Economic Impact Analysis
Virginia Department of Planning and Budget

4 VAC 50-20 – Impounding Structure Regulations
Department of Conservation and Recreation
May 4, 2007

Summary of the Proposed Amendments to Regulation

The Virginia Soil and Water Conservation Board (Board) proposes several significant changes to these regulations. Overall, the changes are designed to improve the protection of the public and their property from the impact of potential dam failures. Proposed changes include, but are not limited to: 1) revision of the dam hazard potential classification system, 2) specification that spillway design requirements are applicable to all state regulated dams, 3) modification of the spillway design requirements to enhance public safety and reduce subjectivity, 4) allowing for the potential reduction of the spillway design flood requirement through an incremental damage assessment for all qualified dams, 5) establishing dam break inundation zone mapping requirements, 6) expanding emergency action plan requirements for High and Significant Hazard Potential dams and emergency preparedness plan requirements for Low Hazard Potential dams, 7) establishing permit application fees for the administration of the Dam Safety Program that will create a stream of revenue sufficient to support an additional dam safety engineer, 8) removing the forms that are incorporated by reference and move reporting standards into the regulations, 9) creating new definitions and modifying current definitions, 10) reorganizing, clarifying, and expanding sections related to permitting procedures, and 11) updating sections related to inspections, enforcement, and unsafe conditions.

Result of Analysis

The benefits likely exceed the costs for one or more proposed changes. There is insufficient data to accurately compare the magnitude of the benefits versus the costs for other changes.

Estimated Economic Impact

The Virginia Dam Safety Act (§10.1-604 through §10.1-613 of the Code of Virginia) was designed to ensure public safety through requirements related to the proper and safe design, construction, operation, and maintenance of impounding structures in the Commonwealth. Section §10.1-605 of the Code of Virginia directs the Board to "promulgate regulations to ensure that impounding structures in the Commonwealth are properly and safely constructed, maintained and operated." The Department of Conservation and Recreation (DCR) points out that "As there have been no regulatory changes made to the impounding structure regulations since the late 1980's except to update the definition of regulated dams to conform it with a 2001 legislative change in definition [Chapter 92 (SB1166) of the 2001 Virginia Acts of Assembly], it was determined that this body of regulations required a substantive review and potential revisions."

For some of the Board's proposed changes, the benefits clearly outweigh the costs. For example, the Board proposes to clarify that "if an owner or the owner's engineer has determined that circumstances are impacting the integrity of the impounding structure which could result in the imminent failure of the impounding structure, temporary repairs may be initiated prior to approval from the Board. The owner shall notify the Department within 24 hours of identifying the circumstances impacting the integrity of the impounding structure." According to DCR, this clarification was provided in response to numerous dam owners expressing concerns that they did not feel the regulations permitted them from acting to prevent a dam failure in an emergency. This language may very well encourage some dam owners to act more quickly to prevent dam failures.

Also, the Board proposes to require that when dam owners are issued an operation and Maintenance certificate, they send a copy to the appropriate local government(s) with planning and zoning responsibilities. The cost of sending a copy of the certificate is minimal, while the benefits can be significant. Downstream development approved by a locality may result in the

change in hazard classification of an upstream dam and for the need for the dam to upgrade its spillway design at a significant expense to the owner. Notification may result in localities making more informed zoning decisions regarding development.

Most of the Board's proposed changes increase requirements related to safety, which likely reduce the probability of dam failures and the associated loss of life and property damage. These proposed changes also increase costs for dam owners. There is no precise estimate available to determine the reduced likelihood of loss of life due to the proposed increased requirements related to safety. Thus, even if one were willing to place a dollar figure on the value of a human life, an accurate assessment of whether the benefits of the proposed increased requirements exceed the costs cannot be made. Nevertheless, the following paragraphs are potentially useful to the reader in that some specifics of the proposed changes are elucidated, and fairly detailed cost estimates are presented.

