OFFICE OF INSPECTOR GENERAL

Catalyst for Improving the Environment

Evaluation Report

Development Growth Outpacing Progress in Watershed Efforts to Restore the Chesapeake Bay

Report No. 2007-P-00031

September 10, 2007

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Abbreviations

CBPO	Chesapeake Bay Program Office (EPA)
EPA	U.S. Environmental Protection Agency
ESD	Environmentally Sensitive Development
GAO	Government Accountability Office
LEED-ND	Leadership in Energy and Environmental Design for Neighborhood Developments
MS4	Municipal Separate Storm Sewer System
NEMO	Nonpoint Education for Municipal Officials
NPDES	National Pollutant Discharge Elimination System
OIG	Office of Inspector General
TMDL	Total Maximum Daily Load

Cover photo: Farmland is lost to encroachment from housing developments in central Maryland. (Photo courtesy U.S. Department of Agriculture, Natural Resources Conservation Service)

U.S. Environmental Protection Agency
Office of Inspector General

2007-P-00031
September 10, 2007

At a Glance

Catalyst for Improving the Environment

Why We Did This Review

This review is one of several conducted by the Office of Inspector General in response to a congressional request. We sought to determine how well the U.S. Environmental Protection Agency (EPA) is assisting its Chesapeake Bay partners in restoring the Bay. This report focuses on progress to reduce nutrient and sediment loads from developed and developing land sources.

Background

Over 64,000 square miles of land drain to the Chesapeake Bay. Population in the watershed exceeds 16 million and is projected to surpass 19 million before 2030. Excessive loads of nutrients and sediments have been identified as primary causes of Bay degradation. From 1985 to 2005, EPA estimated loads from developed land sources increased up to 16 percent, while loads from wastewater disposal and agriculture decreased.

For further information, contact our Office of Congressional and Public Liaison at (202) 566-2391.

To view the full report, click on the following link:
www.epa.gov/oig/reports/2007/20070910-2007-P-00031.pdf

Development Growth Outpacing Progress in Watershed Efforts to Restore the Chesapeake Bay

What We Found

EPA and its Chesapeake Bay watershed partners will not meet load reduction goals for developed lands by 2010 as established in the *Chesapeake 2000* Agreement. In fact, new development is increasing nutrient and sediment loads at rates faster than restoration efforts are reducing them. Developed lands contribute less than one-third of the Bay loads but would require about two-thirds of the overall estimated restoration costs. Consequently, EPA and its Bay partners focused on more cost-effective approaches, such as upgrading wastewater facilities and implementing agricultural best practices. Additional challenges impeding progress include:

- Lack of community-level loading caps.
- Shortage of up-to-date information on development patterns.
- Ineffective use of regulatory program to achieve reductions.
- Limited information and guidance on planning and applying environmentally sensitive development practices.
- Limited funding available for costly practices.

A cost-effective start to reversing the trend of increasing loads from developed land is for communities to concentrate on new development. Opportunities abound for EPA to show greater leadership in identifying practices that result in no-net increases in nutrient and sediment loads from new development and assisting communities in implementing these practices. If communities do not sufficiently address runoff from new development, loads from developed lands will continue to increase rather than diminish. As a result, restoration costs will increase, and the Bay will not be restored to the health envisioned in the *Chesapeake 2000* Agreement because water quality degradation and loss of aquatic life will continue.

What We Recommend

We recommend that the EPA Chesapeake Bay Program Office Director prepare and implement a strategy that demonstrates leadership in reversing the trend of increasing nutrient and sediment loads from developed and developing lands. The strategy should include developing a set of environmentally sensitive design practices and support for the use of those practices. The Chesapeake Bay Program Office Director should also work with Bay partners to set realistic, community-level goals for reducing loads from developed and developing lands. In addition, the EPA Region 3 Water Protection Division Director should establish a stormwater permitting approach that achieves greater nutrient and sediment reductions. EPA concurred with the recommendations in this report.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
INSPECTOR GENERAL

September 10, 2007

MEMORANDUM

SUBJECT: Development Growth Outpacing Progress in Watershed Efforts to Restore the Chesapeake Bay
Report No. 2007-P-00031

FROM: Wade T. Najjum
Assistant Inspector General for Program Evaluation

TO: Donald S. Welsh
Regional Administrator, Region 3

This is our report on the subject evaluation conducted by the Office of Inspector General (OIG) of the U.S. Environmental Protection Agency (EPA). This report contains findings that describe the problems the OIG has identified and corrective actions the OIG recommends. This report represents the opinion of the OIG and does not necessarily represent the final EPA position. Final determinations on matters in this report will be made by EPA managers in accordance with established resolution procedures.

