

Competitive Procurement Programs Can Help Heal the Chesapeake Bay

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After 25 years of concerted effort at the local, state, and federal levels of government, the Chesapeake Bay remains a nutrient clogged waterway, recently receiving a health score of 32 on a scale of 1 to 100 by the Chesapeake Bay Foundation.¹ In 2010, the Environmental Protection Agency (EPA) established a total maximum daily load (TMDL) regulatory standard for the Bay that includes drastic nutrient reduction mandates for the Bay states as well as new enforcement and accountability measures designed to ensure measurable progress.² However, three years down the road into the Chesapeake Bay TMDL implementation process, a default of commitments is on the horizon for some Bay states.

What is the reason for the disappointing lack of progress? It is clear that financial difficulties at all levels of government have a role to play in the lack of progress in meeting these new TMDL mandates. But there is another negative driver as well: the political challenge (not financial or technical) associated with moving various interests off of their established positions.

The losers in this stubborn drama are the environment and the region's tax- and ratepayers. For example, recent data shows EPA Chesapeake Bay TMDL compliance costs can be cut by **80%**,³ provided that governmental entities and other key stakeholders agree to one key provision—to fully engage the private sector as a part of the compliance solution. As further enticement, these low-cost compliance solutions brought forth through competition also lead to a vastly improved local environment while encouraging economic growth and activity, much more so than the current government-centered approach.

The key is to find a voluntary platform to engage non-point source reductions, in a timely, efficient, and cost-effective manner. Many states have decided the best way to bring in the non-point sources and cut the cost of compliance is to develop nutrient credit-trading programs. However, competitive procurement programs offer potentially greater and more cost-effective results. Such programs differ from credit-trading programs because there are no 'trades' where a buyer purchases a pollution-reduction credit in exchange for polluting an equal amount. Procurement is focused solely on the acquisition of goods or services by an external source, such as a government agency.

Another key characteristic of competitive procurement programs is the creation of a verifiable standard unit of purchase (or, in this case, a unit of pollution reduction such

as one pound of nitrogen removed from the Bay). Standardizing this unit through an EPA-acceptable and fully transparent test procedure enables the creation of a commodity (as Bay TMDL compliance is based upon verified nitrogen reductions).

This paper outlines how these reforms can be implemented, and how reducing the mandated role of quasi-government entities while engaging the competitive marketplace can heal the bay much more quickly and efficiently than the current approaches.

Background

The Chesapeake Bay: a nutrient clogged waterway

The Chesapeake Bay is the largest estuary⁴ in the United States; it is an incredibly complex ecosystem that includes habitats and food webs important to plants, animals, and humans alike. Economists have valued the Bay's economic benefits at over one trillion dollars related to fishing, tourism, property values, and shipping activities.⁵ Despite extensive and expensive restoration efforts funded over the last 25 years, the Chesapeake Bay is not healthy. On May 12, 2009, President Barack Obama signed an Executive Order that recognizes the Chesapeake Bay as a national treasure and calls on the federal government to lead a renewed effort to restore and protect the Bay watershed.⁶ With much fanfare yet little surprise, the U.S. Environmental Protection Agency (EPA) established the Chesapeake Bay Total Maximum Daily Load (TMDL) standard in December 2010,⁷ a historical and comprehensive 'pollution diet' with rigorous accountability measures designed to restore the Chesapeake Bay and the region's fresh water bodies. A TMDL is the calculation of the maximum amount of pollution a body of water can receive and still meet state water quality standards; it is designed to ensure that waterways meet a national goal of being swimmable and fishable. The 64,000-square mile watershed, which includes portions of New York and six additional states plus the District of Columbia, comprises the largest TMDL standard ever established by the EPA.

¹ Chesapeake Bay Foundation. 2012 State of the Bay Report. Retrieved from <http://cbf.org/about-the-bay/state-of-the-bay/2012-report> March 25, 2013.

² US EPA. Final Chesapeake Bay TMDL Standard. Retrieved from <http://www.epa.gov/reg3wapd/tmdl/ChesapeakeBay/tmdlexec.html> March 25, 2013.

³ Pennsylvania Legislative Budget and finance Committee. A Cost Effective alternative Approach to Meeting Pennsylvania's Chesapeake Bay Nutrient Reduction Targets. Retrieved from <http://lbfc.legis.state.pa.us/reports/2013/77.PDF> March 25, 2013.

⁴ An estuary is a body of water formed where fresh water from rivers and streams flows into the ocean and mixes with seawater.

⁵ Chesapeake Bay Foundation. The Economic Argument for Cleaning up the Chesapeake Bay and its Rivers, page 3. Retrieved from <http://www.cbf.org/document.doc?id=591> 25 March 2013.

⁶ Chesapeake Bay Executive Order. Retrieved from <http://executiveorder.chesapeakebay.net/page/About-the-Executive-Order.aspx>. 25 March 2013.

⁷ US EPA. Executive Summary of the Final Chesapeake Bay TMDL Standard. Retrieved from <http://www.epa.gov/reg3wapd/tmdl/ChesapeakeBay/tmdlexec.html> March 25 2013.

TABLE 1

2011 (delivered) and 2025 target nitrogen loads for Pennsylvania

Sector	Model-Projected 2011 Progress	Phase 2 Watershed Implementation Plan	% difference
	(lbs/yr) Nitrogen	2025 Planning Target (lbs/yr) Nitrogen	
Agriculture	59,281,017	35,313,572	-40%
Forest	21,067,076	21,417,135	2
Point source	11,483,413	9,080,860	-21
Urban/developed	17,467,177	10,235,505	-41
Septic	2,141,702	1,742,464	-19
Air deposition to water	1,042,439	1,042,439	0
Totals	112,482,824	78,831,975	-30

Source: Pennsylvania Legislative Budget and finance Committee. A Cost Effective alternative Approach to Meeting Pennsylvania's Chesapeake Bay Nutrient Reduction Targets. Page S-1. Retrieved from <http://lbf.c.legis.state.pa.us/reports/2013/77.PDF> March 25, 2013.

The Chesapeake Bay TMDL was designed to ensure that all pollution control measures needed to fully restore the Bay and its tidal rivers are in place by 2025, with at least 60 percent of the actions completed by 2017. Specifically, the TMDL sets Bay watershed limits of 185.9 million pounds of nitrogen, 12.5 million pounds of phosphorus, and 6.45 billion pounds of sediment per year—a 25 percent reduction in nitrogen, 24 percent reduction in phosphorus, and 20 percent reduction in sediment. While EPA maintains oversight of this TMDL program, the states are responsible for identifying sources of nutrient reduction and ensuring these reductions occur. States document their plans and progress for nutrient reduction through Watershed Implementation Plans (WIPs), which are submitted to EPA for review and approval. Enforcement measures for non-compliance include loss of federal funding, EPA takeover of state programmatic authority, and more.

EPA and the states organize, track, regulate, and fund nutrient reductions through categorized sources of nutrients called sectors. In Pennsylvania, for example, to comply with the nutrient reduction commitments outlined in their WIP, the Department of Environmental Protection (DEP) issues a host of regulations and programs aimed at the reduction of nutrient loads from each of these sectors. As shown in Table 1, the major defined sectors are urban/developed (municipal stormwater), forests, point sources (e.g., municipal waste treatment plants, industrial sources with discharge pipes), septic systems, and agriculture. Each sector has a nutrient reduction mandate, and collectively these mandates equal the entire required reductions through 2025 (as shown in Table 1).

This plan provides structure for EPA's TMDL regulations and a connected series of government programs. However,

this sector-structured approach is flawed, and compliance with nutrient-reductions mandates will require a fundamental shift in approach as: (1) organizing TMDL compliance through sectors does not make sense from a technical standpoint, particularly for nitrogen, which is the primary nutrient of concern for the Bay, and (2) cost effectiveness *is not* a consideration with federal and state agencies' mandates for sector-specific reductions.

Budget cuts and the pending state TMDL compliance crisis

Despite the well thought out and thoroughly accountable TMDL compliance approach and structure (through state reporting, EPA oversight, etc.), sky rocketing costs will inhibit, if not prevent, compliance with TMDL-mandated reductions. In 2012, for example, the State of Maryland estimated the cost of compliance with the Bay TMDL at \$11 billion, and the compliance cost estimate for Frederick County, Maryland alone, needing to reduce just 500,000 pounds of nitrogen, was estimated at nearly \$1 billion, raising the question of affordability.⁸ Frederick County Commissioner President Blaine Young stated that "Counties are dealing with pension and other budget problems, and trying to figure out the basics of how they can deal with this [the Bay TMDL]. To me, this is catastrophic."⁹

Anne Arundel County, Maryland foresees needing more than \$1.6 billion to upgrade septic systems and to curb

⁸ Frederick County Fears Price Tag of Bay Cleanup. August 16, 2012 <http://www.gazette.net/article/20120816/NEWS/708169873/1016/frederick-county-fears-price-tag-of-bay-cleanup&template=gazette> retrieved on March 25, 2013.

⁹ Same as footnote #8

stormwater runoff.¹⁰ The same financial concerns are facing policy makers and tax- and rate payers in Virginia and Pennsylvania. Randy Bartlett, Public Works Director for suburban Fairfax County, Virginia stated that compliance cost estimates are “big numbers and scary numbers”, and that “meanwhile we’re cutting teachers, we’re cutting police and we’re cutting fire.”¹¹

According to an article in the *Bay Journal*, EPA officials have been hearing a lot of this type of concern as they meet with local leaders across the watershed. “The costs come up every time,” acknowledged Jeff Corbin, senior advisor for the Bay to the EPA administrator. Corbin stated “the costs are tremendous, but what do we do?”¹²

In response to EPA’s ‘but what do we do’ position, below is list of challenges that need to be addressed to contain excessive compliance cost issues.

