two years from the date of issuance.

Statutory Authority: §10.1-605 of the Code of Virginia.  
Historical Notes: Derived from VR625-01-00 §2.3, eff. February 1, 1989.

#### **4VAC50-20-90. Transfer of permits.**

Prior to the transfer of ownership of a permitted impounding structure the permittee shall notify the director in writing and the new owner shall file a transfer application on official forms. The new owner shall amend the existing permit application as necessary and shall certify to the director that he is aware of and will comply with all of the requirements and conditions of the permit.

Statutory Authority: §10.1-605 of the Code of Virginia.  
Historical Notes: Derived from VR625-01-00 §2.4, eff. February 1, 1989.

### **Part III: Certificate Requirements**

#### **4VAC50-20-100. Operation and maintenance certificates.**

A. A **Class I High Hazard** Operation and Maintenance Certificate is required for a **Class I High Hazard** potential impounding structure. The certificate shall be for a term of six years. It shall be updated based upon the filing of a new ~~re~~inspection report certified by a **licensed** professional engineer every two years.

B. A **Class II Significant Hazard** Operation and Maintenance Certificate is required for a **Class II Significant Hazard** potential impounding structure. The certificate shall be for a term of six years. It shall be updated based upon the filing of a new ~~re~~inspection report certified by a **licensed** professional engineer every three years.

C. A **Class III Low Hazard** Operation and Maintenance Certificate is required for a **Class III Low Hazard** potential impounding structure. The certificate shall be for a term of six years.

D. The owner of a **Class I, II or III High, significant or Low Hazard** impounding structure shall provide the director an annual owner's inspection report on official forms in years when no **licensed** professional ~~re~~inspection is required and may be done by the owner or his representative.

E. If an Operation and Maintenance Certificate is not updated as required, the board shall take appropriate enforcement action.

F. The owner of a **Class I, II or III High, significant or Low Hazard** impounding structure shall apply for the renewal of the six year operation and maintenance certificate 90 days prior to its expiration in accordance with 4VAC50-20-120 of this chapter.

**G. A Class IV impounding structure will not require an operation and maintenance certificate. An inventory report is to be prepared as provided in 4VAC50-20-120 B and filed by the owner on a six-year interval, and an owners inspection report filed annually.**

H. The owner of any impounding structure, regardless of its hazard classification, shall notify the board immediately of any change in either cultural features downstream from the impounding structure or of any change in the use of the area downstream that would present hazard to life or property in the event of failure.

I. The owner of any impounding structure shall meet the emergency action plan submittal requirements setout in 4VAC50-20-175.

Statutory Authority: §10.1-605 of the Code of Virginia.

Historical Notes: Derived from VR625-01-00 §3.1, eff. February 1, 1989.

#### **4VAC50-20-110. Operation and maintenance certificate for newly constructed impounding structures.**

A. Within 180 days after completion of the construction of an impounding structure, the owner shall submit:

1. A complete set of as-built drawings certified by a licensed professional engineer and an as-built report on official forms.

2. A copy of a certificate from the licensed professional engineer who has inspected the impounding structure during construction certifying that, to the best of his judgment, knowledge and belief, the impounding structure and its appurtenances were constructed in conformance with the plans, specifications, drawings and other requirements approved by the board.

3. A copy of the operation and maintenance plan ~~and emergency action plan~~ submitted with the design report including any changes required by the director. The emergency action plan shall also be updated as necessary and resubmitted at this time.

B. If the director finds that the operation and maintenance plan or emergency action plan developed in accordance with 4VAC50-20-175 is deficient, he shall return it to the owner within 60 days with suggestions for revision.

C. Within 60 days of receipt of the items listed in subsection A above, if the board finds that adequate provision has been made for the safe operation and maintenance of the impounding structure, the board shall issue an operation and maintenance certificate.

Statutory Authority: §10.1-605 of the Code of Virginia.

Historical Notes: Derived from VR625-01-00 §3.2, eff. February 1, 1989.

#### **4VAC50-20-120. Operation and maintenance certificates for existing impounding structures.**

**A. Any owner of an a High, Significant, or Low Hazard impounding structure other than a Class IV impounding structure which has already filed an inventory report that does not have an operation and maintenance certificate or any owner renewing an operation and maintenance certificate shall file an application with the board.**

B. The application for an operation and maintenance certificate shall be on official forms and shall include:

1. A reinspection report for **Class I and II High or Significant Hazard** impounding structures. The reinspection report shall include an update of conditions of the impounding structure based on a previous safety inspection as required by the board, a previous reinspection report or an as-built report.

2. An inventory report for **Class III Low Hazard** impounding structures. The inventory report shall include:

- a. The name and location of the impounding structure and the name of the owner.
- b. The description and dimensions of the impounding structure, the spillways, the reservoir and the drainage area.
- c. The history of the impounding structure which shall include the design, construction, repairs, inspections and whether the structure has ever been overtopped.
- d. Observations of the condition of the impounding structure, reservoir, and upstream and downstream areas.
- e. Any changes in the impounding structure, reservoir, and upstream and downstream areas.
- f. Recommendations for remedial work.

3. An impoundment and impounding structure operation and maintenance plan certified by a licensed professional engineer. This plan shall place particular emphasis on operating and maintaining the impounding structure in keeping with the project design in such manner as to maintain its structural integrity and safety during both normal and abnormal conditions which may reasonably be expected to occur during its planned life. The safety inspection report required by the board should be sufficient to serve as the basis for the operation and maintenance plan for a **Class I and II High or Significant Hazard** impounding structure. For a **Class III Low Hazard** impounding structure, the operation and maintenance plan shall be based on the data provided in the inventory report.

4. An emergency action plan developed in accordance with 4VAC50-20-175 and evidence that ~~a copy~~ the required copies of such plan ~~has~~ have been filed with the Department, the local organization for emergency management and the State Department of Emergency Management. The plan shall include a method of providing notification and warning to persons downstream, other affected persons or property owners and local authorities in the event of a flood hazard or the potential or impending failure of the impounding structure.