The estimated cost of this report – calculated by multiplying the project's staff days by the applicable daily full cost billing rates in effect at the time – is $783,489.

Action Required

In accordance with EPA Manual 2750, you are required to provide a written response to this report within 90 calendar days. You should include a corrective actions plan for agreed upon actions, including milestone dates. We have no objections to the further release of this report to the public. This report will be available at http://www.epa.gov/oig.

If you or your staff have any questions regarding this report, please contact me at 202-566-0827 or najjum.wade@epa.gov; Dan Engelberg, Director, at 202-566-0830 or engelberg.dan@epa.gov; or Linda Fuller, Project Manager, at 617-918-1485 or fuller.linda@epa.gov.

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Chapter 1
Introduction

Purpose

In 2000, the U.S. Environmental Protection Agency (EPA) and its Chesapeake Bay Program partners (Bay partners) agreed to improve the water quality of the Chesapeake Bay and its tidal tributaries by 2010. EPA and its partners planned to improve the water quality to the level needed for the waters to be removed from EPA's impaired waters list. Based on stakeholder concerns, U.S. Senator Barbara A. Mikulski of Maryland requested that the EPA Office of Inspector General (OIG) evaluate progress being made in reducing nutrient and sediment loads to the Bay. This report focuses on progress in reducing contributions from developed and developing lands. We previously reported on progress in reducing agricultural and air deposition sources. An additional report on municipal wastewater treatment discharges is forthcoming.

Controlling sources of nutrients and sediments from developed and developing lands is important in light of continuing population growth and development within the Bay's watershed. To determine the extent to which the Bay partners are meeting their restoration commitments and the extent of EPA's support, we sought to answer the following questions:

- Can the goals for reducing nutrient and sediment loads from developed and developing lands be accomplished and sustained to restore the ecological health of the Chesapeake Bay by 2010?

- To what extent is EPA supporting the Chesapeake Bay Program partners in their efforts to implement and sustain load reduction practices on developed and developing lands within the watershed?

- What challenges must be overcome to effectively implement management practices to meet and sustain reduction goals for nutrient and sediment loads from developed and developing lands within the Chesapeake Bay watershed?

Background

Bay Watershed Environmental Setting and Demographics

The Chesapeake Bay provides economic and recreational opportunities estimated to exceed $33 billion annually, according to a 1989 economic study by the State of Maryland. Over 64,000 square miles of land drain to the Bay or one of its tributaries (see Figure 1-1).

The watershed includes more than 1,600 local governments, the District of Columbia, and parts of six States:

- Virginia
- Maryland
- Pennsylvania
- New York
- Delaware
- West Virginia

Figure 1-1. Chesapeake Bay Watershed
(Source: Chesapeake Bay Program Office)

The population in the watershed area exceeds 16 million and is projected to surpass 19 million before 2030. Population is particularly concentrated along Interstate 95. The major urban areas in the watershed all lay on tributaries or the Bay. Some of these major urban areas and tributaries are shown in Figures 1-2 and 1-3, respectively.

Major Urban Areas in Chesapeake Bay Watershed
• Harrisburg, Pennsylvania • Baltimore, Maryland • District of Columbia • Annapolis, Maryland • Richmond, Virginia • Hampton Roads, Virginia (Norfolk-Virginia Beach area)

Figure 1-2. (Source: EPA OIG review)

Major Tributaries in Chesapeake Bay Watershed
• Susquehanna • Patuxent • Potomac • Shenandoah • Rappahannock • York • James

Figure 1-3. (Source: EPA OIG review)

Much of the population growth is projected to occur in the suburban and rural edges of these metropolitan areas. For example, the population of Loudoun and Spotsylvania Counties, Virginia, are projected to more than double between 2000 and 2030.

Different restoration approaches are needed in different parts of the watershed because of variations in governmental structure, physical geography, and land use. The watershed stretches from the Appalachian Mountains to tidewater regions. Land use also varies, with developed lands (urban areas and mixed open) covering 20 percent of the watershed, forests 57 percent, agriculture 22 percent, and non-tidal water 1 percent.

Bay Pollution Sources and Impacts

Excessive loads of nutrients and sediments have been identified as the primary cause of water quality degradation and loss of aquatic life in the Bay and its tributaries.