Sector allocation failures

Government agencies have traditionally utilized a category or sector-based approach to track and mandate nutrient loss reductions (see the first column in Table 1 above for a listing of the primary sectors). The agency and primary stakeholder position is that all sectors contribute, so all need to participate in the solution. While that is a reasonable approach in general, the sector allocation approach has evolved into medley of government spending and mandates that (1) are based on technical inaccuracies, (2) are not necessary for Bay restoration, and most importantly (3) ignore cost effectiveness. A summary of these challenges are outlined as follows:

(1) Technically inaccurate. The most important facts to consider when categorizing nitrogen sources is that nitrogen is both very unstable and highly mobile when released into the environment. Nitrogen moves through the environment in a gaseous phase in the form of airborne ammonia (NH₃), which then frequently re-deposits back into the watershed; it can move in an aqueous phase across land surfaces and into surface water and/or groundwater;¹³ and can aggregate into a solid phase in the form of sediment. This variability in form and pathways can make it difficult to neatly or

accurately ‘categorize’ the original source of the nitrogen as it moves through the environment.

Another technical challenge is associated with ammonia-nitrogen loss from livestock waste, which is significantly higher than most agency estimates based upon traditional livestock data as well as Bay watershed models.¹⁴ In fact, the Chesapeake Bay Program’s (a regional partnership of involved government agencies) own Science and Technical Advisory Committee has focused on localized hotspots of ammonia nitrogen deposition from livestock operations that escape measurement in the Bay monitoring network, leading to underestimations of ammonia deposition rates in the Bay models. Kevin Sellner (the Chesapeake Research Consortium and a member of the referenced Scientific and Technical Advisory Committee that was concerned with hotspots) has stated that: (1) livestock nitrogen contributes to more ‘sectors’ than just the livestock nitrogen allocation in regulatory models, and that (2) the storm water and forest ‘sectors’ are saturated with diluted, downstream re-deposited livestock nitrogen.¹⁵

Once the above concerns are addressed and integrated into the discussion, it is difficult to justify municipal ratepayers spending billions of dollars to capture and treat dilute nitrogen when it is known that (a) a significant portion of that nitrogen originates from upstream agricultural operations, and (b) treating nitrogen at its source can be accomplished much more cost effectively than capturing then treating the dilute form in municipal facilities downstream.

(2) Not necessary for Bay restoration. The purpose of the Chesapeake Bay TMDL is to reduce loads of nitrogen and phosphorus delivered to the Bay. The Bay is the regulated entity that is the focus of this standard, and the Bay waters do not differentiate where the particular reduction in nitrogen originates. What matters is that reductions take place. Defining reductions through (technically inaccurate) sectors might help government regulators organize and track data and sources and direct funding, but such a categorization is not important to the Bay ecology. For compliance purposes, a pound of nitrogen removed from the Bay is the only unit or categorization that truly matters.

(3) Ignoring cost effectiveness. Miscategorizing the original sector of delivered nitrogen is one problem. But the problem

¹⁰ City, Counties foresee costly Bay Cleanup Tab. December 12, 2011. http://articles.baltimoresun.com/2011-12-12/features/bs-gr-bay-pollution-20111212_1_pollution-diet-bay-cleanup-bay-states retrieved on March 25, 2013.

¹¹ Local officials worry that TMDL actions are much too costly. July 1., 2011. http://www.bayjournal.com/article/local_officials_worry_that_tmdl_actions_are_much_too_costly.

¹² Same as footnote #11

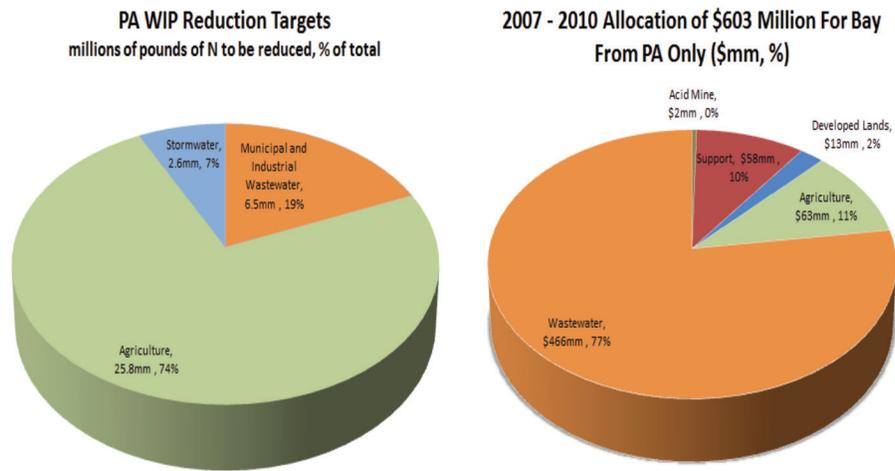
¹³ Nitrogen movement through the soil to the groundwater is skillfully described in Brady, Nyle C. and Weil, Ray R. (2002) “The Nature and Properties of Soils, 13th ed. (see p 546, then 246, 555). Battye et al. also provides descriptions on ammonia-nitrogen movement through the environment (<http://nepis.epa.gov/Adobe/PDF/P100ERTR.pdf>).

¹⁴ See footnote # 23 from this paper for a basic explanation (and citation) regarding ammonia loss estimates. While many studies continue to support ammonia loss estimates from livestock manure in the range of 50% of total voided nitrogen (See recent work published and presented by Jay Ham of the Colorado State University Extension Office), EPA and other state agencies in the Chesapeake Bay watershed tend toward reliance on much lower ammonia loss estimates, such as can be found by Pinder, et al. (<http://public.wsu.edu/~forda/CE%20543/Adams%201.pdf>).

¹⁵ Kevin Sellner, telephone conversation with James Morris of Bion. 3 February 2010.

FIGURE 1

Pennsylvania N reduction targets and allocated costs



Source: Bion compiled these pie charts using data from 'ChesapeakeStat', the publicly available database of Chesapeake Bay data managed by US EPA. Retrieved at <http://stat.chesapeakebay.net/>

is amplified when regulators mandate reductions by sector category regardless of cost. Because miscategorized agricultural nitrogen deposits in a diluted form into a suburban stormwater sector, for example, the municipality, in turn, is forced to charge ratepayers hundreds of dollars per pound of nitrogen removed to capture the dilute nitrogen and treat it. A more affordable alternative is to treat nitrogen at its source, in a concentrated form, for pennies on the dollar compared to the dilute downstream treatment costs placed on the shoulders of suburban and urban ratepayers. The Chesapeake Bay Commission released a study in 2012¹⁶ that estimated the average costs of agricultural reductions are \$58 per pound versus a “downstream” storm water average cost of \$447 per pound. That equates to savings in the 85% range, or put another way, sector allocation inflates the costs by over 7.5 times.

The sector-centered approach currently favored by the regulators results in policy that allocates a preponderance of financial and technical resources on high-cost yet low-value public-sector projects, while starving low-cost, private-sector solutions of the capital to provide affordable solutions. The single largest source of nitrogen load to the Bay, agriculture, is exempt from discharge standards and relatively unaffected by federal regulatory requirements. While the agricultural sector provides the most cost-effective opportunity to deliver nutrient reductions, long-standing ideas, comfort zones, and special interests continue to funnel scarce funds to conventional, overly expensive pathways.

Since promoting cost effectiveness is not a new or particularly innovative idea, municipal representatives from around the Bay have been pushing for more consideration of costs; at the same time, they must continue to go back to their ratepayer base to ask for more funding for compliance. Jerry Johnson, general manager of the Washington (DC) Suburban Sanitary Commission, stated in 2012 that “I believe that we need to start dealing with the worst problems of our waterways first so that we’re getting the greatest impact for the number of dollar that we’re spending”

Last mile costs

One of the political challenges of Bay restoration is the divergence of nutrient-delivered loads relative to regulated entities. As Figure 1 above shows for Pennsylvania, the vast majority of public spending is directed to regulated entities, even though those entities are minor contributors (relative to the large-scale contributions from agriculture). This over- and under-emphasis of regulation and spending can be traced back to the Clean Water Act (CWA), which exempts non-point sources of pollution, such as agricultural operations. Over the years, continuous regulation on point source dischargers of nutrients, primarily permitted (National Pollutant Discharge Elimination System—NPDES) municipal and industrial waste treatment plants, has triggered ‘last mile costs’, resulting in increasingly higher unit costs over time.¹⁷

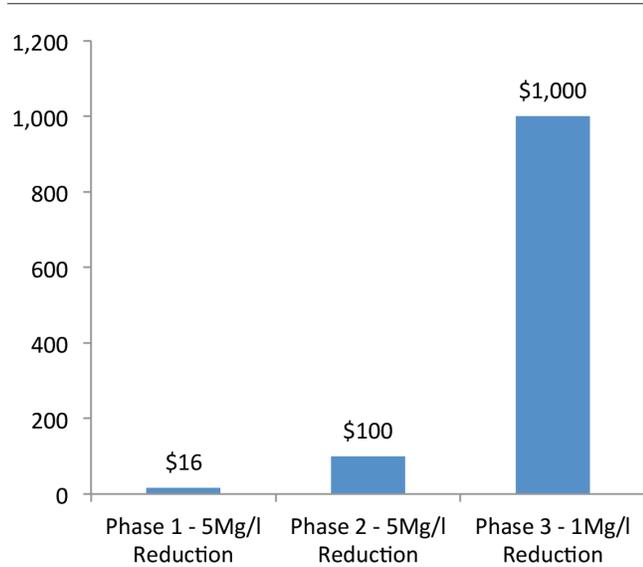
George Hawkins, general manager of the Blue Plains Wastewater Treatment plant in Washington, D.C., stated

¹⁶ Nutrient Credit Trading for the Chesapeake Bay—An Economic Study. Chesapeake Bay Commission. May 2012. <http://www.chesbay.us/nutrienttrading.htm> retrieved on March 25 2013.

¹⁷ The term last mile costs is a reference to the most expensive and difficult portion of an upgrade, normally following a series of more efficient upgrades.

FIGURE 2
Blue Plains escalating upgrade costs required to meet Chesapeake Bay TMDL

\$ in millions



that “It is 400 million times more expensive to get the next tiny increment out of Blue Plains WWTP than it was when we started. We’ll do it—our enterprises will do it—[but] the question we have to ask as a society is: Is that a smart investment if we want to stop the problems we have in the Chesapeake Bay?”¹⁸ Hawkins also warned that the cleanup costs in urban areas will hit a point of diminishing returns. He said it cost about \$100 million a decade ago to reduce nitrogen in discharges at the Blue Plains wastewater plant from 15 milligrams per liter of water to 5 milligrams per liter. But it will cost \$1 billion to reduce it from 5 mg/l to 4 mg/l. That’s about 10 times the cost for one-tenth of the reduction.¹⁹ Such a scenario, which has been expressed graphically in Figure 2 (the project is moving forward today), is an excellent representation of “last-mile” costs.