C. The owner shall certify in writing that the operation and maintenance plan approved by the board will be adhered to during the life of the project except in cases of emergency requiring departure therefrom in order to mitigate hazard to life and property, at which time the owner's engineer, ~~and the director~~, and other specified contacts shall be notified in accordance with the emergency action plan developed in accordance with 4VAC50-20-175.

D. If the director finds that the operation and maintenance plan or emergency action plan developed in accordance with 4VAC50-20-175 is deficient, he shall return it to the owner within 60 days with suggestions for revision to meet the specified minimum requirements.

E. Within 60 days of receipt of an acceptable application if the board finds that adequate provision has been made for the safe operation and maintenance of the impounding structure, the board shall issue an operation and maintenance certificate.

Statutory Authority: §10.1-605 of the Code of Virginia.

Historical Notes: Derived from VR625-01-00 §3.3, eff. February 1, 1989; Amended, Virginia Register Volume 18, Issue 14, eff. July 1, 2002.

Effect of Amendment: The July 1, 2002 amendment, in paragraph B 1, substituted "previous safety inspection as required by the board" for "Phase I or Phase II inspection as established by the U.S. Army Corps of Engineers"; in the third sentence of paragraph B 3, substituted "safety inspection report required by the board" for "Phase I Inspection Report"; and, in paragraph B 4, substituted "local organization for emergency management and the State Department of Emergency Management" for "local and State Department of Emergency Services".

**4VAC50-20-125. Delayed effective date for Spillway Design Flood requirements for certain impounding structures.**

Those impounding structures determined to have an adequate spillway capacity prior to January 1, 2007, and that hold a current certificate to operate (regular or conditional certificates) but due to changes in the spillway capacity requirements require spillway modifications, shall not be required to upgrade the spillway to the new spillway design flood requirements until January 1, 2012. However, those dams previously issued a regular certificate will now require a conditional certificate until the new spillway design flood requirements are adequately addressed. If circumstances change during this delay effective period that justify more immediate repairs to the impounding structure, the Board may direct alterations sooner. During this delay period, dam owners are required to be working on plans to both upgrade their dam to the required spillway design flood requirements and also to address other deficiencies that may exist that are not related to the SDF. [THIS PLACEHOLDER SECTION IS UNDER CONSTRUCTION PURSUANT TO THE JULY 12 TAC DISCUSSIONS AND WOULD REPLACE DRAFT SECTION 130 BELOW.]

**4VAC50-20-130. Existing impounding Grandfathering of certain impounding structures constructed prior to July 1, 1982.**

A. High hazard dams that possess a valid operation and maintenance certificate and are less than 40 feet in size and have a required SDF of less than a PMF shall not be required to upgrade to a full PMF until such time as the impounding structure requires other alteration related to the integrity of the structure.

B. For impounding structures where the state has prior determined a required SDF value that is less than the higher value arrived at by proportionalizing the maximum impounding height and maximum impounding capacity within the appropriate size classification, shall not be required to upgrade to the proportionalized SDF value until such time as the impounding structure requires other structural repairs.

A C. ~~Many existing impoundment structures were designed and constructed prior to the enactment of the Dam Safety Act, and may not satisfy current criteria for new construction.~~ The board may reissue an operation and maintenance certificate for such those structures grandfathered pursuant to subsections A and B provided that:

1. Operation and maintenance is determined by the director to be satisfactory and up to date;

2. The dam is not in need of other alteration related to the integrity of the structure;

3. Emergency Action Plan requirements set out in 4 VAC 50-20-175 have been satisfied;

4. Annual owner's inspection reports have been consistently filed with, and are considered satisfactory, by the director;

5. The applicant proves in accordance with the current design procedures and references of 4VAC50-20-320 to the satisfaction of the board that the impounding structure as designed, constructed, operated and maintained does not pose an unreasonable hazard to life and property; and

6. The owner satisfies all special requirements imposed by the board.

~~B. When appropriate with existing impounding structures only, the spillway design flood requirement may be reduced by the board to the spillway discharge at which dam failure will not significantly increase the downstream hazard existing just prior to dam failure provided that the conditions of 4VAC50-20-130 A have been met.~~

Statutory Authority: §10.1-605 of the Code of Virginia.

Historical Notes: Derived from VR625-01-00 §3.4, eff. February 1, 1989.

#### ~~4VAC50-20-140. Existing impounding structures constructed after July 1, 1982.~~

~~The board may issue an operation and maintenance certificate for an impounding structure having a construction permit issued after July 1, 1982, and shall not require upgrading to meet new more stringent criteria unless the board determines that the new criteria must be applied to prevent an unreasonable hazard to life or property.~~

Statutory Authority: §10.1-605 of the Code of Virginia.

Historical Notes: Derived from VR625-01-00 §3.5, eff. February 1, 1989.

#### **4VAC50-20-150. Conditional operation and maintenance certificate.**

A. During the review of any operation and maintenance application should the director determine that the impounding structure has deficiencies of a nonimminent danger category, the director may recommend that the board issue a conditional operation and maintenance certificate.

B. The conditional operation and maintenance certificate for **Class I, II and III High, Significant, and Low Hazard** impounding structures shall be for a maximum term of two years. This certificate will allow the owner to continue normal operation and maintenance of the impounding structure, and shall require that the owner correct the deficiencies on a schedule determined by the director.

C. A conditional certificate may be renewed in accordance with the procedures of 4VAC50-20-120 provided that annual owner inspection reports are on file, and the board determines that the owner is proceeding with the necessary corrective actions.

D. Once the deficiencies are corrected, the board shall issue an operation and maintenance certificate based upon any required revisions to the original application.

E. The owner of any impounding structure, whether under conditional certificate or otherwise, shall meet the emergency action plan requirements set out in 4VAC50-20-175.

Statutory Authority: §10.1-605 of the Code of Virginia.  
Historical Notes: Derived from VR625-01-00 §3.6, eff. February 1, 1989.

#### **4VAC50-20-160. Additional operation and maintenance requirements.**

A. The owner of an impounding structure shall not, through action or inaction, cause or allow such structure to impound water following receipt of a written report from the owner's engineer that the impounding structure will not safely impound water.

