Economic Impact Analysis
Virginia Department of Planning and Budget

9 VAC 25-260 – Rules Governing the Water Quality Standards
Department of Environmental Quality
November 15, 2005

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 21 (02). 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. The analysis presented below represents DPB's best estimate of these economic impacts.

Summary of the Proposed Regulation

The State Water Control Board (board) proposes to amend the state's Water Quality Standards regulation to add new nutrients criteria for man-made lakes and reservoirs as well as the two natural lakes. The board also proposes to restrict the existing dissolved oxygen criteria during times of thermal stratification to the upper layer (epilimnion) in man-made lakes and reservoirs.

Estimated Economic Impact

Nutrients have consistently ranked as one of the top three causes of use impairment in US waters for more than a decade. Although nutrients such as phosphorus are necessary for the growth of algae which are an essential part of the food chain, excess nutrients lead to significant water quality problems including harmful algal blooms, hypoxia, declines in fish and fish habitat.

The U.S. Environmental Protection Agency (EPA) has published ecoregion water body specific nutrient related criteria and stated its intent in a National Nutrient Strategy (1998) to promulgate these default nutrient criteria for a state if the state does not adopt nutrient criteria by December 31, 2004 or submit a nutrient development plan with timelines for adoption of this criteria that are accepted by EPA.

With an intent to develop state specific criteria rather than adopt the EPA published national nutrient criteria, the Virginia Department of Environmental Quality (DEQ) submitted to EPA a nutrient criteria development plan which was accepted by EPA on June 15, 2004. According to the plan, Virginia is committed to adopt new and revised water quality standards for estuaries, lakes and reservoirs and rivers and streams. These standards will be used in setting Virginia Pollutant Discharge Elimination System (VPDES) permit limits[1] and for evaluating the waters of the Commonwealth for inclusion in the Clean Water Act 305 (b) report and on the 303 (d) list. Waters not meeting standards will require development of a Total Maximum Daily Load (TMDL) under section 303(d) of the Clean Water. [2]

The board has adopted uses and nutrient criteria for the Chesapeake Bay which were effective on June 24, 2005. Adoption of site specific criteria for the York River (30-day dissolved oxygen) and James River (numerical chlorophyll) is scheduled for the 11/21/05 board meeting. Now the board proposes to add new numerical and narrative nutrient criteria for man-made lakes and reservoirs as well as the two natural lakes in the state. Specifically, chlorophyll *a* and total phosphorus criteria will be established for the 116 man-made lakes and reservoirs that DEQ has previously monitored or plans to monitor. [3] Special nutrient standards will be added for the two natural lakes in Virginia: Mountain Lake and Lake Drummond. In addition, a statement is included to allow for site specific modifications to the criteria if the nutrient criteria specified for a man-made lake or reservoir do not provide for the attainment and maintenance of the water quality standards of downstream waters. This is proposed to address the phased development of nutrient criteria for lakes and reservoirs preceding those for rivers and streams.

Currently nutrients in lakes and reservoirs of the commonwealth are regulated under Policy for Nutrient Enriched Waters (9 VAC 25-40). The board designates Nutrient Enriched

[1] VPDES permit regulations are addressed in 9 VAC 25-31.
[2] TMDLs are addressed through §§ 62.1-44.19:4 through 62.1-44.19:8 of the Code of Virginia. "Water Quality Monitoring, Information, and Restoration Act (WQMIRA)".

Waters based upon an evaluation of the historical water quality data for one or more of the following indicators of nutrient enrichment: chlorophyll *a* concentrations, dissolved oxygen fluctuations, and concentrations of total phosphorus. The permitted dischargers that exceed specified flow rates are required not to exceed a monthly average total phosphorus effluent limitation. Currently four lakes and reservoirs are designated as Nutrient Enriched Waters: Claytor Lake, Lake Chesdin, South Fork Rivanna Reservoir and Smith Mountain Lake. Since the proposed regulation provides for a new method for controlling nutrients, Claytor Lake, Lake Chesdin, South Fork Rivanna Reservoir and Smith Mountain Lake will be removed from the existing regulatory Nutrient Enriched Waters listings.