Under the current regulations dams are categorized as Class I, II, III, or IV, where Class I dams are located where failure will cause probable loss of life or serious property damage to others, Class II dams are located where failure could cause possible loss of life or serious property damage to others, Class III dams are located where failure may cause minimal property damage to others, and Class IV dams are located where failure would cause no property damage to others. The board proposes to rename these hazard categories as follows: Class I would be High, Class Two would be Significant, and Class III and Class IV would be grouped together as Low. According to DCR, this change would conform the classification categories to those used by federal agencies and many other states.

Significant potential costs associated with the board's proposed amendments include: A) development of a dam break inundation zone map, B) development of an emergency action plan or emergency preparedness plan, C) implementing a dam upgrade to conform with SDF requirements, D) payment of permitting fees, and E) conducting inspections.

The Board proposes to require that dam owners have a dam break inundation zone map completed by a licensed professional engineer for hazard potential class determinations. The map would also be required for High and Significant Hazard dams as part of their Emergency Action Plan (EAP). Maps would be required to be submitted every 6 years as part of the re-certification process. The map would be useful for planning and risk assessment since it would

provide information on what areas would be affected by potential dam breaks. According to DCR, the development of a dam break inundation zone map includes two primary elements: (1) a detailed survey with a benchmark; and (2) a hydraulic computer model run with mapping of sunny day failure, mapping of the Probable Maximum Flood (PMF) with a complete failure, and mapping of the PMF without a dam failure. DCR obtained estimates of map costs provided by engineering firms that average $16,417 per map. DCR estimates that 465 dams would require mapping; thus the estimated total cost associated with the proposed requirement for inundation zone maps is $7,633,905.[1]

The Board also proposes to require the development of an EAP for High and Significant Hazard dams. EAPs are already required in the current regulations for Class I, II, and III structures. Many EAPs do not contain the dam break inundation zone map discussed above. Beyond those mapping costs estimated above, the remaining EAP preparation costs are associated with completing the plan in the specified format and in exercising the plan at the specified intervals. Although there is no requirement for the dam owner to solicit the services of an engineer to complete the plan, DCR estimates the owners of about 80% of the dams (or 464 dams out 581) will use engineers, and that engineers will charge approximately $3,125 per plan. Total costs for plan preparation would then be approximately $1,450,000.[2]

Due to Board-proposed increased spillway design requirements, DCR estimates that of the 1,731 dams in the Commonwealth database, at least 166 regulated dams will require a spillway upgrade. According to the database, there are 127 dams that are currently compliant with the regulations that may require a spillway upgrade due to the regulation changes. DCR estimates that upgrade costs for these 127 dams will total $223,397,500. Additionally, there are 39 dams that are currently noncompliant, as they already require a spillway upgrade, but the change in the regulations will require upgrading to a higher standard. DCR estimates that only 25% of the upgrade costs would be associated with upgrading to a higher standard. This results in $25,556,875 total required upgrade costs for these dams. Thus the estimated total required spillway design upgrade costs would be $248,954,375.[3]

The proposed regulations include the following new fees:

[1] Calculation: 465 x $16,417 = $7,633,905
[2] Calculation: 464 x $3,125 = $1,450,000
[3] Calculation: $223,397,500 + $25,556,875 = $248,954,375

Construction Permit: High or Significant Hazard Dam	$2,500
Construction: Low Hazard Dam	$1,000
Regular Operation and Maintenance Certificate: High Hazard	$1,500
Regular Operation and Maintenance Certificate: Significant Hazard	$1,000
Regular Operation and Maintenance Certificate: Low Hazard	$600

The proposed regulations also include other fees for Conditional Operation and Maintenance Certification and Incremental Assessment Review. Dam owners can request an Incremental Assessment Review that may reduce required upgrades if it is deemed that the dam has lower hazard potential than it has been previously assessed. DCR estimates that the following amounts will be paid in fees annually:

Construction Permit	$10,500
Regular Operation and Maintenance Certificate Application	$49,500
Conditional Operation and Maintenance Certificate Application	$49,250
Incremental Damage Analysis Review	$18,675
Estimated Total	$127,925