**B. In accordance with § 10.1-609.2 of the Code of Virginia, dam owners shall not permit the growth of trees and other woody vegetation and shall remove any such vegetation from the slopes and crest of embankments and the emergency spillway area, and within a distance of 25 feet from the toe of the embankment and abutments of the dam.**

Statutory Authority: §10.1-605 of the Code of Virginia.  
Historical Notes: Derived from VR625-01-00 §3.7, eff. February 1, 1989.

#### **4VAC50-20-170. Transfer of certificates.**

Prior to the transfer of ownership of an impounding structure the certificate holder shall notify the director in writing and the new owner shall file a transfer application on official forms. The new owner may elect to continue the current operation and maintenance certificate for the remaining term or he may apply for a new certificate in accordance with 4VAC50-20-120. If the owner elects to continue the existing certificate he shall amend the existing certificate application as necessary and shall certify to the director that he is aware of and will comply with all of the requirements and conditions of the certificate.

Statutory Authority: §10.1-605 of the Code of Virginia.  
Historical Notes: Derived from VR625-01-00 §3.8, eff. February 1, 1989.

#### **4VAC50-20-175. Emergency Action Plans.**

A. In order to minimize the loss of life and property damage during potential emergency conditions at a dam, and to ensure effective, timely action is taken should a dam emergency occur, an EAP shall be required for each impounding structure. The emergency action plans shall be coordinated with the Department of Emergency Management in accordance with §44-146.18. The plans required by these regulations shall be incorporated into local and inter-jurisdictional emergency plans pursuant to §44-146.19.

B. It is the dam owner's responsibility to develop, maintain, exercise, and implement a site-specific EAP.

C. An EAP shall be submitted every six years. For a High, Significant, or Low hazard impounding structure, the EAP shall be submitted with the dam owner's renewal of their operation and maintenance certificate application.

D. It is imperative that the dam owner furnish all holders of the EAP section updates to the EAP immediately upon becoming aware of necessary changes to keep the EAP workable. Should a dam be reclassified, an emergency action plan in accordance with this section shall be submitted.

E. A drill shall be conducted annually for each High, Significant, or Low hazard impounding structure. A table-top exercise shall be conducted once every 3 years for High, and Significant hazard structures. Owners shall certify to the Department annually that an exercise has been completed and the statement shall include a critique of the exercise and any revisions or updates to the plan or a statement that no revisions or updates are needed.

F. Dam owners shall test existing monitoring, sensing, and warning equipment at remote/unattended dams at least twice per year and maintain a record of such tests.

G. An EAP shall contain the following seven basic elements unless otherwise specified in this subsection.

1. Notification chart - A notification chart shall be included for all classes of dams that shows who is to be notified, by whom, and in what priority. The notification chart shall include contact information that assures 24-hour telephone coverage for all responsible parties.

2. Emergency Detection, Evaluation, and Classification - The plan shall include a discussion of the procedures for timely and reliable detection, evaluation, and classification of an emergency situation to ensure that the appropriate course of action is taken based on the urgency of the situation. Where appropriate, the situations should address dam breaks that are imminent or in progress, a situation where the potential for dam failure is rapidly developing, and a situation where the threat is slowly developing.

3. Responsibilities - The plan shall specify a determination of responsibility for EAP-related tasks. The EAP shall also clearly designate the responsible party for making the decision that an emergency condition no longer exists at the dam.

4. Preparedness - The plan shall include a section that describes preparedness actions to be taken both before and following development of emergency conditions.

5. Dam Break Inundation Maps - The plan shall include an inundation map that delineates the areas that would be flooded as a result of a dam failure. [All properties identified within the dam break inundation zone shall be incorporated into the EAP's dam break inundation zone map to ensure the proper notification of persons downstream and other affected persons or property owners in the event of a flood hazard or the impending failure of the impounding structure.](#) Such maps shall be developed in accordance with [4VAC50-20-52](#).

6. Appendices - The appendices shall contain information that supports and supplements the material used in the development and maintenance of the EAP such as analyses of dam break floods; plans for training, exercising, updating, and posting the EAP; and other site-specific concerns.

7. Certification - The plan shall include a section that is signed by all parties involved in the plan, where they indicate their approval of the plan and agree to their

responsibilities for its execution. The preparers name, title, and contact information shall be printed in this section. The preparer's signature shall also be included in the certification section.

**Table X:** Emergency Action Plan Requirement Summary

<u>Hazard Class</u>	<u>Notification Chart</u>	<u>Emergency Detection, Evaluation, and Classification</u>	<u>Responsibilities</u>	<u>Preparedness</u>	<u>Dam Break Inundation Maps</u>	<u>Appendices</u>	<u>Certification</u>	<u>Drill</u>	<u>Table Top Exercise</u>
<u>High</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>
<u>Significant</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>
<u>Low</u>	<u>?</u>	<u>?</u>	<u>?</u>	<u>?</u>	<u>?</u>	<u>?</u>	<u>?</u>	<u>?</u>	

H. The development of the EAP shall be coordinated with all entities, jurisdictions, and agencies that would be affected by a dam failure or that have statutory responsibilities for warning, evacuation, and post-flood actions. Consultation with state and local emergency management officials at appropriate levels of management responsible for warning and evacuation of the public is essential to ensure that there is agreement on their individual and group responsibilities.

I. The EAP shall at a minimum be filed with the Department, the local organization for emergency management, and the State Department of Emergency Management. Two copies shall be provided to the Department.