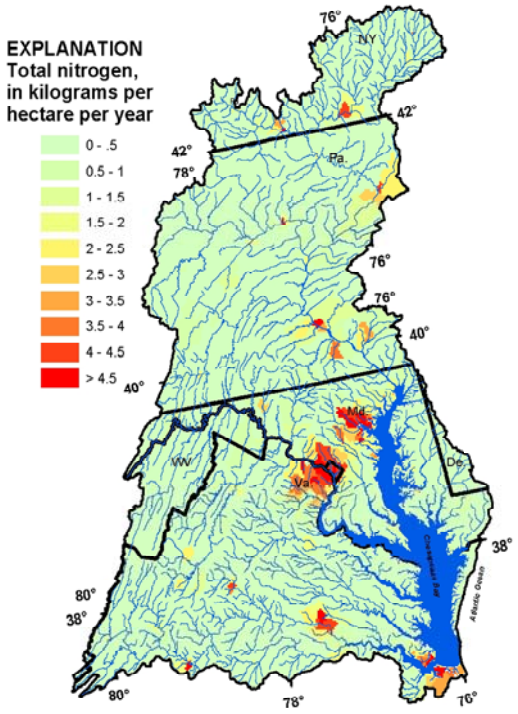


Figure 1-4. Modeled distribution of density of nitrogen loading rates from developed land sources in the Chesapeake Bay Watershed.
(Source: U.S. Geological Survey Sparrow Model)

Nutrients: Nitrogen and phosphorus are essential nutrients for plant growth, but in excessive quantities promote growth of algal blooms. As the algae die and decompose, oxygen in the water is consumed. Without oxygen, fish, crabs, and many other aquatic dwellers cannot live.

Sediments: Water flowing off the watershed landscape carries suspended sediment – particles of sand, silt, clay, and organic material. These sediments block sunlight from passing through the water, impact aquatic habitat, and hinder the growth of submerged aquatic vegetation.

The major population centers in the watershed are easily identified on the map of modeled loads of nitrogen from developed lands (Figure 1-4); they are the areas of high loading rates. Applications of fertilizers onto home lawns, golf courses, and parklands contribute nitrogen and phosphorus. Other sources of nitrogen include atmospheric deposition and septic (onsite wastewater disposal). Sources of sediment include disturbance of land during construction and erosion of stream banks and sediments already accumulated in streams.

EPA's Chesapeake Bay Program Office (CBPO) currently divides the loads from developed lands into three categories: urban runoff, septic systems, and runoff from mixed open areas (such as golf courses and parks). Based on 2005 estimated loads to the Bay, these three categories together account for 24 percent of the nitrogen load, 30 percent of the phosphorus load, and 18 percent of the sediment load (see Figure 1-5).