One approach to avoid last-mile costs is to go outside the fence of the WWTP and into the watershed and direct resources to where they haven’t been directed previously in order to take advantage of lower-cost reductions, or those that haven’t already been the recipient of recent technology. The National Association of Clean Water Agencies (NACWA), an organization founded in 1970 to represent the interests of

municipal (large and small) water treatment entities, has an idea where to look. As a part of its Healthy Waters Coalition, NACWA stated that:

*[T]he U.S. Environmental Protection Agency attributes excess nutrients as the direct or indirect cause of impairments in over 50% of impaired river and stream miles; over 50% of impaired lake acres; and nearly 60% of impaired bay and estuarine square miles. For the majority of these waters, nutrient run-off from agricultural lands is the dominant source of the nutrient impairments, according to studies by the U.S. Geological Survey (USGS). In fact, recent USGS data indicate that despite efforts to reduce nitrate levels in the Mississippi River Basin, concentrations at eight major USGS study sites did not consistently decline from 1980–2008.*²⁰

According to the [NACWA] report, it is far more economical to control agricultural runoff compared to additional reductions from urban point sources. A related report issued by NACWA stated that: “The cost to remove a pound of nitrogen or phosphorus from farm runoff and drainage is typically 4 to 5—and sometimes up to 10 to 20—times less than the cost to remove the same amount from municipal wastewater or stormwater.”²¹

At the Healthy Waters Initiative (by NACWA) press conference at the Press Club in Washington, DC, City of Cedar Rapids Utilities Environmental Manager Steve Hirshner stated: “Unfortunately, the most important means for improving our nation’s water quality, the Clean Water Act—did not adequately address the degree to which non-point sources currently contribute to our water quality challenges.”²²

The challenge is clear: to better engage the non-point source sector, the single largest source of delivered nutrient load to the Bay, in the solution. There are two basic ways this engagement can take place: through the issuance of new laws and regulations on agricultural operations and/or through voluntary measures.

Enacting new laws and standards on animal agriculture faces challenges. First off, it would be difficult and time consuming to further regulate the agricultural industry. For

¹⁸ As landmark law turns 40 (CWA), utility managers call for a tune-up. 16 October 2012. <http://rlch.org/news/landmark-law-turns-40-utility-managers-call-tuneup> retrieved on 25 March 2013.

¹⁹ Local officials worry that Bay TMDL measures are much too costly. 1 July 2011. http://www.bayjournal.com/article/local_officials_worry_that_tmdl_actions_are_much_too_costly retrieved on March 25 2013.

²⁰ Healthy Waters Coalition urges action on run-off. 6 March 2012. <http://www.nacwa.org/images/stories/public/2012-03-06hwc-pr.pdf> retrieved on 25 March 2013.

²¹ Controlling nutrient loadings to US waterways - an urban perspective. October 2011. <http://www.nacwa.org/images/stories/public/2012-03-06wp.pdf> retrieved on 25 March 2013.

²² Healthy Waters Coalition press conference at the National Press Club. 6 March 2012. <http://www.youtube.com/watch?v=shzuLXaER-s&feature=youtu.be> retrieved on 25 March 2013.

example, EPA, the likely source of any new regulations, took the better part of a decade to advance new, yet modest, Confined Animal Feeding Operation (CAFO) rules. Aggressive milestones embedded within the Chesapeake Bay TMDL standard do not allow for an elongated regulatory process; results are needed now.

There are also some competitive issues to consider, such as where to draw the line for enhanced regulation (e.g., how to define the regulated CAFO), which animal herds to focus on, and why. The lobbying groups for these stakeholders are very strong and actively engaged, and not just any rule generated by environmental special interests is able to make its way through a rulemaking process. This is for a good reason, as a significant number of farm families live at or near the poverty level and newly imposed regulations that require capital expenses can shut down many operations and lead to lowered supplies, higher food costs, and conversion of farmland.

Perhaps the most important reason not to consider more regulation on agriculture is that it won't solve the problem. Lowering CAFO definitions to smaller herd sizes, tightening up standards for nutrient management plan generation, and all the other regulatory options on the pro-regulation wish list would be very costly to farm operators, yet at the same time be only marginally effective for nitrogen control. Nitrogen's mobile nature poses a challenge to regulators from the outset, as roughly half of the nitrogen has already escaped to the environment (via volatilization) before the nutrient accounting and regulation begins.²³ Requiring struggling mid- and small- sized farm operations to initiate extra paperwork, accounting, and operating practices absent a productive outcome doesn't make economic or environmental sense.

The key, therefore, is to find a voluntary platform to engage non-point source reductions, in a timely, efficient, and cost-effective manner. Many states have decided the best way to bring in the non-point sources and cut the cost of compliance is to develop nutrient credit-trading programs. The potential for success of the nutrient credit trading programs is discussed in the next section.

²³ On-farm nutrient regulations begin at the point of requiring a nutrient management plan (NMP) to manage and account for nutrient application. NMP coverage initiates at the point of nutrient application, which, when considering manure application from a whole system standpoint, covers about 50% of the nitrogen that was originally voided from the livestock herd. The other 50% (or so) of the nitrogen escapes to the environment before land application. While most regulatory emission factors are not consistent with this level of ammonia loss, the 50% nitrogen loss number is corroborated by state agronomy guides, which document average amounts of nitrogen per animal type available for land application, which is about half of the voided nitrogen amounts as documented in guidance issued by the American Society of Agricultural and Biological Engineers (ASABE). The logic of this ammonia loss approach was vetted by Professor Douglas Beegle, Distinguished Professor of Agronomy at Penn State University's College of Agricultural Science.

Nutrient credit trading programs: their role in reducing TMDL compliance costs

One tool in the regulatory toolbox to help agencies reduce compliance costs is nutrient credit-trading programs. Within the Chesapeake Bay watershed, Pennsylvania, Virginia, and Maryland each have their own versions of nutrient credit trading platforms. In principle, and indeed in practice, it makes sense to most stakeholders to promote nutrient reductions where the cost per unit reduction is the cheapest, whereby those regulated sources that have high costs of reduction can purchase credits in lieu of undertaking their own expensive nutrient-reduction projects (as long as baseline compliance standards are met).

However, nutrient credit-trading programs have yet to substantially take off. Substantive trades are few and far between in all of the Bay states, even in Pennsylvania where there have been years of investment and programmatic engagement with a wide variety of stakeholders. Trades that have occurred are generally for short durations involving minimal numbers of credits (relative to TMDL reduction mandates); and the vast majority of credits have been created from sources that require little to no long-term investment (on-farm management practices) and/or are being phased out (manure hauling).

Nutrient credit-trading programs, while a useful tool, have little chance of leading to substantive and long-term nutrient reductions relative to Bay TMDL compliance mandates. The logistical and structural challenges that hamper the overall effectiveness of nutrient credit trading programs are as follows:

There is a lack of scale in the credit-buying community. As Table 2 shows, municipal waste treatment plants and a few select large commercial point source operations are the only potential buyers of credits, as these are the CWA-regulated

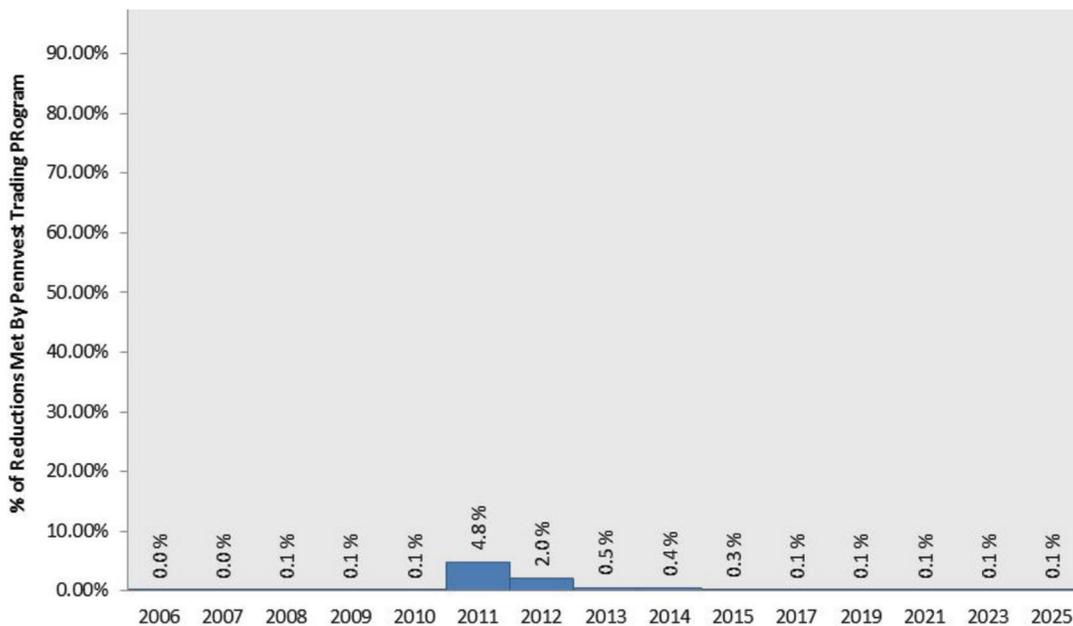
TABLE 2
Sellers of reductions 2006–2015

Public point sources	199,731	26%
Agriculture	61,536	8%
Manure hauling	409,509	53%
Technology	95,217	12%
Total	765,993	

Source: Bion staff compiled the data presented in this table from PA DEP and PennVest credit sales and auction results.

FIGURE 3

PennVest trades as a % of total mandated reductions



Source: Bion staff collected the data on credit auction results from PennVest (Pennsylvania Infrastructure Investment Authority, http://www.pennvest.state.pa.us/portal/server.pt/community/nutrient_credit_trading/19518) and compared those to the total mandated reduction figures from PA DEP WIP report

sources that must meet permit discharge standards. The issue is that these point sources are minor contributors of nutrients, at least when compared to the CWA-exempt agricultural sources (refer to the pie chart in Figure 1 above).