J. The following format shall be used as necessary to address the requirements of this section.

Title Page/Cover Sheet

Table of Contents

I. Certifications

II. Notification Flowchart

III. Statement of Purpose

IV. Project Description

V. Emergency Detection, Evaluation, and Classification

VI. General Responsibilities Under the EAP

A. Dam Owner Responsibilities

B. Responsibility for Notification

C. Responsibility for Evacuation

D. Responsibility for Termination and Follow-Up

E. EAP Coordinator Responsibility

VII. Preparedness

VIII. Inundation Maps

IX Appendices

A. Investigation and Analyses of Dambreak Floods

B. Plans for Training, Exercising, Updating, and Posting the EAP  
C. Site-Specific Concerns

**Part IV: Procedures**

**4VAC50-20-180. Inspections.**

The director may make inspections during construction, alteration or operation and maintenance as deemed necessary to ensure that the impounding structure is being constructed, altered or operated and maintained in compliance with the permit or certificate issued by the board. **During the maintenance, construction, or alteration of any dam or reservoir, the director shall require the owner to perform, at the owner's expense, such work or tests as necessary to obtain information sufficient to enable the director to determine whether conformity with the plans and specifications approved by the certificate is being secured.** The director shall provide the owner a copy of the findings of these inspections. This inspection does not relieve the owner from the responsibility of providing adequate inspection during construction or operation and maintenance. Periodic inspections during construction or alteration shall be conducted under the supervision of a **licensed** professional engineer who shall propose the frequency and nature of the inspections subject to approval by the director. Periodic inspections during operation and maintenance shall be conducted under the supervision of a **licensed** professional engineer at an interval not greater than that required to update the operation and maintenance certificate. At a minimum, an annual owner's inspection shall be conducted when a professional inspection is not required. Every owner shall provide for an inspection by a **licensed** professional engineer after overtopping of the impounding structure. A copy of the findings of each inspection with the engineer's recommendations shall be filed with the board within a reasonable period of time not to exceed 30 days subsequent to completion of the inspection.

Statutory Authority: §10.1-605 of the Code of Virginia.  
Historical Notes: Derived from VR625-01-00 §4.1, eff. February 1, 1989.

**4VAC50-20-190. Right to hearing.**

Any owner aggrieved by an action taken by the director or by the board without hearing, or by inaction of the director or the board, under the provisions of this chapter, may demand in writing a formal hearing.

Statutory Authority: §10.1-605 of the Code of Virginia.  
Historical Notes: Derived from VR625-01-00 §4.2, eff. February 1, 1989.

**4VAC50-20-200. Enforcement.**

**Any owner refusing to obey any order of the board or the director pursuant to this chapter may be compelled to obey and comply with such provisions by injunction or other appropriate remedy obtained in a court proceeding. Such proceeding shall be instituted by the board or in the case of an emergency, by the director in the court which granted approval to the owner to impound waters or, if such approval has not been**

granted, the proceeding shall be instituted in any appropriate court. Enforcement of the provisions of this chapter shall be in accordance with the provisions of the Dam Safety Act (§ 10.1-604 et seq. of the Code of Virginia).

Statutory Authority: §10.1-605 of the Code of Virginia.  
Historical Notes: Derived from VR625-01-00 §4.3, eff. February 1, 1989.

#### **4VAC50-20-210. Consulting boards.**

A. When the board needs to satisfy questions of safety regarding plans and specifications, construction or operation and maintenance, or when requested by the owner, the board may appoint a consulting board to report to it with respect to those questions of the impounding structure's safety ~~of an impounding structure~~. Such a board shall consist of two or more consultants, none of whom have been associated with the impounding structure.

B. The costs and expenses incurred by the consulting board, if appointed at the request of an owner, shall be paid by the owner.

C. The costs and expenses incurred by the consulting board, if initiated by the board, shall be paid by the board.

Statutory Authority: §10.1-605 of the Code of Virginia.  
Historical Notes: Derived from VR625-01-00 §4.4, eff. February 1, 1989.

#### **4VAC50-20-220. Unsafe conditions.**

A. No owner shall ~~have the right to~~ maintain an unsafe impounding structure ~~which unreasonably threatens the life or property of another person. The owner of any impounding structure found to have deficiencies which could threaten life or property if uncorrected shall take the corrective actions needed to remove such deficiencies within a reasonable period of time.~~ Designation of an impounding structure as unsafe shall be made in accordance with § 10.1-607.1 of the Code of Virginia.

B. Imminent danger. When the director finds that an impounding structure is unsafe and constitutes an imminent danger to life or property, he shall immediately notify the State Department of Emergency Management and confer with the owner and ensure that the emergency action plan has been implemented if appropriate to do so. The owner of an impounding structure found to constitute an imminent danger to life or property shall take immediate corrective action to remove the imminent danger as required by §10.1-608 of the Code of Virginia.

C. Nonimminent danger. The owner of an impounding structure who has been issued a report by the board containing findings and recommendations for the correction of deficiencies which threaten life or property if not corrected, shall undertake to implement the recommendations for correction of deficiencies according to a schedule of implementation contained in that report as required by §10.1-609 of the Code of Virginia.

Statutory Authority: §10.1-605 of the Code of Virginia.  
Historical Notes: Derived from VR625-01-00 §4.5, eff. February 1, 1989; Amended, Virginia Register Volume 18, Issue 14, eff. July 1, 2002.

Effect of Amendment: The July 1, 2002 amendment, in subsection B, changed "Emergency Services" to "Emergency Management"; and, in subsection C, changed "director" to "board", following "issued a report by the".

#### **4VAC50-20-230. Complaints.**

A. Upon receipt of a complaint alleging that the person or property of the complainant is endangered by the construction, maintenance or operation of impounding structure, the director shall cause an inspection of the structure, unless the data, records and inspection reports on file with the board are found adequate to determine if the complaint is valid.

B. If the director finds that an unsafe condition exists, the director shall proceed under the provisions of §§10.1-608 and 10.1-609 of the Code of Virginia to render the extant condition safe.

Statutory Authority: §10.1-605 of the Code of Virginia.  
Historical Notes: Derived from VR625-01-00 §4.6, eff. February 1, 1989.

### **Part V: Design Requirements**

#### **4VAC50-20-240. Design of structures.**

A. The owner shall complete all necessary investigations prior to submitting the design report. The scope and degree of precision required is a matter of engineering judgment based on the complexities of the site and the hazard potential classification of the proposed structure.

B. Surveys shall be made with sufficient accuracy to locate the proposed construction site and to define the total volume of storage in the impoundment. Locations of center lines and other horizontal and vertical controls shall be shown on a map of the site. The area downstream and upstream from the proposed impounding structure shall be investigated in order to delineate the areas and extent of potential damage in case of failure or backwater due to flooding.

C. The drainage area shall be determined. ~~Present, projected and potential future~~ and planned land-use conditions shall be considered in determining the runoff characteristics of the drainage area. The most severe of these conditions shall be included in the design calculations which shall be submitted as part of the design report.