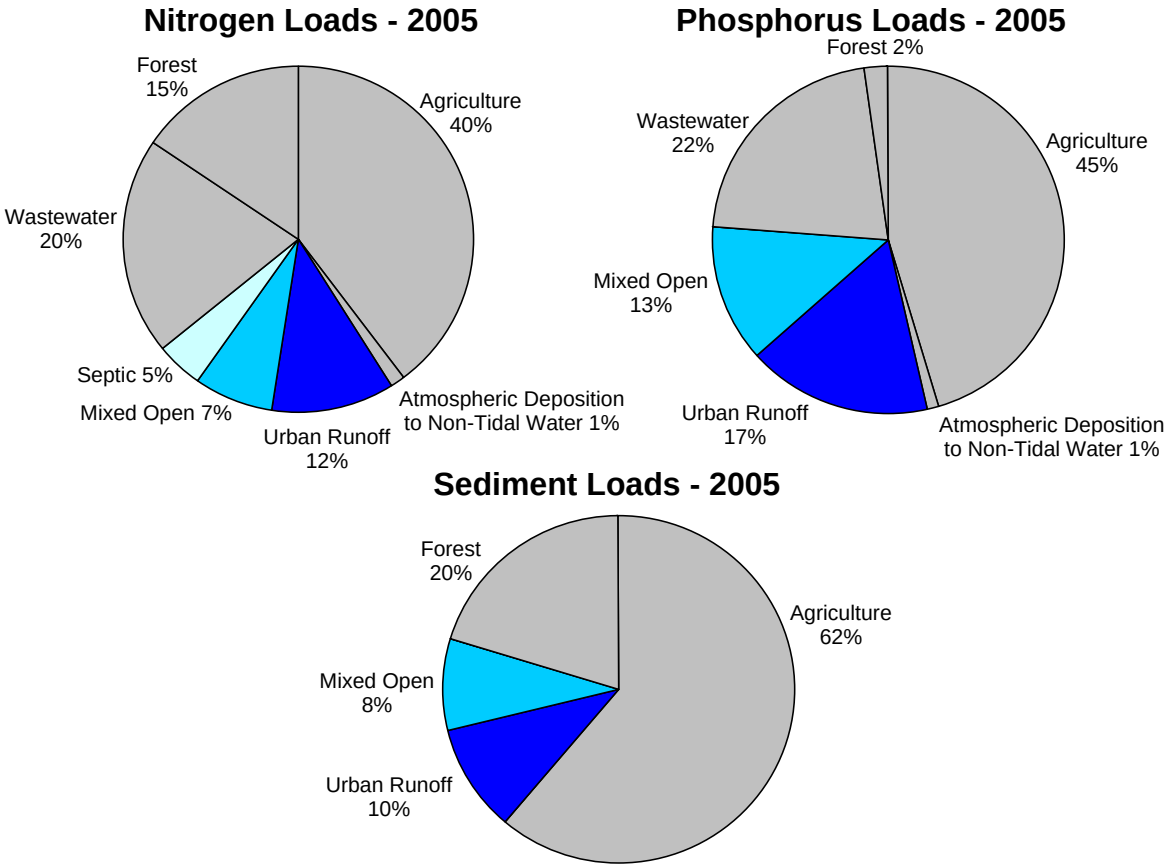


Figure 1-5. Estimated loads of nitrogen, phosphorus, and sediment into Bay for 2005.
(Source: CBPO, Chesapeake Bay Watershed Model, v. 4.3)

In this report, these three sources will be considered together as a developed-land sector, even though only some of the lands grouped in the mixed open category are developed lands. Most of the report focuses on runoff from developed and developing lands; septic systems are discussed only when related to new development. Relative to the estimated loads from other major source sectors – agriculture, wastewater facilities, and forests – the developed-land sector contributes significantly, but is not the largest source.

About a third of the nitrogen delivered to the Bay comes from mobile and stationary air emission sources, such as automobiles and power plants. This air-delivered component of the nitrogen load is included in Figure 1-5 with each land use area on which it falls. This nitrogen is quickly swept by stormwater from the impervious surfaces that dominate developed lands and is carried to the receiving water. We addressed efforts to reduce the air-delivered component of the nitrogen load to the Bay in our report *EPA Relying on Existing Clean Air Act Regulations to Reduce Atmospheric Deposition to the Chesapeake Bay and its Watershed*, issued in February 2007.

Development converts a natural landscape to impervious surfaces, such as roads, driveways, sidewalks, parking lots, rooftops and storm drains. This traditionally has detrimental environmental impacts. A natural landscape slows and adsorbs precipitation, releasing it gradually to local streams. Developed lands quickly channel water, nutrients, sediment, and trash into local streams and rivers, eroding streambanks, polluting the waterways, and changing how water moves through the watershed. In general, water quality of a local stream is likely to be impacted when the amount of impervious surface exceeds 10 percent of the stream's watershed.

Restoration Partnerships

Chesapeake 2000 is the latest agreement to establish a partnership among the watershed jurisdictions and the Federal Government to protect and restore the Bay. The agreement was signed by members of the Chesapeake Executive Council – the governors of Maryland, Virginia, and Pennsylvania; the mayor of the District of Columbia; the chairman of the tri-State legislative Chesapeake Bay Commission; and the EPA Administrator (representing the Federal Government). The Council establishes the policy direction and motivates the Bay partners to take the expensive and vital steps needed to achieve and sustain the restoration goals of the *Chesapeake 2000* Agreement.

CBPO was established by a 1987 amendment to the Clean Water Act to provide support to the Chesapeake Executive Council. Part of CBPO's charge in Section 117 of the Act is coordinating the actions of EPA with those of appropriate officials of other Federal agencies and State and local authorities to develop strategies to:

- Improve the water quality and living resources in the Chesapeake Bay ecosystem.
- Obtain the support of the appropriate officials of the agencies and authorities in achieving the objectives of Chesapeake Bay agreements.