From a Pennsylvania perspective, Figure 3 above shows that the nutrient credit-trading program managed by the Pennsylvania Infrastructure Investment Authority (PENNVEST) has done very little in terms of meeting EPA TMDL reduction mandates. In fact, nonpoint sources, which comprise 60% to 80% of the total mandated reductions in the Pennsylvania WIP, have accounted for 0% of the credit purchases to date. All of the purchases were made by point sources to meet their own permit requirement. In addition, the majority of these purchases were made on a single-year basis.

Point source reductions represent approximately 20% of PA's WIP, so even if 100% of all point sources were to purchase credits instead of undertaking on-site facility upgrades, the vast majority of delivered load to the Bay would still not be addressed by nutrient credit-trading programs.

Even if there were a stronger market for nutrient credits (outside of the limited world of regulated point sources for example), nutrient credits could not be produced at scale or for longer-term commitments (e.g., 10 years in duration) absent major modifications in policy and programmatic guidance. This author has reviewed all of the nutrient credit-trading programs in the Chesapeake Bay, and most of those

from around the country, and none of these programs have adequately considered how to promote the generation of credits at scale for longer-term durations; these are important factors for long-term TMDL compliance. Also, duration and scale are the two main programmatic characteristics required to insure that the investments needed for low-cost credits are attracted through the private sector.

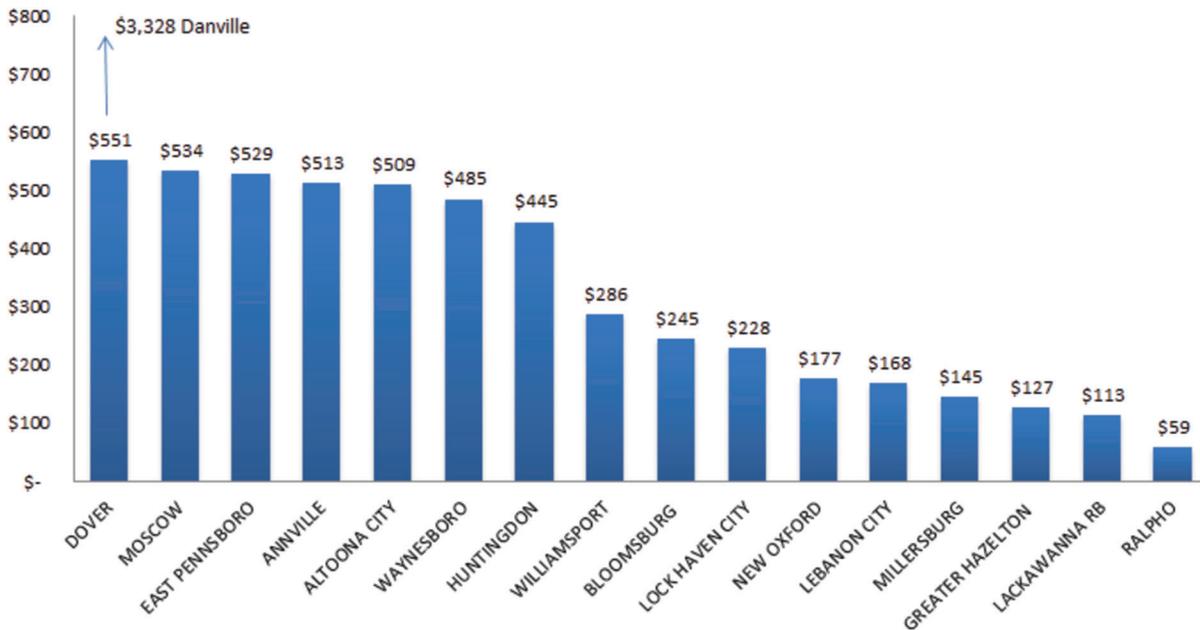
Another challenge to the traditional nutrient credit-trading programs is the hesitancy to purchase credits by point-source buyers. The predominant position is that nutrient credits are sufficient to meet end-of-year discharge 'true-ups' to ensure permit compliance, but credits are not a functional or permanent alternative to facility upgrades. This apprehensive approach to credit purchasing from municipal and industrial buyers makes sense as most credits sold today are derived from small entities hauling manure or from farms implementing best management practices (BMPs),²⁴ neither of which the municipal purchaser has expertise with or oversight of. Yet this cautious mentality holds true even when upgrades cost 10 to 100 times more than the price of credits (see Figure 4). Such an approach is inherently unfair to the rate-paying public, producing an exaggerated inconsistency in cost of compliance.

²⁴ A decentralized type of pollution control practice or procedure identified as a "best practice" to enhance environmental performance.

FIGURE 4

Sample of municipal plant upgrades

Capital cost per pound of N



Source: Bion staff collected this data from information gained during phone calls and email exchanges with these municipalities.

There is a need for municipalities to decouple aging infrastructure and deferred maintenance project costs from Bay TMDL compliance requirements. Municipal authorities have typically ‘leveraged’ the Bay TMDL standards to justify upgrades for a host of additional projects. In other words, the municipal projects financed as per Figure 4 were likely not entirely conducted for Bay compliance, but the Bay TMDL is used to justify more and larger projects than needed strictly for TMDL compliance. In Pennsylvania, the Department of Environmental Protection/PENNVEST “Project Priority Rating System” acts as a systematic cost driver, since it enables projects that combine Bay-wide TMDL compliance projects with aging infrastructure needs to be favorably evaluated based upon their combined overall project cost needs. In other words, Bay TMDL mandates become embedded in much larger infrastructure and deferred maintenance projects that cost ratepayers millions of dollars. The infrastructure costs are then absorbed by ratepayers much more rapidly than necessary in order to meet the TMDL compliance timeframes (e.g., a ten-year infrastructure upgrade gets pushed through in two or three years). The result is TMDL sticker shock for communities that are being hit by sewer and water rate increases.

The next section of this paper addresses solutions, outlining a roadmap to more fully engage the capital and cost-cutting innovations provided by the competitive marketplace.

More importantly, these cost-savings measures can enhance the local environment (in addition to the Bay), spur economic activity and growth, and shorten compliance timeframes.

Harnessing the power of the marketplace

As described earlier, there are barriers to private-sector participation in existing nutrient credit-trading programs. This section will outline how to modify agency emphasis in order to advance a competitively bid procurement program for the purpose of generating nitrogen reductions in a more cost-effective, expansive, voluntary, transparent, sustainable, and long-term manner. We describe how agencies have already used competitive procurement to secure water pollution reductions, and also how competitive bidding would lead to significant enhancements to local and upstream environments, all as compared to the existing expensive and inefficient approaches used for TMDL compliance today.

Procurement overview

A descriptive term applicable to the enhanced use of government resources relative to lowering the cost of compliance with the Chesapeake Bay TMDL is “public-private partnership”

(PPP). In effect, this term can be described simply as the public asking the private sector to participate in a cost-effective solution, or as one PPP-focused organization put it, “the private market serving the public good.”²⁵ Public and private resources are blended to achieve a goal or set of goals judged to be mutually beneficial both to the private entity and to the public. The competitive request-for-proposal program is the mechanism by which the PPP is implemented. PPPs have proven to be critical instruments of innovation, as they help government become more inventive by creating space outside of the government structure that allows innovation to flourish. Law professor Robert Adler has stated that “the use of public funds for pollution control should be viewed largely as a process by which the government is purchasing pollution control services, and not as a public benefits program in which we distribute public funds without regard to the value received.”²⁶

Chesapeake Bay programs do not report expenditures in terms of cost-effectiveness (e.g., cost per pound of nitrogen removed by existing publicly supported or subsidized projects). The cost-effectiveness of government expenditures in terms of dollars spent per unit of pollution control is poorly understood, and the absence of a competitive process to allocate those resources reduces incentives to produce better results. However, competitive procurement programs may provide the government with better, market-based information with which to allocate resources, compared to regulatory processes in which agencies make allocation decisions based on other factors and sources of information—what one commenter referred to as “beauty contests.”²⁷

Competitive procurement programs differ from credit-trading programs because there are no ‘trades’ where a buyer purchases a pollution-reduction credit in exchange for polluting an equal amount. Procurement is focused solely on the acquisition of goods or services by an external source, such as a government agency.

Another key characteristic of competitive procurement programs is the creation of a verifiable standard unit of purchase (or, in this case, a unit of pollution reduction such as one pound of nitrogen removed from the Bay). Standardizing this unit through an EPA-acceptable and fully transparent test procedure enables the creation of a commodity (as Bay TMDL compliance is based upon verified nitrogen reductions). Once the commodity is established, there is no longer the need for states to solely regulate and mandate on

the basis of sector-based reductions; as noted earlier, the Bay ecology does not discern where nitrogen reductions are accomplished—only that they occur. EPA does not specify sector-based reductions in the TMDL standard. Once the walls of sector-based mandates are broken down, so will the stranglehold by existing interests over the process of using public funds diminish. At this point, the cost of compliance plummets, as low-cost, verifiable nitrogen reductions would now drive procurement decisions, independent of who produces reductions and how or where the reductions are produced.

Competitive procurement programs have previously been used for watershed protection

The following case provides an example of how the government has used competitive bidding to improve the efficiency and effectiveness of direct spending for water pollution control.

High salinity in the Colorado River has caused significant economic harm both in the United States as well as Mexico. A 1988 study conducted for the U.S. Bureau of Reclamation (BOR) estimated annual economic damages of \$311–\$831 million due to excess salinity in Colorado River water and that damages could exceed \$1.5 billion per year if salinity is not properly controlled.²⁸

Robert Adler, James I. Farr Chair and Professor of Law at the University of Utah, has written extensively on this topic. According to Adler, there have been three distinct federal spending models within the federal salinity control program; two of these models should sound familiar to stakeholders working on the Chesapeake Bay issues (this paper is focused on the third model):

(1) a public works model in which federal bureaucrats within the Bureau of Reclamation (BOR) identified, and Congress authorized on a project-specific basis, targeted federally-funded or cost-shared salinity control projects. Although the federal agencies typically were required to prepare a cost-benefit analysis to demonstrate that the economic benefits of each project exceeded project costs, this only ensured that the project is likely to generate some net benefits. It does not ensure that federal dollars are spent in the most cost-effective way possible.