D. The geotechnical engineering investigation shall consist of borings, test pits and other subsurface explorations necessary to adequately define the existing conditions. The investigations shall be performed so as to define the soil, rock and ground water conditions.

E. All construction materials shall be adequately selected so as to ensure that their properties meet design criteria. If on-site materials are to be utilized, they shall be located and determined to be adequate in quantity and quality.

Statutory Authority: §10.1-605 of the Code of Virginia.  
Historical Notes: Derived from VR625-01-00 §5.1, eff. February 1, 1989.

#### **4VAC50-20-250. Design flood.**

The minimum design flood to be utilized in impounding structure evaluation, design, construction, operation and maintenance shall be commensurate with the size and hazard potential of the particular impounding structure as determined in 4VAC50-20-50 and Table 1. Competent, experienced, ~~professional~~-engineering judgment by a licensed professional engineer shall be used in applying those design and evaluation procedures referenced in 4VAC50-20-320 of this chapter.

Statutory Authority: §10.1-605 of the Code of Virginia.  
Historical Notes: Derived from VR625-01-00 §5.2, eff. February 1, 1989.

#### **4VAC50-20-260. Emergency spillway design.**

A. Every impounding structure shall have a spillway system with adequate capacity to discharge the design flood without endangering the safety of the impounding structure.

B. An emergency spillway shall be required.

C. Vegetated earth or an unlined emergency spillway may be approved when the applicant demonstrates that it will pass the spillway design flood without jeopardizing the safety of the impounding structure. In no case, however, shall dam owners permit the growth of trees and other woody vegetation in the emergency spillway area.

D. Lined emergency spillways shall include design criteria calculations, plans and specifications for open channel, drop, ogee and chute spillways that include crest structures, walls, panel lining and miscellaneous details. All joints shall be reasonably water-tight and placed on a foundation capable of sustaining applied loads without undue deformation. Provision shall be made for handling leakage from the channel or under seepage from the foundation which might adversely affect the structural integrity and structural stability of the impounding structure.

Statutory Authority: §10.1-605 of the Code of Virginia.  
Historical Notes: Derived from VR625-01-00 §5.3, eff. February 1, 1989.

#### **4VAC50-20-270. Principal spillways and outlet works.**

A. It will be assumed that principal spillways and regulating outlets provided for special functions will operate to normal design discharge capabilities during the spillway design flood, provided appropriate analyses show:

1. That control gates and structures are suitably designed to operate reliably under maximum heads for durations likely to be involved and risks of blockage by debris are minimal;

2. That access roads and passages to gate regulating controls would be safely passable by operating personnel under spillway design flood conditions; and

3. That there are no other substantial reasons for concluding that outlets would not operate safely to full design capacity during the spillway design flood.

B. If there are reasons to doubt that any of the above basic requirements might not be adequately met under spillway design flood conditions, the "dependable" discharge capabilities of regulating outlets shall be assumed to be less than 100% of design

capabilities, generally as outlined in the following subsections C through G of this section.

C. Any limitations in safe operating heads, maximum velocities to be permitted through structures or approach channels, or other design limitations shall be observed in establishing "dependable" discharge rating curves to be used in routing the spillway design flood hydrograph through the reservoir.

D. If intakes to regulating outlets are likely to be exposed to dangerous quantities of floating ~~drift~~ debris, sediment depositions or ice hazards prior to or during major floods, the dependable discharge capability during the spillway design flood shall be assumed to be zero.

E. If access roads or structural passages to operating towers or controls are likely to be flooded or otherwise unusable during the spillway design flood, the dependable discharge capability of regulating outlets will be assumed to be zero for those period of time during which such conditions might exist.

F. Any deficiencies in discharge performance likely to result from delays in the operation of gates before attendants could be reasonably expected to reach the control for in estimating "dependable" discharge capabilities to be assumed in routing the spillway design flood through reservoir. Reports on design studies shall indicate the allowances made for possible delays in initiating gate operations. Normally, for projects located in small basins, where critical spillway design flood inflows may occur within several hours after intense precipitation, outflows through any regulating outlets that must be opened after the flood begins shall be assumed to be zero for an appropriate period of time subsequent to the beginning of intense rainfall.

G. All gates, valves, conduits and concrete channel outlets shall be designed and constructed to prevent significant erosion or damage to the impounding structure or to the downstream outlet or channel.

Statutory Authority: §10.1-605 of the Code of Virginia.  
Historical Notes: Derived from VR625-01-00 §5.4, eff. February 1, 1989.

#### **4VAC50-20-280. Drain requirements.**

All new impounding structures regardless of their hazard potential classification, shall include a device to permit draining of the impoundment within a reasonable period of time as determined by the owner's licensed professional engineer, subject to approval by the director.

Statutory Authority: §10.1-605 of the Code of Virginia.  
Historical Notes: Derived from VR625-01-00 §5.5, eff. February 1, 1989.

#### **4VAC50-20-290. Life of the impounding structure.**

Components of the impounding structure, the impoundment, the outlet works, drain system and appurtenances shall be durable in keeping with the design and planned life of the impounding structure.

Statutory Authority: §10.1-605 of the Code of Virginia.  
Historical Notes: Derived from VR625-01-00 §5.6, eff. February 1, 1989.

**4VAC50-20-300. Additional design requirements.**

A. Flood routings shall start at or above the elevation of the crest of the lowest ungated outlet.

B. All elements of the impounding structure and impoundments shall conform to sound engineering practice. Safety factors, design standards and design references that are used shall be included with the design report.

C. Inspection devices may be required by the director for use by inspectors, owners or the director in conducting inspections in the interest of structural integrity during and after completion of construction and during the life of the impounding structure.

Statutory Authority: §10.1-605 of the Code of Virginia.  
Historical Notes: Derived from VR625-01-00 §5.7, eff. February 1, 1989.

**4VAC50-20-310. Plans and specifications.**

The plans and specifications for a proposed impounding structure shall consist of a detailed engineering design report that includes engineering drawings and specifications, with the following as a minimum:

1. The name of the project; the name of the owner; classification of the impounding structure as set forth in this chapter; designated access to the project and the location with respect to highways, roads, streams and existing impounding structures and impoundments that would affect or be affected by the proposed impounding structure.