The establishment of new nutrient criteria for lakes and reservoirs is likely to impose economic cost for point source dischargers to the lakes and reservoirs that have nutrients in their discharges. The proposed water quality standards will be used in calculating the nutrients (phosphorus) load allocation for all point sources and the load allocation so determined will be used to set VPDES permit limits. The point source dischargers are likely to incur additional cost in order to control total phosphorus in their discharges through such processes as precipitation and setting and solid disposal. According to DEQ, currently there are no permitted dischargers to the two natural lakes while there are 17 permitted dischargers to the man-made lakes and reservoirs in the Commonwealth, which include eleven wastewater treatment plants, four water treatment plants, one power station and one restaurant. The estimated total cost for the two biggest (Clarksville Wastewater Treatment Plant and River Ridge) will be about $400,000 on an annualized basis, assuming that all of the phosphorus in their discharges are to be removed.[4] The estimated total cost for all the 17 dischargers would be between $400,000 and $1,000,000 on an annualized basis.

The actual cost, however, will be less than the estimated numbers. The above estimated costs are calculated assuming that all the phosphorus in the discharges is to be removed. While actually the point sources will be required to remove only the amount of phosphorus that exceeds the permitted limits. Also, according to DEQ, dischargers will be subject to changes in their

[3] Chlorophyll *a* criteria apply to all waters on the list. The total phosphorus criteria apply only when algicide treatments are made during the monitoring period of April 1 through October 31.
[4] The estimated cost to remove phosphorus is $74 per pound for Wastewater Treatment Plant. Karl Blankenship (2004), "6 Most Cost Effective Ways To Reduce Nutrients", *Bay Journal*.

permit limits only upon permit issuance or renewal, which might take as long as five years[5], in addition to a four-year compliance period. This means that the dischargers may not be required to comply and the cost may not occur until a few years later, which will lower the current value of the total cost.

For DEQ, the additional permitting requirements for nutrient control can be handled at the time of permit issuance or re-issuance rather than incur the cost to the state of reopening the estimated 17 discharge permits. However, if a lake or reservoir is designated as impaired water pursuant to section 303(d) of the Clean Water Act, DEQ will be required to develop TMDL which will cause an increased cost of a minimum $15,000 per lake or reservoir.[6]

This proposed regulatory change will reduce the amount of nutrients and restore water quality, thus producing benefits for public health, commercial fisheries, tourism and recreation. There is an existing body of literature on the benefits of water quality improvements. For example, Morgan and Owens (2001) compared the 1996 water quality of the Chesapeake Bay with what it would have been in 1996 without the Clean Water Act and related legislation and estimated that the monetized annual boating, fishing, and swimming benefits of water quality improvements in the Chesapeake Bay range from $357.9 million to $1.8 billion. According to DEQ, the estimated annual reduction of total phosphorus from the two biggest point source dischargers (Clarksville Wastewater Treatment Plant and River Ridge) will be 5327 lbs, assuming that all the phosphorus in the discharges are to be removed. The other point source dischargers either have small effluents or have little nutrients in their discharges. Although not required by the proposed nutrient criteria, the non-point sources, such as businesses in agriculture, forestry, and grazing, may be encouraged to reduce their contribution of nutrients in the lakes and reservoirs on a voluntary basis. Since nutrient reduction from non-point sources is not easily identified, and not all of the benefits accruing from point source nutrient reductions are easily quantifiable, total benefit from the proposed nutrient criteria is unknown.

The board also proposes to restrict the existing dissolved oxygen criteria during times of thermal stratification to the upper layer (epilimnion) in man-made lakes and reservoirs. The rationale is that lakes and reservoirs naturally have low oxygen levels in the bottom layer during

[5] A permit is on its own schedule every five years.
[6] TMDLs are addressed through §§ 62.1-44.19:4 through 62.1-44.19:8 of the Code of Virginia. "Water Quality Monitoring, Information, and Restoration Act (WQMIRA)".

times of stratification. Nutrient enrichment may contribute to even lower oxygen levels at these depths. However, those effects of nutrient enrichment would be controlled by the proposed applicable nutrient criteria. Therefore, the low oxygen in the deeper portions of these lakes and reservoirs would only be due to national conditions. Under the revised dissolved oxygen criteria, some lakes that are currently on the impaired lake list and slated for TMDL development because of dissolved oxygen would no longer show impairment if the dissolved oxygen criteria is only to be applied to the epilimnion during stratification. According to DEQ, there will be at least five lakes[7] that would come off the impaired lake list because of the revised dissolved oxygen criteria. Given that the cost of developing TMDL is $15,000 for each lake, the total cost savings from not having to initiate the TMDL process for these five lakes will be at least $75,000.

The net economic impact of the proposed regulatory change will depend on whether the total benefit exceeds the total cost. Since the total monetized benefit from the nutrient reductions is not known, it is not possible to precisely establish whether the total benefit exceeds the total cost.

