

March 31, 2006

To: Gov. Kaine; Sec. Natural Resources Bryant; Senators Norment (vice-chairman), Chichester, Colgan, Stosch, Williams; Delegates Putney (chairman), Callahan, Cox, Griffith, Hargrove, Joannou, Jones, Parrish, Wardrup, Wittman

From: Dr. Lynton S. Land, Emeritus Prof. Geological Sciences and E. Allday Centennial Chair in Subsurface Geology, Univ. Texas at Austin. P. O. Box 539, Ophelia VA 22530

Re: Blatant omission from JLARC House Document No. 89, "Review of Land Application of Biosolids in Virginia"

The report, rightly critical of VDH's promotion and management of the land-application of municipal sewage sludge (biosolids) in Virginia, omits the quantitative environmental consequences of nitrogen (N) and phosphorus (P) pollution caused by the land application of all forms of animal waste. Nobody questions the potential benefits of land-application of animal waste in terms of supplying N, P and other nutrients, and reducing the cost of chemical fertilizer for a few farmers. But the report does not address the economic consequences to society of applying animal waste as a source of fertilizer at (or exceeding) the sanctioned agronomic rate. Massive unnecessary N and P pollution of Chesapeake Bay results from existing practices.

Table 3 (p. 17) lists 250,500,000 pounds of N land-applied in 1997 in the form of farm animal manure, and 16,600,000 pounds of N land-applied in the form of sewage sludge. These numbers are higher than those supplied to me by VDH, DCR and DEQ, that I previously supplied to DCR in my public comments on Nutrient Management Training and Certification Regulations, 4 VAC 5-15. Here are the pounds (dry weight) land-applied in 2003. The fraction N in the animal waste and the fraction of the N not used by crops (pollution) are from DCR's "2005 Nutrient Management Standards" ("Standards") Tables 8-2, 8-4 and 9-1.

	<u>Pounds applied</u>	<u>*</u>	<u>fraction N</u>	<u>*</u>	<u>fraction N not used</u>	<u>=</u>	<u>pounds N pollution</u>
Sewage sludge	494,648,000	*	0.02	*	0.48	=	4,749,000
Poultry litter	1,115,268,000	*	0.03	*	0.40	=	13,383,000
Cattle, swine	468,509,000	*	0.03	*	0.60	=	<u>8,433,000</u>
							26,565,000

Irrespective of minor adjustments that can be made in some or all of these numbers, approximately 27 million pounds of N were land-applied in 2003 in Virginia but not used by crops. If the N is not removed from the field with the crop, it is released to the environment in order to achieve a steady-state material balance. Except for small amounts of denitrification in oxidized soils, whose N content remains relatively constant over many crop cycles (the soil is not a "sink" for the excess N), most of the N released to the environment constitutes nitrate pollution. To put 26 million pounds of N pollution per year in perspective, the Virginia Tributary Strategies claim that Virginia rivers supply 78 million pounds of N to Chesapeake Bay annually, 26 million pounds of it from point-sources, mostly wastewater treatment plants. The 2010 Cap Load Allocation for N is 51 million pounds. The goal of reducing 78 million pounds of N discharge to 51 million pounds annually by 2010 could be achieved ( $78 - 51 = 27$ ) by simply eliminating the land-application of animal waste. N pollution from the land-application of animal waste is of the same magnitude as the discharge of N from wastewater treatment facilities, and much cheaper to address. The land-application of animal waste is by far the most polluting agricultural practice, and it has been known for three decades that agricultural practices cause most of the N and P pollution of Chesapeake Bay.

Conventional chemical fertilization causes a great deal of pollution. In Northumberland County (to use a specific example), the average yield for corn is 130 bushels per acre. Conveniently, 130 pounds of chemical N fertilizer (usually ammonium nitrate) is applied per acre. A bushel of corn weighs 64 pounds and contains about 15% moisture and about 1.2% N on a dry-weight basis. This means that about 85 pounds ( $130 * 64 * 0.85 * 0.012$ ) of N is removed from each acre of the field with the crop. What happens to the other 45 pounds ( $130 - 85$ )? Most of the N not used by the crop ultimately ends up as nitrate in surface water or ground water, either directly or by oxidation of other N compounds like ammonia or NOx. No more than 10% of the N is converted to nitrogen gas by denitrification in oxidized soils, unlike salt marshes and rice paddies where denitrification is a major process. Chemical fertilization is “leaky” and typical single-application releases at least 1/3 of the applied N as nitrate pollution.

When animal waste (poultry litter, manure or municipal sewage sludge) is used as fertilizer, pollution is greatly increased because about half the N is not immediately “crop available.” Approximately twice as much N is land-applied using animal waste as would be applied using conventional chemical fertilizer, to grow exactly the same crop. In the example above, 236 pounds of N ( $130/0.55$  – “Standards” Table 9-1) would be land-applied in Virginia to grow exactly the same amount of corn, using the application rate for sewage sludge averaged over four-years. The land-application of sewage sludge results in approximately 136 ( $.9$  [assuming 10% denitrification] \*  $(236 - 85)$ ) pounds of N pollution per acre. Every time you see a farmer using sewage sludge (or poultry litter or manure), N pollution will be generated on each acre at a rate equivalent to dumping about 25 50 pound bags of 10-10-10 fertilizer into the Bay.

I observed the land-application of sewage sludge in Northumberland County in March of 2004, and believe that the property owner and spreader adhered strictly to current policies of the VDH, albeit in violation of Virginia Statute. Based on the submitted Nutrient Management Plan, 24,770 pounds of N were spread on 72.4 acres in accordance with Table 9-1 in “Standards”. If chemical fertilizer had been used, 7,431 pounds of N would have been applied. Lime-stabilized sewage sludge is applied on the basis that 30% of the N is crop-available the first year ( $24,770 * 0.3 = 7,431$ ), 10% the second and third years, and 5 % the fourth year. This means that 55% of the N is presumed to be crop-available over four years and the remaining 45% is pollution. This specific application caused at least 11,000 pounds of N pollution (more than 2000 50 pound bags of 10-10-10).

In the case of P, the soil in five fields, encompassing 55.9, acres tested “Very High” in P. This acreage should have received no P according to Virginia Statute 12VAC5-585-550.A “The applied nitrogen and phosphorous content of biosolids shall be limited to amounts established to support crop growth” and DCR policy as set forth in “Standards.” According to “Standards” the remaining 16.5 acres, based on soil tests for P, should have received no more than 1151 pounds of P. In fact, 10,912 pounds of P were disposed (again, roughly 2000 50 pound bags of 10-10-10.) The law is being violated so as not to restrict the land-application process. As another example of how the land-application process is promoted and the environmental consequences ignored, DCR permits sewage sludge to be land-applied to soybeans, a legume rarely fertilized with chemical N fertilizer by farmers. In the case of soybeans, almost all the applied N is unnecessary pollution.

You must recognize that the cost savings for poultry-growers, a very few farmers, and the profits of the land-application industry come at an immense cost to society in the form of pollution of lakes, rivers and Chesapeake Bay, a fact completely ignored in your report. Would you be re-elected if you stated the existing government policy that “Continued profits for special interests (poultry growers, land-appliers and a few farmers) are more important than improving water quality in Chesapeake Bay?”