2. Cross-sections, profiles, logs of test borings, laboratory and in situ test data, drawings of principal and emergency spillways and other additional drawings in sufficient detail to indicate clearly the extent and complexity of the work to be performed.

3. The technical provisions, as may be required to describe the methods of the construction and construction quality control for the project.

4. Special provisions, as may be required to describe technical provisions needed to ensure that the impounding structure is constructed according to the approved plans and specifications.

Statutory Authority: §10.1-605 of the Code of Virginia.  
Historical Notes: Derived from VR625-01-00 §5.8, eff. February 1, 1989.

**4VAC50-20-320. Acceptable design procedures and references.**

The following are acceptable as design procedures and references:

1. The design procedures, manuals and criteria used by the United States Army Corps of Engineers.

2. The design procedures, manuals and criteria used by the United States Department of Agriculture, Natural Resources Conservation Service.

3. The design procedures, manuals and criteria used by the United States Department of the Interior, Bureau of Reclamation.

4. The design procedures, manuals and criteria used by the United States Department of Commerce, National Weather Service.

5. Other design procedures, manuals and criteria that are accepted as current, sound engineering practices, as approved by the director prior to the design of the impounding structure.

Statutory Authority: §10.1-605 of the Code of Virginia.

Historical Notes: Derived from VR625-01-00 §5.9, eff. February 1, 1989; Amended, Virginia Register Volume 18, Issue 14, eff. July 1, 2002.

Effect of Amendment: The July 1, 2002 amendment, in paragraph 2, changed "Soil" to "Natural Resources" before "Conservation"; and, in paragraph 3, changed "or Interior" to "of the Interior".

#### **4VAC50-20-322. Other applicable dam safety references.**

EAP reference

Incremental reference

#### **FORMS**

Dam Owner's Annual Inspection Form, DCR 199-098 (rev. 12/01).

Operation and Maintenance Application Class I, II and III High and Significant Hazard Impounding Structures, DCR 199-099 (rev. 12/01).

As-Built Report for Class I, II and III High, Significant, and Low Hazard Impounding Structures, DCR 199-100 (rev. 12/01).

Design Report for the Construction/Alteration of Impounding Structures, DCR 199-101 (rev. 12/01).

~~Emergency Action Plan for Class I, Class II and Class III Impounding Structures, DCR 199-103 (rev. 12/01).~~

Inventory Report for Class III and Class IV Low Hazard Impounding Structures, DCR 199-104 (rev. 12/01).

Reinspection Report for Class I and II High and Significant Hazard Impounding Structures, DCR 199-105 (rev. 12/01).

Agricultural Certification for Impounding Structures, DCR 199-106 (rev. 12/01).

Transfer Application for Impounding Structures, DCR 199-107 (rev. 12/01).



Attachment #2

**Virginia Soil and Water Conservation Board Work Group Meeting**

USDA Natural Resources Conservation Service Conference Room

1606 Santa Rosa Road, Suite 209

Richmond, Virginia 23229

October 20, 2005

10:00 am

**Discussion of an Alternate Procedure for Existing Dams**

**Background** - At the May 19, 2005 meeting of the Virginia Soil and Water Conservation Board, the Board unanimously passed a motion that accepted the report of the Ad Hoc Dam Safety Study Committee and directed the Department of Conservation and Recreation staff to provide further information regarding two key regulatory alternatives at their July meeting.

At the subsequent Board meeting on July 21, 2005, the Department presented six key recommendations to the Board for their consideration. One of the six recommendations developed stated “[t]hat the Board Chairman and Department Director assemble a special Board chaired workgroup composed of staff and a subset of the Ad Hoc Dam Safety Study Committee to develop a draft regulatory concepts (strawman) document for consideration by stakeholders and the interested public during the subsequent public review process following the NOIRA public comment period”.

The Ad Hoc Committee report further specified that for Alternative #2, which recommended that the Board provide an “Alternate Procedure for Existing Dams” which allows spillway design floods (SDF) less than the PMF in cases where there would be no significant increase in downstream hazard, that the Board consider the following point:

“C. When considering spillway capacity for existing dams that are in a size and hazard classification currently requiring passage of a full PMF, the SDF would be presented as a range from ½ PMF to PMF for existing dams (statutory bounds). The selection of SDF would default to the full PMF, but could be considered for downward adjustment based upon the owner’s historic compliance with regard to all other dam safety requirements and taking into account meaningful site specific factors, such as:

- maximum depth and duration of overtopping
- robustness of the dam’s construction
- potential structural/operational changes
- number and type of structures and transportation corridors in the inundation zone
- number of people at risk
- flood wave travel time to impact areas
- simplicity or complexity of evacuation provisions

- existence of a well coordinated and regularly exercised Emergency Action Plan
- public education program
- flood recurrence and frequency data for relevant nearby streams
- likelihood of prior flooding from other nearby streams or rivers affecting the inundation zone
- other possible site-specific factors relating to the level of risk, potential impacts of a failure and mitigating circumstances.

This listing is not intended to be comprehensive, but rather to be indicative of the types of information and analysis that may be required for this process.”

“In no case would the spillway design flood be reduced to less than ½ of the PMF (except as is considered acceptable based on 4VAC50-20-130 B [an incremental analysis]).”

- **THE DEPARTMENT AGREES AND RECOMMENDS THAT AFTER AN APPLICANT COMPLIES WITH BASIC PROGRAM PROVISIONS IN SECTION 4 VAC50-20-50 AND TABLE 1, AND AN INCREMENTAL ANALYSIS HAS BEEN PERFORMED AND THE SDF STILL EXCEEDS ½ PMF (AND ANY REDUCTIONS HAVE NOT EXCEEDED 25% OF THE PMF), THAT FOR CLASS 1 AND 2 HIGH HAZARD DAMS, THAT AN ALTERNATIVE PROCEDURES PROCESS BE DEVELOPED BY REGULATION WHICH MAY BE CONSIDERED WHERE THERE WILL BE NO UNREASONABLE HAZARD TO LIFE AND PROPERTY.**
- **FURTHERMORE, AS RECOMMENDED IN THE AD HOC COMMITTEE REPORT, THE DEPARTMENT STAFF WILL WORK WITH A SPECIAL BOARD CHAIRED WORKGROUP TO DEVELOP A DRAFT REGULATORY CONCEPTS (STRAWMAN) DOCUMENT FOR CONSIDERATION BY STAKEHOLDERS AND THE INTERESTED PUBLIC DURING THE SUBSEQUENT PUBLIC REVIEW PROCESS.**