Loading Caps for Developed and Developing Lands

The Chesapeake Bay Program is a collaborative partnership among the Federal Government, District of Columbia, and States. The partners collectively determined the loads of nutrients and sediment that the Bay and tidal waters could assimilate and the goals needed to achieve the restoration envisioned in the *Chesapeake 2000* Agreement. The partners allocated these load caps by river basin and jurisdiction (State or District of Columbia). Each jurisdiction then drew its own strategy for how it would meet the cap load allocations. In their tributary strategies, the jurisdictions identified management practices to achieve the reductions needed in each sector, relying on current permit requirements, as well as efforts that extend beyond requirements. Each jurisdiction chose to place reductions on the various sectors based on its current loading rates, governmental structure, economic goals, and environmental priorities.

Table 1-1 shows the total 2010 loading caps for developed and developing lands established by the partners. The reductions needed to reach these goals are relatively minor compared to those expected from agriculture sources and wastewater treatment facilities. Loads from developed lands account for up to 30 percent of nutrient and sediment loads to the Bay, whereas the reduction goals for developed and developing lands make up less than 10 percent of the overall reductions needed to achieve Bay restoration. In their tributary strategies, Bay partners indicated reduction goals for developed and developing lands would be met through control of stormwater quality and quantity, promotion of environmentally sensitive development (ESD), upgrade of septic systems, education of the public, and direct decrease of sources.

Table 1-1. 2010 Loading Caps for Developed and Developing Lands

	Loading (in millions)
Nitrogen (lbs/yr)	44.27
Phosphorus (lbs/yr)	3.77
Sediment (tons/yr)	0.64

Source: Estimates from Chesapeake Bay Program Phase 4.3 watershed model

Corrective action was taken to restore a stream previously impacted by excessive runoff from developed land, Cecil County, Maryland. (OIG Photo)

The primary regulatory program for achieving load reductions on developed and developing lands is the Federal stormwater program. This program was added to the Clean Water Act in 1987 and is a component of EPA's National Pollutant Discharge Elimination System (NPDES) program. Most relevant are parts of the program that control runoff from construction sites and municipal stormwater. Construction activities that disturb one or more acres are currently regulated regardless of location. The goal of the construction requirements is to stabilize sediment. EPA Office of Water develops national general stormwater

permits for construction and industrial activities that apply in areas where State permitting authorities do not have jurisdiction. Municipal Separate Storm Sewer System permits were added to the NPDES program to better control physical, biological, and chemical effects that runoff from developed lands can have on the receiving waters. Programs outside regulatory requirements are also used to meet load reduction goals. Some of these programs include citizen education, stream restoration, volunteer monitoring, brownfields restoration, and stormwater system retrofitting.

Noteworthy Achievements

EPA and its Bay partners have developed several noteworthy approaches to reduce nutrients and sediment entering the Bay from developed and developing lands. One example is the September 2006 memorandum of understanding between the Chesapeake Executive Council and two manufacturers of home lawn fertilizer. These manufacturers agreed to reduce by 50 percent the amount of phosphorus in their products by 2009. In addition, they promised to study the possibility of reducing nitrogen levels in their fertilizers.

Other noteworthy achievements include promoting innovative techniques for controlling stormwater and supporting compliance with stormwater regulations. These achievements are discussed in greater detail in Chapter 2. In some cases, they are highlighted in green sidebar boxes.

Scope and Methodology

We conducted this evaluation from December 2005 through November 2006 in accordance with *Government Auditing Standards*, issued by the Comptroller General of the United States. We used a variety of methods to evaluate whether the goals for developed and developing lands would be met, to assess EPA's level of support of the efforts, and to identify challenges. Appendix A contains detailed information on the scope and methodology of our evaluation. We specifically evaluated progress toward meeting the caps on nutrient and sediment loads from developed and developing lands and the goal to reduce the rate of sprawl development. We limited our evaluation to efforts within the signatory jurisdictions of the District of Columbia, Maryland, Virginia, and Pennsylvania. We consulted primary documents, conducted interviews, visited nine local communities, and developed a set of practices for minimizing the impacts of development on the watershed (see Appendix B).

Chapter 2
Load Reduction Goals Will Not Be Met

EPA and its Chesapeake Bay watershed partners will not meet load reduction goals for developed lands by 2010 as established in the *Chesapeake 2000* Agreement. In fact, new development is increasing nutrient and sediment loads at rates faster than restoration efforts are reducing them. Developed lands contribute less than one-third of the Bay loads but would require about two-thirds of the overall estimated restoration costs. Consequently, EPA and its Bay partners focused on more cost-effective approaches, such as upgrading wastewater facilities and implementing agricultural best practices. Additional challenges impeding progress include:

- Lack of community-level loading caps.
- Shortage of up-to-date information on development patterns.
- Ineffective use of regulatory program to achieve reductions.
- Limited information and guidance on planning and applying environmentally sensitive development practices.
- Limited funding available for costly practices.