The current regulations already require that Class I, Class II, and Class III dams be inspected by licensed profession engineers to ensure their structural safety; but Class IV dams are exempt. Under the proposed regulations Low Hazard dams require an inspection by an engineer once every six years. Since current Class IV dams will be Low Hazard dams under the proposed regulations, current Class IV dams will need to be inspected once every six years. According to DCR there are 30 Class IV dams, and it costs on average $2,833 for inspection and report generation from engineering firms. Thus, the proposed reclassification of Class IV dams

as Low Hazard dams will result in approximately $84,990 in new costs every six years,[4] or $14,165 annually.[5]

Businesses and Entities Affected

According to DCR, 530 private individuals and entities currently own impounding structures that are subject to the proposed regulations and that may be affected by them, at least in part. In addition, five state agencies, four public colleges and universities, 58 Virginia localities, 10 service authorities, one Watershed Improvement District, and 12 Soil and Water Conservation Districts own or maintain state regulated impounding structures subject to the requirements of the Dam Safety Act, and may be affected by provisions of the proposed regulations. Thousands of downstream property owners will likely be affected as well.

The proposed amendments will create additional demand for the services of engineers who have the expertise to work on dams, and for contractors. DCR is aware of approximately 60 engineers offering services to dam owners in the Commonwealth; these engineers represent 46 different engineering firms. Most of those firms are likely small businesses. According to DCR the number of contractors is not susceptible to calculation, as contractors often vary project to project; and few specialize in dam repairs.

Localities Particularly Affected[6]

There are fifty-eight Virginia localities which own or maintain state-regulated impounding structures (114 dams). These localities may incur additional costs associated with the operation and maintenance of their impounding structures as a result of this proposed regulation, including costs associated with inundation mapping, emergency action plan development, engineering assessments, structural improvements, and application submittal. According to DCR, no locality will bear a disproportionate cost per impounding structure.

Number of State Regulated Impounding Structures Owned or Maintained by Localities

Albemarle County	6		City of Lynchburg	3

[4] Calculation: 30 x $2,833 = $84,990
[5] Calculation: $84,990 / 6 = $14,165
[6] All of the information in this section was graciously provided by the Department of Conservation and Recreation.

Amherst County	4		City of Manassas	2
Augusta County	2		City of Martinsville	2
Brunswick County	1		City of Newport News	6
Buckingham County	1		City of Norfolk	3
Campbell County	1		City of Norton	2
Carroll County	1		City of Portsmouth	4
Chesterfield County	2		City of Staunton	2
Fairfax County	8		City of Virginia Beach	1
Fauquier County	1		City of Waynesboro	1
Frederick County	1		City of Williamsburg	1
Gloucester County	1		Town of Appalachia	1
Henrico County	1		Town of Big Stone Gap	2
Henry County	1		Town of Brookneal	1
James City County	3		Town of Chatham	2
Louisa County	1		Town of Coeburn	1
Patrick County	7		Town of Culpeper	2
Prince Edward County	1		Town of Drakes Branch	1
Prince William County	2		Town of Keysville	1
Roanoke County	1		Town of Luray	2
Spotsylvania County	1		Town of Pulaski	2
Stafford County	5		Town of Purcellville	1
Tazewell County	1		Town of Scottsville	1
City of Bedford	1		Town of South Boston	1
City of Clifton Forge	1		Town of Strasburg	1
City of Fairfax	3		Town of Tazewell	1
City of Fredericksburg	2		Town of Warrenton	2
City of Harrisonburg	1		Town of Wise	1
City of Lexington	2		Town of Woodstock	1
			Total	**114**

Additionally, there are 10 service authorities (including water authorities, sewage authorities, park authorities and airport authorities) which own or maintain state-regulated impounding structures and that may serve multiple localities (20 dams). These authorities may incur additional costs associated with the operation and maintenance of their impounding structures as a result of this proposed regulation, including costs associated with inundation mapping, emergency action plan development, engineering assessments, structural improvements, and application submittal. According to DCR, no service authority will bear a disproportionate cost per impounding structure.