**Committee Selection** - As agreed to by the Board, the Chairman and Director requested the following individuals serve on the workgroup:

Susan Taylor Hansen – Workgroup Chair and Virginia Soil and Water Conservation Board Member

David B. Campbell, P.E. – Director of Dam Engineering, Schnabel Engineering  
Joseph S. Haugh, P.E. – Retired, USDA Soil Conservation Service; Department of Conservation & Recreation, Dam Safety Director

Mathew J. Lyons, P.E. – State Conservation Engineer, USDA, Natural Resources Conservation Service

John W. Peterson, P.E. – President/CEO KEMPS Consultants, Inc.

William G. Browning – Department of Conservation and Recreation, Director, Dam Safety and Floodplain Management Division

James M. Robinson, P.E. – Department of Conservation and Recreation, Manager, Dam Safety Program

Dianna C. Sheesley, P.E. – Department of Conservation and Recreation, Regional  
Dam Safety Engineer

**Workgroup Charge** – Based on the direction received from the Board, the Department prepared the following work group charge: “develop a list of concepts for high hazard dams that could be used as criteria by the Department when considering a dam owner’s request for an alternative means to lower their dam’s spillway design flood (SDF). During an upcoming regulatory process the concept list will be considered by a technical advisory committee as potential regulatory changes to the Virginia Soil and Water Conservation Board Dam Safety Regulations.”

In an effort to guide the workgroup’s discussions and to assist them in carrying out their charge, the Department developed a series of questions for the work group’s consideration:

- “How would the selected criteria promote the safe operation of the dam from normal operation activities up to and including the Spillway Design Flood?
- What additional economic impact to lives, property, transportation systems, utility infrastructures, etc. downstream of the dam would be allowed by the selected criteria?
- Under what process or circumstances would the dam owner be able to utilize the selected criteria?
- What amount of historic compliance should the dam owner need to demonstrate? How, if at all, should this apply to new dams?
- Should these selected criteria require the dam owner to provide an extra measure of insurance in case of an emergency situation? How readily available is such coverage?
- What should be included in the Emergency Action Plan above what is already required?”

**Meeting Results** - Susan Taylor Hansen, Workgroup Chair, welcomed the work group and asked for self- introductions. John Peterson was in New England but participated by telephone during the morning portion. There were eight members of the work group, four representatives of the Lake of the Woods Association, David Dowling, DCR’s Policy, Planning and Budget Director, and a reporter from the Free Lance-Star newspaper in attendance (list available upon request).

Ms. Hansen read the Workgroup Charge and indicated that this is the formative phase of a process that will take 1.5 to 2 years. She emphasized that the alternative approach would need to maintain the same level of safety and that an adjustment to the level of risk would not be considered. Ms. Hansen noted that the meeting goal was to discuss specific criteria and determine what factors could be considered and recommended to the Virginia Soil and Water Conservation Board (Board) that would allow dam owners to lower their Spillway Design Flood (SDF) requirement without diminishing the safety considerations required of the dam.

Ms. Hansen asked Dave Campbell to define SDF in generic terms, which he described as a maximum flood event based on hazard classification.

Ms. Hansen reviewed questions for consideration in carrying out the Workgroup Charge then began the discussions regarding the specific factors listed under Alternative 2 of the Ad Hoc Committee Report. The workgroup's thoughts on the questions were as follows:

Maximum depth and duration of overtopping: The workgroup recognized that earthen dams have spillways designed to erode, generally no overtopping of earthen dams is considered appropriate or safe, and some have overtopped and have not failed. Accommodating overtopping will change the level of safety (not considered by this Workgroup). The focus is on what is happening downstream of the dam. If damages have already occurred downstream prior to a dam failure, then the failure of the dam may not cause any additional loss of life or property damage. If overtopping is allowed, only theoretical analysis would take place since the circumstances and consequences of flow over the dam could range from minimal erosion damage to catastrophic damages. Federal standards require freeboard between the top of dam and the maximum SDF water surface elevation. The group agreed that this factor could not be considered.

Robustness of the dam's construction: The workgroup recognized that how well a dam is designed and constructed, and the embankment's resistance to erosion, are fundamental to the ability of a dam to pass a significant storm event. It was noted that during Hurricane Katrina, overtopping of the levees provided a good example that those levees were not designed for overtopping, thus they failed and caused major death and destruction. Most earth-fill structures will fail during overtopping. Emergency spillways are expected to erode some and repairs would be necessary after significant storm flows. Water retaining embankments are considered engineered devices or appurtenances that may increase the safety of the dam. Maintenance must be committed to prepare the dam for flood events. Deterioration does occur and repairs must be made. High hazard dams concentrate on the SDF requirements. The embankment is expected to remain sound during the life of the structure; however, some structures do get worse over time due to factors associated with soil settlement, poor compaction, lack of adequate maintenance, etc. Metal pipes used to pass water through a dam will deteriorate and have to be replaced. The workgroup recognized that this factor is already generally applied in the Dam Safety Program and does not offer any new opportunity for consideration.

Potential structural/operation changes: The workgroup recognized that some judgment calls are made throughout the life of a project whether under normal or storm conditions. Owners may choose to apply changes prior to certain storm events such as lowering the reservoir substantially or modifying gate operations to pass the SDF with clear evidence that adequate resources and enforcement are available. Reliability must be assured and it's likely that many dam owners would not have resources to fulfill such a requirement. Small drainage areas are more likely to be flashy while large drainage areas would require tropical storms to apply maximum pressure. Permanently lowering the reservoir could result in increasing the storage potential of a dam; however, this option is usually not esthetically accepted. The workgroup concluded that this was not a viable approach in Virginia. Roller-compacted-concrete has been placed at some earth dams that provides protection from overtopping. Some areas have considered "Fuse plugs" that are designed to fail under a designed pressure loading. When the fuse plug washes out it increases the ability of the dam to pass flow through the dam. Owners should have their engineer determine changes that would be more efficient and there must be certification that there would be adequate staffing and resources. The question was asked, could there be one proposal that would be accepted associated with a tropical storm and the general answer was yes but limited in Virginia. Tropical storms are wide spread and many of the watersheds upstream of dams in Virginia are small and would be impacted by the large intense storms as well as the localized thunderstorms that can generate lots of precipitation over the area of most watersheds. This factor was not considered favorable for general use by the workgroup.