Businesses and Entities Affected

Entities that have discharges to the lakes or reservoirs will be affected. According to DEQ, currently there are no permitted dischargers to the two natural lakes while there are 17 permitted dischargers to the man-made lakes and reservoirs in the Commonwealth, which include eleven wastewater treatment plants, four water treatment plants, one power station and one restaurant. Table 1 lists the 17 dischargers that will be affected by the proposed regulatory change.

These dischargers may be required to remove part or all of the nutrients in their discharges and will incur an increased cost, which will commensurately reduce their profits. According to DEQ, the estimated total cost for the two biggest (Clarksville Wastewater Treatment Plant and River Ridge) will be about $400,000 on an annualized basis, assuming that all of the phosphorus in their discharges is to be removed. The estimated total cost for all the 17 dischargers would be between $400,000 and $1,000,000 on an annualized basis. However, the dischargers might not be required to comply until a few years later because the permit limit is

[7] Source: DEQ.

only implemented upon permit issuance and renewal, and there is an approximately four-year compliance schedule. Therefore, the actual total cost will be lower. The increase in cost will reduce the profits for the permitted dischargers, however, for some entities such as power stations, part of the increased cost may be passed on to the consumers in the form of increased price.

Businesses and entities involved in industries such as commercial fisheries, tourism and recreation, and boat building and repair will likely benefit from any improvement in water quality in the lakes and reservoirs.

Table 1 Facility with Discharges to Lakes or Reservoirs

#	Facility with discharges to reservoirs	
1	Nine O Three Inc WWTP	Wastewater treatment plant
2	US Army Corps of Engineers - Rudds Creek So	
3	Clarksville WWTP	
4	River Ridge Association Inc	
5	Longwood Sand Filter	
6	Longwood Sand Filter South	
7	US Army Corps of Engineers – Rudds Creek	
8	Callebs Cove Campground STP	
9	United Company STP	
10	Lake Anna Family Campground STP	
11	Bolar Mountain Complex STP	
12	Stafford County - Abel Lake Water Treatment Plant	Water treatment plant
13	Motts Run Water Treatment Plant	
14	Scottsville WTP	
15	Crozet WTP	
16	Virginia Power - North Anna	Power Station
17	Simmons Terminal and Restaurant	Restaurant

Localities Particularly Affected

The proposed regulatory change will particularly affect the localities where the lakes and reservoirs are located.

Projected Impact on Employment

The proposed nutrient criteria will cause an increased cost due to phosphorus control for the 17 permitted dischargers. The increase in cost will commensurately reduce their profits,

which will likely reduce the number of people employed. On the other hand, the proposed regulation will likely have a positive effect on employment in industries such as commercial fisheries, tourism and recreation, and boat building and repair that will benefit from any improvement in water quality in the lakes and reservoirs.

Effects on the Use and Value of Private Property

The proposed regulatory change will cause an increased cost for the 17 permitted dischargers to the lakes and reservoirs, which may reduce their profit and commensurately, reduce the asset value of these businesses. Businesses in commercial fisheries, tourism and recreation, and boat building and repair that will benefit from water quality improvement in lakes and reservoirs may experience increases in their profits and commensurately increased property values. In addition, improvements in water quality may have a positive impact on the value of the residential properties in the surrounding areas.

Small Businesses: Costs and Other Effects

According to DEQ, among the 17 entities that will be affected by the proposed regulations, an estimated five are small businesses: Nine O Three Inc, Simmons Terminal and Restaurant, Callebs Cove Campground, Lake Anna Family Campgrounds, and Bolar Mountain Complex. These facilities may be required to remove part or all of the nutrients in their discharges and will incur an increased cost, which will commensurately reduce their profits. However, according to DEQ, these facilities have small discharges close to or below 0.02 Million Gallons per Day (MGD), thus the impact of the proposed regulatory change will likely not be significant.

Small Businesses: Alternative Method that Minimizes Adverse Impact

An alternative to the proposed regulatory change is to adopt EPA's national nutrient criteria rather than developing state specific criteria. According to DEQ, this alternative plan will be more stringent than the proposed criteria and will be more costly to implement. So there is no alternative method that would both achieve the benefit and have a smaller adverse impact.

References

Morgan and Owens (2001), Benefits of water quality policies: the Chesapeake Bay, *Ecological Economics, Volume 39, Issue 2 , November 2001, Pages 271-284*