(2) an assistance-based approach in which federal officials within the BOR and the USDA provided technical assistance to willing farmers, and federal funding to share the costs of implementing the

²⁵ Guidance on Promoting Good Governance with Public-Private Partnerships. United Nations, 2008. <http://www.unece.org/fileadmin/DAM/ceci/publications/ppp.pdf> retrieved on 25 March 2013.

²⁶ Priceline for Pollution: Auctions to Allocate Public Pollution Control Dollars. William and Mary Environmental Law and Policy Review. Volume 34, Issue 3, 2010. Retrieved at http://works.bepress.com/robert_adler/1/ on 25 March 2013.

²⁷ Same as #26

²⁸ Loretta C. Lohman et al., US Dept. of the Interior, Bureau of Reclamation, Estimating Economic Impacts of Salinity of the Colorado River, pp. 69-72 (1988).

necessary controls. The federal assistance approach in the salinity control program is based on a combination of educational, technical assistance, and federal cost-sharing for improvements in on-farm infrastructure and practices (including retirement of acreage that generates particularly high amounts of soil erosion or other sources of pollution).

(3) In order to push for higher achievement and accountability, a third option was developed: a collaborative effort by the BOR and the Basin States was used to generate a competitive bidding (auction) program to reduce salinity in a more cost-effective manner. Prior to initiation of the competitive bidding program, a GAO report confirmed that there was little to ensure that the salinity program as a whole was as cost-effective as possible. So modifications were made in the cooperative federal multi-state effort to control salinity pollution in the Colorado River; now federal reclamation program dollars are bid out to projects that can demonstrate the most cost-effective salinity reductions on the basis of dollars spent per ton of salt removed, combined with various ways to consider risk of project failure and other factors.²⁹

The competitive bidding model, once implemented, quickly improved the cost-effectiveness of salinity controls in the Colorado River Basin. The BOR initially expected the cost-effectiveness of controls under the new program to average \$50 per ton. After the initial four years of the program, however, selected projects averaged just over half of that estimate (\$26 per ton), with a range of \$11 to \$36 per ton, and slightly over a third of the average cost-effectiveness of controls under the previous program (\$70 per ton). Moreover, although one might have expected costs to increase after the most cost-effective proposals were funded in the first year or two of the program, cost-effectiveness actually improved over the first four years of the program.³⁰

The fundamental assumption in the salinity control program was that a ton of salt (or a reduction of a ton of salt) has approximately the same effect regardless of location in the watershed (the same basic assumption as being stated here for nitrogen compliance with the Chesapeake Bay TMDL). Thus, project proposals can be compared without regard to location, and control opportunities may be developed and proposed anywhere in the vast upper Colorado River watershed.³¹ Also, rather than focusing on

particular, pre-determined sources or sectors of salinity, bidding is open to any salinity source anywhere in the basin, including saline springs, leaking wells, irrigation sources, municipal and industrial sources, erosion on public or private land, or other sources. All proposals are first ranked on their cost per ton of salinity control. This ranking is then adjusted for risk factors that might affect the project's performance. The performance risk evaluation considers both financial and effectiveness risks.

Adler describes the use of RFPs for the purpose of water pollution control in this manner:³²

RFPs identify cost-effectiveness as the "primary criterion" in project selection. Bids are thus evaluated based on multi-dimensional criteria rather than the simple price of controls. Proposals must identify the specific control methods to be used; the project management plan and schedule; the projected salinity reductions over time, along with the specific methodology used to calculate those reductions and the calculation itself, based either on approved BOR methods or other documented methods; project costs and payment methods; anticipated project life; incidental project environmental impacts (both positive and negative); and a project risk analysis that follows a prescribed formula. Moreover, the RFP specifically asserts that the selection committee retains flexibility in deciding the winning bidders within the overall program scope, that it will negotiate projects that maximize benefits to the government, that it may accept bids other than those with the lowest costs, and that it might reject all bids. The RFPs do disclose the evaluation criteria in more detailed ways that better inform potential bidders about the selection process, and that seek to ensure that program benefits, as distinct from overall societal benefits, are maximized. The RFPs advise potential bidders of the kinds of risk factors that will be considered. BOR acknowledges that accepting some risk may reduce overall program costs.

Adler also provides some additional observations on competitive procurement benefits and challenges from a governmental perspective, including one focused on the Chesapeake Bay:³³

- "In pollution control programs, the whole purpose of government funding is often to induce voluntary controls where regulations are not feasible for political or other reasons."

²⁹ Same as #26

³⁰ Same as #26

³¹ Same as #26

³² Same as #26

³³ Same as #26

“It appears that the competitive bidding approach has the potential to improve significantly the cost-effectiveness of nonpoint source pollution control expenditures, and to stimulate more innovative ways to achieve environmental results.”

- “This reallocation of funding will likely be opposed by interest groups that currently receive the funding, but that is precisely the point. Public dollars will be spent more cost-effectively if all proposed projects are required to compete for funding on the basis of cost-effectiveness, and on a level playing field rather than one tilted by political clout or existing program bias.”
- “What is crystal clear, however, is that past control efforts—particularly controls on nonpoint sources—have not been sufficient to restore water quality and the health of the Chesapeake Bay ecosystem. Given that public resources to address this problem are finite, more progress might be made if greater attention is paid to the cost-effectiveness with which those dollars are spent. An auction process modeled after the Colorado River Basin procurement program might help to achieve that goal.”

Pennsylvania’s legislative budget and Finance Committee 2013 Report: competitive bidding and TMDL compliance costs

In January 2013, the State of Pennsylvania Legislative Budget and Finance Committee (LBFC) issued a report in response to Pennsylvania Act 2012-87, which commissioned an assessment on the use of competitive bidding to secure long-term verified nutrient credits, rather than following the current sector-based allocation approach. According to this report:

The approach contemplated in Act 87 would involve a change to the Commonwealth’s WIP [watershed implementation plan] whereby the current sector-allocated nutrient reduction plan for meeting the federal TMDL mandates would be replaced with a program in which the Commonwealth—presumably through PENNVEST—would purchase nutrient credits through a competitive RFP (Request for Proposal) process. The credits would then be applied to the Commonwealth’s total reduction requirement, not to the various individual sectors.³⁴

The report also states:

The competitive RFP program as outlined in Act 87 is fundamentally different in that the credits would

be purchased by the Commonwealth; they would not be traded between sources. The principle, however, is similar: using nutrient credits generated through cost-effective means to replace nutrient reductions that otherwise would have to be generated from high-cost—or at least higher-cost—practices.³⁵

According to the report, this study was commissioned when “it became sufficiently apparent that meeting the milestones and final targets outlined in Pennsylvania’s watershed implementation plans would be challenging. To date, most progress has come from regulated point sources. Goal attainment related to non-point sources, particularly agriculture and urban stormwater, has been less successful.”³⁶

The Act 87 report compared nutrient reductions between a traditional trading program and a competitive RFP program in the following manner:³⁷

Nutrient credit trading programs are designed primarily to help point source dischargers (such as wastewater treatment plants) comply with specific nutrient reductions they are required to achieve. The competitive RFP program as outlined in Act 87 is fundamentally different in that the credits would be purchased by the Commonwealth; they would not be traded between sources. The principle, however, is similar: using nutrient credits generated through cost-effective means to replace nutrient reductions that otherwise would have to be generated from high-cost—or at least higher-cost—practices.

The following key points were also made in the Act 87 report:³⁸

- “Both the PA DEP and EPA appear receptive to a competitive RFP program as part of a Chesapeake Bay strategy.”
- DEP cites the importance of advanced technologies in meeting WIP goals. Engaging innovative technology through private-sector participation in a competitive market system can “support the three priorities in the Chesapeake Bay region: maintaining a vibrant farming economy; restoring and protecting the water quality of Pennsylvania streams and the Chesapeake Bay; and providing crucial economic development benefits to rural businesses and communities.”

³⁴ Same as #3—page 16 of report retrieved at <http://lbfc.legis.state.pa.us/reports/2013/77.PDF> 25 March 2013.

³⁵ Same as footnote #3—page 16 of report retrieved at <http://lbfc.legis.state.pa.us/reports/2013/77.PDF> 25 March 2013.

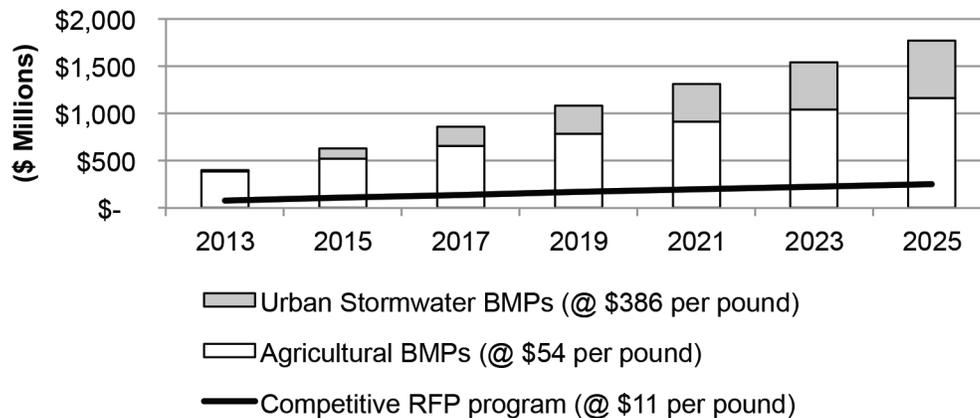
³⁶ Same as footnote #3—page 13 of report retrieved at <http://lbfc.legis.state.pa.us/reports/2013/77.PDF> 25 March 2013

³⁷ Same as footnote #3—page 16 of report retrieved at <http://lbfc.legis.state.pa.us/reports/2013/77.PDF> 25 March 2013.

³⁸ Same as footnote #3

FIGURE 5

Estimated costs to achieve all needed nitrogen reductions from nonpoint source agriculture and urban runoff using best management practices (BMPs) and under a competitive RFP program



Source: Pennsylvania Legislative Budget and finance Committee. A Cost Effective alternative Approach to Meeting Pennsylvania's Chesapeake Bay Nutrient Reduction Targets. Retrieved from <http://lbfc.legis.state.pa.us/reports/2013/77.PDF> 25 March 2013.