A cost-effective start to reversing the trend of increasing loads from developed land is for communities to concentrate on new development. Opportunities abound for EPA to show greater leadership in identifying practices that result in no-net increases in nutrient and sediment loads with new development and assisting communities in implementing these practices. If communities do not sufficiently address runoff from new development, loads from developed lands will continue to increase rather than diminish. Restoration costs will increase and the Bay will not be restored to the health envisioned in the *Chesapeake 2000* Agreement because water quality degradation and loss of aquatic life will continue.

Losing Ground in Meeting Reduction Goals

New development is increasing nutrient and sediment loads at rates faster than loads are being reduced from developed lands. Little progress has been reported in reaching nutrient and sediment load reduction goals from developed lands. Judging just the load reductions from implementing the actions laid out in the tributary strategies, about 18 to 28 percent of each reduction goal was reported as being achieved in 2005 for developed lands. At this rate, full implementation of the developed land part of the strategies will not occur until 2028 at the earliest – many years after the 2010 goal.

Table 2-1. Increasing Reductions Needed

	Reductions Needed Based on 2000 Loadings (in millions)	Reductions Needed Based on 2005 Loadings (in millions)	Increase in Reductions Needed (in millions)	Percentage of Increase
Nitrogen (lbs/yr)	16.40	17.48	1.08	7%
Phosphorus (lbs/yr)	1.55	1.75	0.20	13%
Sediment (tons/yr)	0.22	0.26	0.04	18%

Source: Estimates from Chesapeake Bay Program Phase 4.3 watershed model

CBPO estimates that impervious surfaces in the Bay watershed grew significantly – by 41 percent – in the 1990s. Meanwhile, the population increased by only 8 percent. Because progress in reducing loads is being offset by increasing loads from new development, greater reductions will be needed to meet the goals (see Table 2-1). Additional information on the tracking of loads from developed and developing lands is provided in Appendix C.

CBPO estimated that loads from developed and developing lands increased while loads from agriculture and wastewater facilities decreased. Loads from developed and developing lands were 12 to 16 percent higher in 2005 than in 1985. More than 90 percent of these loads are from the District of Columbia, Maryland, Pennsylvania, and Virginia.

To meet the reductions in loads laid out by the jurisdictions, the adaptive management approach of the federally-mandated municipal stormwater program needs to be accelerated. Since 1990, Municipal Separate Storm Sewer Systems (MS4) permits have been required for medium and large cities to discharge stormwater runoff. Regulations for smaller urban areas took effect more recently and do not apply to all small developed areas, such as rural town centers. However, States can elect to extend coverage, which Maryland did.

Where total maximum daily load (TMDL) allocations have been established for local waters, Bay restoration may also benefit. A TMDL is an estimated load of a particular pollutant that a waterbody can safely assimilate and an allocation of that load to the pollutant's sources. These waste load allocations are then incorporated into new and renewed permits. The calculation of TMDL allocations is part of Clean Water Act requirements for restoring impaired waters. Many of the rivers, streams, and creeks within the Bay watershed, as well as the Bay itself, are on the Federal impaired waters list. TMDL allocations have been, or will be, established for these impaired waters. If Bay waters are not restored by 2010, a Bay-wide TMDL will need to be established by Bay partners. *Chesapeake 2000* was adopted partly to avoid needing a Bay-wide TMDL. Without giving up on achieving the 2010 restoration goals, the partners are collaborating to lay groundwork for a possible Bay-wide TMDL.

EPA Could Better Support Local Community Efforts

EPA has taken steps to support efforts by its Bay partners and local communities to reduce nutrient and sediment loads to the Bay from developed and developing lands, as well as to reduce the rate of growth of sprawl development. However, some of these steps are incomplete, local communities still face numerous challenges, and opportunities remain for the CBPO to provide greater leadership.

The Clean Water Act defined part of CBPO's role as working in cooperation with Federal, State, and local authorities in developing and implementing strategies to restore the Bay. In addition, EPA identified the Bay as a critical ecosystem in its 2006-2011 Strategic Plan with an objective to restore and protect the Bay's overall aquatic system health. EPA committed to increasing the current pace of restoration to achieve water quality standards as soon as possible. It would do this by working with its Bay partners to identify opportunities to reduce nutrient and sediment loads and find new economies and innovations to accelerate progress dramatically. Examples of this EPA support are included in the "Noteworthy Achievement" boxes on subsequent pages.