Number of State Regulated Impounding Structures Owned or Maintained by Service Authorities

Appomattox River Water Authority	1
Augusta County Service Authority	1
Fairfax County Park Authority	2
Louisa County Water Authority	1
Metro-Washington Airport Authority	2
Nelson County Service Authority	1
Rapidan Service Authority	1
Rivanna Water and Sewer Authority	6
Upper Occoquan Sewage Authority	1
Western Virginia Water Authority	4
Total	**20**

Additionally, many of the local Soil and Water Conservation Districts own or maintain state-regulated impounding structures (104 dams). These Soil and Water Conservation Districts may incur additional costs associated with the operation and maintenance of their impounding structures as a result of this proposed regulation, including costs associated with inundation mapping, emergency action plan development, engineering assessments, structural improvements, and application submittal. According to DCR, no Soil and Water Conservation District will bear a disproportionate cost per impounding structure.

Number of State Regulated Impounding Structures Owned or Maintained by Soil and Water Conservation Districts

Blue Ridge	10
Culpeper	11
Hanover-Caroline	1
Headwaters	11
Lord Fairfax	2
Mountain Castles	4
Peter Francisco	17
Piedmont	14
Robert E. Lee	6
Shenandoah Valley	8
Southside	12
Thomas Jefferson	8
Total	**104**

Projected Impact on Employment

The proposed requirements for inundation maps, emergency action plans, dam upgrades, and inspections will increase demand for the services of engineers with relevant expertise. Consequently, employment for engineers with the relevant expertise will likely increase. Employment for their support staff may increase as well. The required dam upgrades associated with the proposed regulations will increase demand for contractors who possess the requisite expertise. Construction employment will likely moderately increase as well.

The proposed amendments will likely have some negative impact on employment for public workers in localities. If local governments must spend multiple millions of extra dollars on dams, then there will be significant spending reductions in other areas such as education public safety, and healthcare.

Effects on the Use and Value of Private Property

The proposed requirements for inundation maps, emergency action plans, dam upgrades, and inspections will increase demand for the services of engineering firms with relevant expertise. Consequently, the use and value of engineering firms with dam-relevant expertise will likely increase. The required dam upgrades associated with the proposed regulations will also increase demand for contracting firms which possess the requisite expertise. The use and value of the firms will increase as well. Demand for construction materials associated with dam improvements will also increase. The value of firms selling these materials may moderately increase.

Dam owners whose required expenditures on their dams increase significantly due to the proposed requirements will have fewer dollars to spend elsewhere. For example, localities that spend millions of additional dollars on dams will likely purchase fewer supplies and services from private firms in other categories. Also private dam owners net worth will decline somewhat with required increased expenditures on their dams.

Small Businesses: Costs and Other Effects

Some small engineering and contacting firms will benefit from the proposed regulations.

Small Businesses: Alternative Method that Minimizes Adverse Impact

There is no clear alternative that minimizes the very large costs associated with the proposed amendments while still achieving the very high level of safety sought. Costs could potentially be significantly reduced if greater risk were deemed acceptable.

Legal Mandate

The Department of Planning and Budget (DPB) has analyzed the economic impact of this proposed regulation in accordance with Section 2.2-4007.H of the Administrative Process Act and Executive Order Number 36 (06). Section 2.2-4007.H requires that such economic impact analyses include, but need not be limited to, the projected number of businesses or other entities to whom the regulation would apply, the identity of any localities and types of businesses or other entities particularly affected, the projected number of persons and employment positions to be affected, the projected costs to affected businesses or entities to implement or comply with the regulation, and the impact on the use and value of private property. Further, if the proposed

regulation has adverse effect on small businesses, Section 2.2-4007.H requires that such economic impact analyses include (i) an identification and estimate of the number of small businesses subject to the regulation; (ii) the projected reporting, recordkeeping, and other administrative costs required for small businesses to comply with the regulation, including the type of professional skills necessary for preparing required reports and other documents; (iii) a statement of the probable effect of the regulation on affected small businesses; and (iv) a description of any less intrusive or less costly alternative methods of achieving the purpose of the regulation. The analysis presented above represents DPB's best estimate of these economic impacts.