- Long-term financing is essential to technological solutions. The report acknowledges that long-term contracts (10–20 years) for nutrient credit sales are necessary for the financial viability of these projects. However, that even with long-term contracts, funds for the credits are not released until after the credits have been earned and verified.
- Credits must be verifiable. The LBFC report notes that, using advanced technologies, nutrients can be strictly controlled, measured, and verified at various points in the process, providing greater certainty and reliability than are generated through agricultural and urban stormwater BMP credits. There are job creation opportunities available through the implementation of a competitive procurement program. The report states that, “Advanced technology projects can not only help the Commonwealth achieve its TMDL loads, but also have the potential to promote economic development and create new jobs in rural communities. Advanced technologies may also be key to the continued financial viability of small farms. To remain competitive in today’s commodity markets, farms need to increase the scale of their operations.”

Last but not least is the following report conclusion: “A competitive RFP program could dramatically lower overall compliance costs, perhaps by 80 percent or more for nonpoint agriculture and urban runoff.”

Figure 5 is representative of the data supporting the above 80% savings assessment. The study’s conclusions support adoption of a competitive-bidding platform for nitrogen reductions as a cost-effective solution to the high

costs facing states, municipalities, and tax and rate payers. The study also demonstrates that this strategy would provide tangible environmental, economic, quality of life and health benefits to those upstream rural communities which have shouldered much of the economic cost of downstream nutrient reductions, with little or no benefit to their local communities.

Characteristics of a procurement program for the Bay

Existing and planned nutrient credit-trading programs throughout the Bay area are by design structured to assist regulated entities in meeting their short-term regulatory requirements. However, in order to engage longer-term and larger-scale results at a lower cost, modifications in approach are needed. Below is a summary of recommended programmatic provisions for a competitive procurement program that would support project development and capital formation and be protective, transparent, and beneficial for the Bay and its public- and private-sector stakeholders:

The cornerstones of securing low-cost nutrient reductions for TMDL compliance are allowing for long-term off-take agreements for future delivery³⁹ and financial discipline and accountability. Long-term off-takes for future delivery enable standard project development disciplines

³⁹ An off-take agreement governs the mechanisms of price and volume which make up revenue. The intention of this agreement is to provide the credit seller with stable and sufficient revenue to pay its project debt obligation, cover the operating costs and provide certain required return to the investors.

to be applied (projects need to be sited, engineered, permitted, constructed, and initiated) and reviewed by private-sector capital sources that will provide the long-term capital to finance the project. This capital formation will include pricing performance risk, since the project will be paid in arrears⁴⁰ for verified reductions and the costs of failure to perform will result in losses of equity and debt for the project investors. The competitive procurement, or RFP program, enables this “vetting” process to proceed, enabling the at-risk private-sector investors to determine which providers offer the greatest value for the least amount of risk. The result is a real “clearing” price that adequately reflects the costs and risks in providing the reductions required.

- **Purchase for future delivery.** In order to lower investor risk and, subsequently, lower credit costs, there needs to be a mechanism for the purchase of credits for future delivery. Projects of substance, those requiring time and expense for project development (as opposed to traditional nutrient credit trades involving manure hauling or BMP implementation), need the benefit of a purchase agreement for future delivery. There also needs to be a mechanism for long-term operating costs, which can be covered by long-term credit agreements. The resulting long-term capital investments will predominantly come from the private sector, and the result will be the integration of private-sector financial discipline to the whole TMDL compliance-spending process.
- **Risk transference.** In its present form, there is a lack of financial accountability in the mode of public-sector spending to meet EPA TMDL compliance mandates. The tax- and ratepayers assume the performance risk for these municipal projects. The competitive procurement program would transfer that performance risk to the private sector, which is much more accountable (private companies cannot raise taxes to pay for mistakes). To further mitigate risk to taxpayers under a procurement program, state agencies can require that payment for credits be made in arrears (money is not transferred until after contractual terms are met), so that, in the event of default, the agency could use the funds to purchase additional credits in the bidding process or even from a state credit bank. By waiting to make payment until after delivery, risk and accountability for performance is transferred from the public sector (where it lies in today’s compliance programs) to the private sector.
- **Long-term certainty.** Credit purchase agreements would be longer than the one to five years used in most credit-trading programs today. Verification plans and resulting

credit calculation formulas need to last for 10 to 20 years in the competitive procurement program. This longer duration enables predictable long-term planning for both the credit producer and the purchaser side, and also allows for long-term project financing to reduce overall cost of credits (e.g., consider the affordability of a home mortgage loan when financed over twenty years versus five years). The private sector will price risk in all forms and at all stages of a project. The market will always price to the greatest risk. If the permit is for five years and the credit off-take is for three years, it will price based upon the off-take, since it represents the greater risk. Enabling off-take agreements (a contract which guarantees purchase of throughput) is particularly important for infrastructure projects as they normally carry a high level of fixed costs. The credit generator benefits (reduces risk) by selling a share of its output for an extended period of time, and the customer benefits by securing a long-term guaranteed supply of output.

- **Verification.** The process of producing verified reductions of nitrogen has advanced significantly in the last few years. Private-sector technology providers have innovated to the degree that non-point sources such as livestock operations can control, measure, and verify reductions in nutrient releases to the environment in a manner comparable to point sources. EPA and the Chesapeake Bay Program Office have initiated a Verification Review Panel to compare actual BMP effectiveness to modeled results; further advancing accuracy of BMP offset factors.⁴¹ With these and other advancements in measurement and technology, a commodity has been created—one pound of nitrogen reduction. As the Bay TMDL is focused on the reduction of nitrogen (as well as sediment and phosphorus) to the Bay, there is no technical or regulatory reason to mandate from which particular upstream sector these reductions originate. It is feasible to leverage this commodity to engage commodity pricing, a critical economic feature that today’s credit-trading programs are not set up to accomplish.
- **Site specific edge of segment (EOS) factors.** An “edge of segment” factor is a calculated correction factor critical to the credit calculation formula. The EOS factor represents the amount of nutrients that, when lost to the environment, will travel across the land a sufficient distance to reach a water body that can transport the nutrient much more quickly to the Bay (land-based movement is much slower). Within Pennsylvania’s nutrient credit-trading program, for example, regionally averaged EOS factors are

⁴⁰ Payment in arrears is a term describing payments made after a service has been provided

⁴¹ Descriptions of the Verification Review Panel can be found at http://www.chesapeakebay.net/groups/group/bmp_verification_review_panel. A summary of their recent findings can be found at http://www.chesapeakebay.net/channel_files/18958/attachment_g_-_wkgp_verif_protocol_issues.pdf. Last accessed on 19 April, 2013.

used for credit generation; these regional factors are highly conservative by covering wide and varied swaths of landscape types and distances from water bodies. However, newer models are now available at EPA/USGS to remedy this unnecessarily costly one size fits all approach and replace it with site specific EOS factors. Such an upgrade (where policy catches up to available science) is important as a means for public or private entities to locate the most favorable locations for pollution control projects; the competitive marketplace is able to find the most cost efficient project locations (the most pollution control return per unit of investment). The science supporting site-specific EOS factors to determine estuary impacts is available and ready for use, but has not yet been allowed by government agencies. Arbitrary and averaged EOS factors applied to too large of an area with substantial impact diversity distorts the marketplace in favor of high cost and low value projects.

- **Corrective action—three-year credit averaging.** One of the challenges of the traditional nutrient credit-trading programs is that credits generated from reductions at non-point sources must fit the regulatory parameters of the CWA regulated point-source permits (owned by the credit purchasers). Point-source permit compliance provisions can either negate the value of a non-point source credit or add significant cost (through, for example, meeting quarterly discharge mandates). Credits generated from non-point sources, while fully transparent and verifiable pursuant to the Chesapeake Bay TMDL, cannot or need not necessarily meet all the short-term compliance provisions associated with point source regulation. For example, when generating nitrogen credits by treating livestock waste, it is normal to have some variation in load due to animal health, seasonal changes, and age profiles. Three-year compliance averaging of credits generated from non-point sources would enable the implementation of a corrective action program (absent financial penalty), reducing developer performance risk and therefore cost. Three-year averaging would allow recovery from the intrinsic variability of non-point source treatment without creating added environmental risk. Three-year averaging of credits is consistent with EPA models that demonstrate that natural variations in nutrient loads (climatic and natural flow patterns), along with the massive scale of delivered load (hundreds of millions of pounds of nitrogen per year), results in no short-term impact from longer-term compliance averaging periods. Further, as non-point sources do not directly discharge into waterways, the nitrogen travel time to the Chesapeake Bay is significantly longer than the much shorter travel times associated with point source discharge

facilities.⁴² Enabling corrective action is part of an overall risk mitigation policy envelope.

- **Open to all sources.** A competitive procurement program needs to be open to all sources to bid, both public and private. While much of the discussion in this article is focused on how to enable private investment, innovation can originate in the public sector just as well. By allowing any source to bid, the focus will rightly be on meeting the requirements of the bidding program and not on the origin of the bidder.
- **Transfer payments.** As Figures 4 and 5 above show, significant money is spent annually by tax- and ratepayers to mitigate Bay pollution. Creating clean water is a publicly funded activity. The focus, therefore, is to shift from mandating high-cost solutions and enable the marketplace to provide a low-cost solution to the Bay clean water challenges. What is proposed is that the government shift or ‘transfer’ a portion of its spending, and its particular role in the spending, to more of a role as a procurement agency. However, instead of procuring services or equipment, in this case the government is procuring cost-competitive, verifiable nitrogen reductions. It is proposed that this shift in approach be referred to as a transfer payment.

There are a number of ways to fund these transfer payments, as funding currently is funneled through a wide assortment of local, state, and federal programs. The ultimate method or approach taken for these transfer payments is a local/state decision. Removing unfunded sector-based mandates from the ledger of municipal and county officials is good place to start.

The fund aggregator could be an existing authority or entity, or a new one. In either case, the role would be to issue RFPs for verified nitrogen reductions, score the bids using a scoring model, and allocate the cost. As a reminder for comparison sake, today, municipal ratepayers are paying much higher rates for less-effective results, as driven by the sector-based mandates. Once that sector-based cost driver is removed and a commodity unit is established (one pound of nitrogen, verified), the barriers to competitive procurement are removed.