EPA and its Bay partners are relying on local communities to change their development strategies to minimize impacts of new development on the watershed. EPA could be more supportive of local communities in overcoming the challenges they face to achieve and sustain the Bay restoration goals. Specific challenges EPA needs to address to better support local community efforts are included in the following section.

Challenges Impede Load Reduction Progress

Part of CBPO's charge is to work in cooperation with Federal, State, and local authorities to develop and implement strategies to restore the Bay. EPA and its State partners are relying on local communities to reduce sources of nutrients and sediment and adopt ESD practices. We identified five challenges that CBPO and its State and local partners need to cooperatively address to reduce loads from developed and developing lands: setting community goals, gathering information on recent development, increasing stormwater permit requirements, providing guidance on ESD, and securing funding for needed practices. Details on these challenges follow.

Lack of Community-Level Loading Caps

According to the CBPO, specific nutrient and sediment loading caps have not been set for local communities, even though the local level is where stormwater and development are managed. Consequently, communities have an insufficient understanding and diminished inclination to contribute to meeting the overall cap loads needed to restore the Chesapeake Bay. Successful restoration to achieve Bay water quality goals requires that these community-level goals be established

and communicated to all partners, including the local communities. Local partners then need to accept these goals and their own roles and responsibilities for achieving them.

As explained in the section "Loading Caps for Developed and Developing Lands," each jurisdiction chose how to allocate by sector the reductions needed for Bay restoration. In determining reduction goals from developed and developing lands for each major tributary watershed, States started with the reductions in nutrient and sediment loads that were expected through the current permit cycle of the stormwater management program. They next layered into the plan other efforts to reach needed reductions. Additional efforts included changes in development practices, retrofitting existing developed lands, enhancing green infrastructure (see box), and restoring impaired streams. Some communities already are undertaking these efforts. To achieve Bay restoration, communities across the watershed will need to implement these practices that extend beyond their current regulatory requirements and possibly the needs of their local waters. They should know the magnitude and nature of the additional efforts that will be needed. However, eight of the nine communities we visited had not been given specific load reduction goals. The one exception was the District of Columbia. As a signatory jurisdiction, the District was given specific reduction goals in the initial allocation process.

Noteworthy Achievement

Using Green Infrastructure to Protect Water Quality

EPA's Administrator recently signed a statement promoting community and utility use of green infrastructure. Also, EPA's Assistant Administrator for Water called for EPA water programs "to exert leadership in the consistent and reliable implementation of green infrastructure approaches." Green infrastructure protects water quality and provides other environmental and societal benefits. Examples of green infrastructure include green roofs, urban tree canopy, rain gardens, and riparian buffers. In *Rooftops to Rivers: Green Strategies for Controlling Stormwater and Combined Sewer Overflows,* the National Resources Defense Council reported that some of the more aggressive and innovative green infrastructure approaches to stormwater are located around the Chesapeake Bay.

When EPA and its Bay partners re-evaluate their Bay restoration strategies in 2008, they should seek local community input and buy-in on setting realistic goals for reducing loads from developed and developing lands. EPA and its partners will need to cascade the overall goals down to community-level reduction goals. Much of the work needed to make these reductions is expensive and not required by regulations. Without specific goals and implementation strategies, many communities may have limited appreciation of what they need to do to contribute to Bay restoration.

A "green," stormwater-management roof on an EPA building in Arlington, Virginia (EPA photo).

Community-level reduction goals could help local governments manage new development and redevelopment to eliminate adverse impacts. States could create trading and offset programs that include stormwater controls if community-level nutrient and sediment reduction goals are set. Without these specific goals, certifying that a proposed action is beyond what is needed to meet the Chesapeake Bay cap load allocations and is, therefore, available for trading, would be difficult. Effective trading and offset programs could assist progress in reducing loads from developed and developing lands. Finally, community-level reduction goals could assist in establishing water-quality based targets in regulatory programs, such as TMDLs and NPDES permits.

Shortage of Up-to-Date Information on Development Patterns

Since 2000, EPA and its Bay partners have not reported on progress in reducing the rate of sprawl development. According to the CBPO Associate Director for Ecosystem Management, CBPO and its Bay partners did not report on progress partly because of an inability to define sprawl development in an easily measurable way. Also, the partners lacked access to sufficiently reliable and updated data on land-use changes and implementation of management practices. One of the goals of the *Chesapeake 2000* Agreement is to reduce the growth rate of sprawl development and periodically report to the Executive Council on this progress.