Number and type of structures and transportation corridors in the inundation zone: The workgroup stated this factor would only be allowed if the allowance for levels of risk is considered. Katrina showed how good plans for evacuation do not automatically work. Evacuation plans are necessary but not everything is predictable. NOAA developed the PMF standards and engineers apply the standards in their designs. Better procedures are available; such as, flood proofing structures, elevating property, and floodwalls may reduce or remove the risk to lives and property. Zoning approaches may be useful. Changing of road culverts downstream has in a few cases reduced the risk below dams. NRCS has the ability to purchase easements below dams although they have yet to buy any. These are all good strategies that currently exist to potentially reduce dam hazard classification and that do not require regulatory amendments or the development of an alternatives analysis to implement.

Number of people at risk: Concerns were expressed about the loss of a single life as well as multiple lives. This factor is not likely to be used.

Flood wave travel time to impact areas: It was noted by the workgroup that the amount of time available for communication of a danger and the resulting evacuation of the inundation zone is the determining factor. Dam owners must present dam break inundation zone maps that demonstrate potential impacts. Hazard classification is determined by what is downstream of the dam. If no change in risk is allowed, the factor is not useful.

Simplicity or complexity of evacuation provisions: It was recognized that Virginia's Emergency Action Plan (EAP) requirements are simple and basic and currently do not comply with federal guidelines. It was stated that Virginia needs to come in line with the federal regulation requirements and require a more detailed EAP. The Workgroup recommended improving the standards of the EAP during the regulatory process; however, Class III dams may not be required to meet the improved process. The workgroup felt that the use of an EAP does not provide a counter-balance for design and suggested that this factor should not be used to lower a SDF.

Existence of a well-coordinated and regularly exercised EAP: The workgroup reiterated their recommendation for an upgraded EAP process and suggested inclusion of a requirement to handle a test of the EAP procedures as part of any enhanced requirements.

Public education program: The workgroup noted that this is not required in the EAP or expected through the community. There should be an effort to notify the public of actions that should be made and this should be added to the EAP requirements.

Flood Recurrence and frequency data for relevant nearby streams: It was recognized that the existing data may not take into account future changes. Update analysis can be done already. The placement of a dam upstream of an existing dam may reduce inflow to the lower dam. The workgroup did not find this factor to be useful as an alternative procedure.

Other possible specific factors: It was noted that during a hazard assessment and establishment of the design SDF, that significant engineering judgment comes into play. The Regional Engineer reports to Headquarters and then the recommendations are passed on to the Board. Staff consideration for consensus occurs often. The workgroup was not able to come up with anything else, since many of the specific factors brought are already covered in the Regulations or used in current practice. Height and maximum storage capacity are prorated using Table 1 to determine the SDF where there is a range in storm events, using the higher of the two determinations. The elimination of ranges would make it easier for the engineer. The section 130 process was well written utilizing the idea that there would be no change to risk. Some states have used depths of flow on structures downstream of a dam during a dam failure to determine hazard classification.

After lunch, discussion was focused on specific potential factors that had been generated during the Ad Hoc Committee's work. Factors for specific consideration included:

1. EAP usage: EAP had already been discussed and it was decided that a recommendation to adopt the federal regulations would be made.
2. Controls on inundation zones below dams: This was determined to be a complicated issue. The state of Wisconsin claims to be able to control development below dams.

Low hazard dams are more likely to see changes due to development downstream of dams that would result in a changed classification. Not likely to apply this as a factor.

3. I-Flows: Automated Warning System I-Flows transmit water levels and precipitation at the dam to a control center eliminating the need for a person the travel to the site. This does prevent the valuable visual interpretations that may help emergency coordinators make decisions. This is supplemental to an EAP and may cost \$20,000 each and require maintenance. This was not considered a useful factor to lower the SDF.

4. Emergency Spillway Velocity: This was discussed earlier and was not considered a useful factor to lower the SDF.

5. Dam overtopping: This was discussed earlier and was decided to not be acceptable for any earthen dam.

6. Dam construction with an impervious core: The general discussion was that one mistake in design or construction would allow a path for flow through a dam so the use or knowledge of a clay core was not significant to apply as a factor to lower the SDF. Some members expressed concern in any penetration of the earthen embankment therefore drilling core samples was discouraged. The factor was found not to be useful or applicable.

7. Maps and profiles: This was not considered upon reminder that no change in risk was allowed.

8. Compliance: It was recommended that this was not an alternative factor and should be addressed during discussions dealing with enforcement. Other states deal with penalties and fines that have demonstrated better success in those states to get dam owners to comply with state regulations.

Mr. Dowling emphasized two points. The first point was that the Board had directed the Department to consider legislative and budgetary actions to enhance law enforcement tools and to seek staff increases to address existing dam safety staffing shortfalls. He also noted that should an alternative process be developed, that the Board and the Department recognized that there would be a need for additional staff to address these new procedures. The second point articulated by Mr. Dowling was that the workgroup's discussions would be utilized as points of consideration during a much larger public process that would take place during the upcoming regulatory process. The publishing of a NOIRA will open the regulations and initiate a public regulatory process where a broad based group of individuals can participate in a technical advisory committee and express their viewpoints on this issue.

Ms. Hansen noted the need to prepare a document of the meetings accomplishments and her appreciation for the workgroup's efforts. She noted that the repair of dams and funding alternatives will be considered later and that it would be helpful to compile a list

of other states that have funding mechanisms and possibly use as a starting basis. Pennsylvania and New Jersey are the most advanced states on the East Coast that provide funding.

Ms. Hansen requested staff to circulate a draft document to the workgroup participants for review and comments. Upon completion, the document would be provided to the Workgroup Chair and DCR Director Maroon.