Local environmental benefits associated with competitive procurement

For most fresh water streams and lakes in Pennsylvania, phosphorous is the “limiting” nutrient (i.e., the nutrient

⁴² <http://biontech.com/policy/docs/Four%20Expert%20Opinions%20CB%20Load%20Impact%20-%20Robillard%204-30-09.pdf> retrieved on March 25, 2013.

that primarily controls eutrophication produced by algae growth), whereas nitrogen is typically the limiting nutrient in estuaries such as the Chesapeake Bay. As a result, steps focused solely on reducing the nitrogen flowing to the Bay may do little to address the water quality problems of local streams and water bodies.⁴³ Frequently, however (depending upon source and technology applied), steps taken to reduce one nutrient, such as nitrogen, also result in the reductions of other pollutants, such as phosphorus and sediment. These multi-level pollution-control efficiencies are an important consideration for regulators, because while increasing the cost effectiveness of nitrogen reduction is the driver, maximizing environmental benefits is the ultimate objective.

A recent study by Barry Evans, a senior researcher at Penn State University, on the nutrient control benefits resulting from a combination of projects in south-central Pennsylvania found that while these projects are primarily focused on nitrogen loss reduction, there will also be significant reductions in phosphorus delivery to local water bodies.⁴⁴ Excess phosphorus stimulates the rapid growth of plants and algae in fresh water, clogging waterways and reducing fishery and aesthetic values. The ancillary (and essentially ‘free’) local environmental and economic benefits that accompany onsite livestock waste treatment projects may provide even greater economic benefits and value to local tax- and ratepayers than the already substantial benefits of low-cost nitrogen credits. Evans’s study estimated that the proposed livestock waste treatment projects, which are primarily targeted toward nitrogen loss reductions from livestock manure measured at the Chesapeake Bay, would result in adjusted local phosphorus load reductions that exceed the TMDL-required reductions in two of three locally impaired creeks (the Quittapahilla and Donegal Creeks) and about 44 percent of the TMDL load in Chickies Creek. As shown in Table 3 below, these creeks have been on EPA’s list of impaired streams for 17-plus years; these waterways have presented regulators and local communities with long-term challenges that can gain significant benefits as a result of the Bay nitrogen-reduction programs.

Table 4 presents data that highlight the large-scale local environmental benefits from upstream livestock waste treatment projects. Model results shown in the table below indicate that while the proposed projects would result in approximately 28,354 phosphorus credits for Chesapeake Bay compliance, there will be in excess of one million pounds of phosphorus removed from the local upstream

environment, creating a 36:1 (local:Bay) removal ratio favoring the local environment for the phosphorus reductions.

TABLE 4
Favorable local benefits of Bay-oriented projects

Stage of nutrient removal	Nitrogen (lbs/yr)	Phosphorus (lbs/yr)
Overall removal from local environment	7,116,616	2,128,458
Assumed added replacement fertilizer	810,040	1,064,229
Net calculated removal	6,306,576	1,064,229
Realistic estimation of Bay credits earned	3,479,963	28,354
Amount of local, verified nutrient reductions not counted toward the Bay Credit Trading Program	2,826,613	1,035,875

The numbers in this table were extracted from a report published by PSU researcher Barry Evans on behalf of Bion. This document can be found at http://biontech.com/technology/docs/TMDL_Load_Comparisons_evans2d__4_.pdf retrieved on 25 March 2013.

The status quo alternative, which is the emphasis of today’s regulatory programs, is to regulate nutrient reductions at point-source dischargers such as municipal waste treatment plants. While these projects support Bay reductions, there are limited local environmental benefits from these investments, as they are direct discharges into waterways that flow into the Bay. It is the land-based transfer and collection of nutrients that is inhibited through the upstream non-point source projects, and while still helping solve the Bay issues, those reductions are much more beneficial locally. As Pennsylvanians have no Bay waterfront to enjoy, factoring in local benefits relative to Bay compliance appropriations makes a lot of sense.

Other local environmental benefits

In addition to addressing phosphorous problems in local streams, low-bid agricultural projects can also address another local environmental concern—nitrate contamination in groundwater. Excess nitrates in drinking water can create serious health concerns in both humans and animals and are very expensive to treat if safe limits are exceeded. Costs associated with this environmental challenge don’t normally accrue in the same programs or budgets as wastewater treatment and Chesapeake Bay protection programs, as these costs are allocated to generate and protect municipal drinking water supplies (as opposed to the wastewater angle of Bay programs). According to a separate study

⁴³ Same as footnote #3—page 29 of report retrieved at <http://lbcf.legis.state.pa.us/reports/2013/77.PDF> 25 March 2013

⁴⁴ http://biontech.com/technology/docs/TMDL_Load_Comparisons_evans2d__4_.pdf retrieved on 25 March 2013.

TABLE 3

Local watershed benefits associated with proposed nutrient control projects

Site	Watershed	Year placed on EPA list of impaired watersheds	EPA/DEP TMDL-required P reduction (lbs P/yr)	Waste load reduction by watershed (lbs P/yr)	Quantitative benefit
Manheim	Chickies Creek	1996	39,956	17,717	44.3% of TMDL
Mt. Pleasant	Quittapahilla Creek	1996	15,642	17,814	Exceeds TMDL
Mt. Joy/Donegal	Donegal Creek	1994	3,287	5,321	Exceeds TMDL
			58,885	40,852	70% of TMDLs

conducted by Barry Evans,⁴⁵ projects proposed by one company will result in decreased levels of nitrates that reach local aquifers. In other words, Evans states in his report that:

[A] reduction of nitrogen loads to local ground water resources will not only result in a decrease in nitrogen loads transported via subsequent stream flow to the Bay, it will also potentially result in lower operating costs to community drinking water systems that might otherwise have to install costly treatment systems to remove excess quantities of nitrogen in order to protect the health of local populations.⁴⁶

Competitive procurement programs should not be designed to benefit one particular project type or sector. Procurement awards should be based solely upon the overall cost-benefit that the project provides to the individual state in meeting the TMDL estuary mandate and the verified beneficial environmental and other impacts to the local community. The amount of scoring emphasis that is placed on local environmental benefits should be based upon actual avoided costs both present and future and the beneficial impacts those environmental benefits have on the local community such as improved public health and expansion of freshwater recreational activities such as fishing and their positive economic impact. Each state will need to develop its individual overall cost-benefit scoring model, which will need to incorporate all of the relevant impacts and benefits.

Competitive procurement: identification of challenges

As is the case with almost any complicated problem and proposed solution, there is usually no perfect answer or response. Careful consideration must be given prior to introducing competitive procurement programs for the

purpose of more efficiently meeting Chesapeake Bay TMDL compliance mandates. Below is a list of potential challenges and mitigation strategies associated with implementing a competitive bidding program within the Chesapeake Bay.

Using competitive procurement would entail the development of yet another government-run program. This is a program whereby the government attempts to create and work within a free market-oriented system, which isn't what it is set up to do.

Response: Running procurement programs is something the government function accomplishes on a regular basis with skill sets and programs to support these activities. However, instead of procuring services or equipment, they are procuring pollution-control reductions. The requirement that all credits be verified has created a commodity that can be defined and procured, yet the existing overly structured system whereby governmental entities select the winners and losers fails to provide the tax- and rate payers with commodity pricing.

The government will remain in the lead role in setting standards, measuring improvements, and all the other technical aspects currently managed.

Who pays for the development risk? If there are long-term credit agreements to enable the financing of large and complicated private capital sourced projects, what happens if the project fails?

Response: A key benefit of shifting to a competitive procurement program is that there are strategic performance risk shifts from the public to the private sector. This shift will result in significant savings and less risk to the ratepayers as the private sector is much more efficient at assessing and pricing capital investments. Further, additional risk management controls can be added such as payment in arrears (after verified delivery), whereby if there is failure, the loss will be borne by the credit generator, creating real financial accountability which is lacking in the existing government to government approach. The government can re-allocate the funds to purchase verified reductions

⁴⁵ http://biontech.com/technology/docs/Evans_GroundwaterN.pdf accessed on April 19, 2013

⁴⁶ See page 6 at http://biontech.com/technology/docs/Evans_GroundwaterN.pdf

elsewhere to meet its estuary mandate requirements. Project developers will place their own capital at risk to develop projects, not the ratepayers.

Point sources have already done their fair share to meet Bay mandates, and agricultural interests have not. A procurement program will amount to a major shift in government financial support from municipalities to agricultural interests. This is not a fair transition, as agricultural interests have yet to carry their own fair share of the nutrient reduction load. Procurement programs will also drain money that should be routed to municipal storm water projects, which are getting less expensive and more effective as a result of recent funding.

Response: Government funding to reduce nutrient loading should be applied to the most cost-effective sources of verified reductions above their respective regulatory baseline requirement. The Clean Water Act was not intended to continuously support large-scale public authority nutrient-reduction projects when they are no longer the low-cost solution to the excess nutrient loading issue. Today, any assortment of projects can deliver more cost-effective solutions as measured by either simple estuary compliance costs or overall cost benefit including scoring local beneficial impacts. The reductions can be verified and calculated above regulatory baseline and therefore are the equivalent of reductions from point source sectors. The issue is for government to deliver services to the tax- and ratepayers in the most cost-effective manner. This is not a fairness issue but simply an issue of efficient versus inefficient government. Further, cutting the cost of compliance of the Bay TMDL by 80% (as noted in the PA LBFC report), the procurement program will actually free up additional financial and technical resources to utilize on other valuable municipal projects; more work can be accomplished with the same level of financial and technical resources.

The competitive procurement program will siphon government investments toward only the huge factory farms that have sufficient scale to implement large-scale technologies that can generate low cost nutrient reductions. Family-scale farms, which are the vast majority of operations in the watershed, are the lifeblood of these communities; they are local, responsible members of the community. Unfortunately, these smaller and medium-sized farms will be the losers if such a procurement program is developed, as BMP and other grant monies would disappear and get routed to the factory farms, further pushing these small and medium-sized farms out of business. This hardship could then lead to the loss of farmland and a worsening of the problem.

Response: Despite the significant investments in nutrient reductions from agricultural sources, the current scale of reductions is relatively modest compared to overall nutrient contributions. For example, two livestock waste treatment projects already under development by two firms in Pennsylvania are expected to generate more than three million pounds of nitrogen credits relative to EPA TMDL mandates, which comprises almost half of Pennsylvania's entire reduction mandate from 2009 to 2013⁴⁷ (inclusive of all sectors, not just agriculture). What this means is that competitive procurement can generate reductions from agricultural sufficient to (a) remove the burden of threatened additional regulation on the small and mid-sized farm operations, and (b) provide the needed opportunity for an injection of private investment as well as services and output into the agricultural sector for operations of all sizes and types.

Further, the significant reduction in the cost of compliance with EPA mandates will free up government resources to use on other projects of local interest, such as continuing to support advancements in the small and medium-sized agricultural operations. By lowering the cost of TMDL compliance by up to 80%, these funds should continue to be available for local application and benefit.

The cities, towns and states surrounding the Chesapeake Bay are hurting financially, as is the rest of the country. Any dollar we spend on remediating the Bay equates to one less dollar to support the local schools, fire, and police departments. The TMDL is simply unaffordable, and a procurement program won't fix it.

Response: The Chesapeake Bay TMDL and associated legal agreements supporting this standard (e.g., the federal suit settled between the Chesapeake Bay Foundation and the Department of Justice) all make the states accountable to meet the required reductions. In the case of default, the state enters a complicated legal phase with various federal agencies, which is unlikely to end in a favorable manner for the state. What the procurement program enables is a means to accomplish these goals much more efficiently, with the states offloading much of the investment and associated performance risk off to the private sector. The private sector, in turn, drives jobs and economic development, providing a net benefit to the host locales. Further, as the TMDL takes a Bay-wide approach, it ensures that each state reduces its fair share of the burden, as the estuaries are a shared resource. That way, states that are downstream

⁴⁷ See the Pa DEP Watershed Implementation Plan milestone commitments at <http://files.dep.state.pa.us/Water/Chesapeake%20Bay%20Program/ChesapeakePortalFiles/7-9-2012/PA%20FINAL%202012-2013%20Milestones.pdf> retrieved on March 25, 2013

(Maryland) are not responsible to make up for nutrient loads delivered into the state waters from upstream agricultural operations (Pennsylvania). Both states would benefit from not only the improved environmental conditions, but also the corresponding public health benefits from reduced water pollution.

Sector-based regulatory approaches are the underpinning of all local, state, and federal regulation designed to protect the Bay. It is not feasible to simply dump that approach overnight in order for the free market to step in. There are legislative and regulatory mandates to follow, multi-agency sector based models provide the structure for overall TMDL compliance mandates.

Response: These concerns are often at the crux of the challenge with implementing a competitive procurement within the Chesapeake Bay watershed, and when evaluated carefully, it is clear that there is substantial resistance to change. However, viewing these issues from the perspective of the tax- and ratepayer as well as considering the environmental benefits, there is certainly sufficient impetus for change. All sources (point and nonpoint, private and municipal) can compete to provide low-cost nitrogen reductions while also providing a forum to assess localized benefits.

Also, as was pointed out in the PA LBFC report, it is not necessary to immediately pull the plug on all aspects of the sector-based approach. In fact, the authors of the LBFC report suggested that competitive procurement be used on only that portion of the mandated reduction that has not already been accomplished through the traditional ‘public works’ and ‘assistance based’ models currently in use. There is a range of modifications that can be made to work within existing systems and models to make this work; the key factor is to keep a focus on what is the most cost-effective solution, and not let the status quo approach, which is seen to deliver poor results, override that savings to the taxpayers.

Competitive procurement programs are just another excuse packaged under the guise of “free market economics” to enable a pay-to-pollute scheme. What’s worse is that disadvantaged communities often suffer the brunt of such schemes. Each community and each watershed need to reduce individually in order to not only heal the Bay, but also the local watersheds and communities. Polluters should not benefit financially from continuing to pollute.

Response: Prior to the generation of any pollution control credits, sources have to be in compliance with all regulations, standards, and other mandates. Credits are generated only from control in excess of this compliance

baseline. In addition, if local TMDLs are in place (related to local watersheds and not the Chesapeake Bay), the source may also have to reduce nutrient discharges to comply with that local TMDL in addition to any Bay related reductions. Third, for procurement programs, unlike with the traditional nutrient credit programs, the credit buyer is the state; that focuses the nitrogen credit solely as a means to meet Bay TMDL mandates. Traditional nutrient credit trading programs, however, have both a buyer and a seller, whereby buyers purchase credits in lieu of undertaking their own more expensive reductions. A procurement program does not have this mechanism; there is no credit purchasing source in lieu of actual reductions. Finally, the local environmental benefits associated with low-cost, upstream nutrient reductions provides a far higher benefit to local residents than the current system of treating nutrients that flow directly into streams flowing into the Bay.

States have a responsibility to pursue the most cost-effective solutions to comply with the Chesapeake Bay TMDL, as well as to maximize local benefits to the folks paying the tab for this program – the local rate- and taxpayers.

Pathway to policy

This section addresses initiatives necessary at the state and federal level in order to create an opportunity for competitive procurement within the Bay.

The primary step necessary to establish a state level competitive procurement program is the creation of enabling legislation. This legislation needs to accomplish the following:

- Authorize an agency to manage the program. While organization types may vary from state to state, most states already have a program set up to manage and funnel federal and state clean water funding, and these same functions may be the most appropriate to manage a competitive bidding program.
- Establish basic rules and requirements for a competitive-bidding program. The legislation needs to outline how scoring will work, how bids are established, who defines the process, etc. Establishing a commitment to score local environmental benefits (in addition to those in the Bay) is critical. The Colorado River salinity program experience is that the lowest-priced bid doesn’t always win; sometimes the local environmental benefits and/or enhanced measurement and verification benefits associated with a bid lead to paying more to the winning bidder.
- Identify and approve of funding sources through appropriation provisions (or alternatively through some other evaluation process set up by the state). The key is to

transfer funds from high-cost and low-value projects to lower-cost and higher value projects. There could be some complexity in this process when the various sources of existing funding are considered for inclusion in the bidding program, such as federal grants, state grants, state loans etc., as well as municipal and other local sources of funding.

- Establish program coordination parameters, rules/policies, and timeframes, assuming various state and local agencies are involved at different times. For example, how might one determine the number of credits to purchase? That number may get determined by the amount of reductions necessary to meet WIP forecasts. Another issue is how to coordinate the competitive procurement program with the other ongoing Bay and watershed pollution control programs (traditional credit trading, grant programs, municipal mandates, etc). While all these issues won't be resolved within the legislation, the legislation could establish the framework for agency interaction.

At the federal level, EPA has maintained from the outset of the Bay TMDL that, while it sets nutrient discharge limits, it is up to the states to figure out the optimal means to achieve those reductions. The state Watershed Implementation Plan (WIP) is the document that outlines how a state will accomplish these nutrient reductions. It is likely, therefore, that states will need to modify their WIP submittals to EPA to include planned reductions associated with a competitive procurement program. EPA may need to add some clarity for states on the acceptability of certain provisions in the state procurement programs relating to pricing and managing risk, such as support of long term credit agreements and three-year averaging of credits, 'verified' reduction definitions and thresholds, etc. EPA staff may be challenged, as will the staff at the state level, to lessen their emphasis on sector-based reductions. EPA may also need to provide additional clarity on the use of federal funds (e.g., Clean Water State Revolving Loan Funds) for use in competitive procurement.

Wider application potential

The Chesapeake Bay is one of the most-modeled and measured watersheds in the nation. One primary reason for such detailed assessment is because concerted Bay restoration efforts have been underway for the better part of two decades. Because of its leadership position, EPA has stated on numerous occasions that the Chesapeake Bay is considered a model for how other large watersheds, particularly for the intractable non-point sources, can be remediated.⁴⁸

⁴⁸ One example of this connection can be found at <http://blog.americaswaterway.org/chesapeake-bay-strategy-offers-context-for-mississippi-river/> retrieved on 25 March 2013.

In other words, the competitive procurement approach, should it be successful in helping to solve Chesapeake Bay challenges, can be viewed as a national opportunity. The principle of transparent and competitive bidding to achieve reductions in water pollution is replicable.

As big as the Chesapeake Bay watershed is (41,000 square miles), the Mississippi watershed (and its corresponding dead zone in the Gulf of Mexico) is much bigger, comprising 41% of the entire continental United States land mass. Another difference between the two watersheds is the approach taken by regulators as to how to solve the problem. While EPA has issued a detailed regulation for the largest ever TMDL standard within the Bay watershed, EPA despite the difference in size and complexity, has taken a more hands off approach with the states in the Mississippi River watershed. State nutrient reduction mandates are predominantly in the form of voluntary stakeholder agreements.

The Great Lakes Watershed is another multi-state watershed that could benefit from competitive procurement, as well as many other watersheds that have sufficient scale and complexity to engage long-term and low-cost solutions.

Conclusion

By removing barriers to private-sector entry, government agencies within the Chesapeake Bay watershed can reduce the cost of compliance with nutrient reduction mandates while improving their effectiveness. The challenge that EPA and the Chesapeake Bay states are having with affordable compliance is a political problem, much more so than it is a technology or economic problem. The compliance-cost problem has been nurtured by policies that essentially result in a high-cost solution. The current regulatory approach does not sufficiently incorporate the principles of competition and financial accountability, which are core characteristics of private sector efficiency. Existing sector-allocation mandates do not lead to capital formation based upon economics; they lead to capital formation based on government mandates funded on the backs of taxpayers that absorb all the risk. Regulators need to initiate public-private partnerships that empower the private sector to do what it does best, which is to do more with less. It is about purchasing a commodity; the manner in which these reductions are achieved should not be a part of the government mandate.

The pivot point for change is enabling policy. The stage is set, as we now have:

Verified reductions, which can also be described as qualified EPA offsets. These units of measure enable commoditized pricing through traditional competitive procurement programs; however, instead of purchasing paper clips, the government is procuring nitrogen reductions.

Technological innovations have arrived that enable verified reductions from non-point source operations, opening up new opportunities for low-cost reductions.

Local environmental benefits associated with Bay-focused reductions. Interior freshwater resource benefits in many cases may exceed the cost of federally mandated nitrogen reductions – at no additional cost to the ratepayers.

Simply put, the rate- and taxpayers need to be represented better; they need better advocates. By engaging in a competitive procurement program that maximizes transparency of spending and cost effective investments, cost-effective environmental results can be achieved.