Bay partners adopted growth in impervious surfaces on a watershed basis as their measurement for meeting the sprawl growth goal. However, obtaining reliable, up-to-date information at the watershed scale has not been practical. Further, this information, even if available, may not assist local communities because it is at the wrong scale for their growth management and planning needs. EPA's future efforts to develop better measures and report on development should be done in ways that assist local communities in making informed decisions on development.

When EPA and its Bay partners consider allocating nutrient and sediment reduction goals to the community level, they should include local communities in committing to reducing sprawl development. The local communities could provide the Chesapeake Bay Program reliable and up-to-date information on changes in development in their jurisdictions. In return, local communities would be recognized for their progress, and would have access to better information on development changes in nearby communities.

EPA also needs updated land use data to improve the usefulness of its new watershed model as a predictive management tool. We encourage EPA to continue its efforts to develop 5-year forecasts of land use out to the year 2030. If these forecasts are developed with up-to-date local and State input, they will be useful in local efforts.

Ineffective Use of Regulatory Program

EPA and its Bay partners could have achieved greater load reductions by more effectively using their stormwater regulatory program. The MS4 permit is the primary regulatory tool for EPA and its Bay Partners to use in assisting communities in reducing nutrient and sediment loads from developed and developing lands. Actions implemented under these permits mitigate the local effects of storm runoff on rivers and streams. To promote greater load reductions, the Chesapeake Executive Council directed the Chesapeake Bay Program in 2004 to develop approaches for stormwater management that are "more prevention-oriented, more effective and efficient, and that make the best use of regulatory, voluntary and incentive tools." EPA and its Bay partners recently took steps to achieve more progress in the regulatory stormwater program. However, effective stormwater management in the watershed remains hampered by the lack of adequate research on new management practices, absence of waste load allocations, and limitations of the legislated form of the program.

Stormwater management was added to the Clean Water Act in 1987 to mitigate negative impacts of runoff from developed lands on the receiving water bodies. It relies on an adaptive management approach, in which communities implement a reasonable set of mitigation measures, monitor results, and then propose a new set of measures for the next permit cycle. This approach differs from the numerical effluent limits used in permits for wastewater discharge.

Some of the attributes of MS4 permits that may limit their effectiveness in achieving Bay restoration goals include lack of numerical water-quality goals, implementation that evolves with each 5-year permit cycle, no requirements to retrofit stormwater systems to achieve greater environmental protection, and their reliance on technology-based rather than water quality-based approaches. In addition, some of the actions taken address problems other than nutrient and sediment loads, such as reducing flooding risks, and are relatively inefficient at removing nutrients. Further, not all developed and developing lands are covered by MS4 permits.

A bioretention stormwater management system designed to treat rooftop and parking lot runoff, Cecil County, Maryland (EPA OIG Photo)

While these attributes make the MS4 permit a less-than-ideal tool for achieving restoration goals, State permit writers and EPA could have strengthened the MS4 permits when the opportunities arose, as they chose to do with NPDES wastewater treatment permits. The communities that we visited focus their watershed efforts on meeting the requirements of their stormwater management programs. This suggests that if EPA and its Bay partners were to strengthen the MS4 permits to include greater nutrient and sediment reductions, the

communities would implement the needed steps. Measurable, numerical goals in line with the *Chesapeake 2000* Agreement and a probable Bay-wide TMDL should be considered for future permits.

EPA and its Bay partners can further strengthen their regulatory approach by consistently linking stormwater permit requirements and TMDLs for impaired local waters. Even though TMDLs may be developed to correct local impairments, not impairment of the Bay, local TMDL implementation and Bay restoration can be linked. Actions taken to correct local impairments may serve as the foundation needed to reduce loads to the Bay from developed and developing lands. Improved coordination between local TMDL and Bay restoration efforts may accelerate progress in both programs.

EPA Region 3 is conducting a *Review of EPA's Regulatory Programs and Authorities to Meet Chesapeake Bay Restoration Objectives*. The aim is for EPA and its Bay partners "to use a strategic combination of NPDES regulatory tools, state authorities and especially local planning, zoning and erosion and sediment control authorities to develop this more cost-effective, preventive approach to stormwater management." In response, EPA Region 3 formed a permanent workgroup with its Bay partners. Although we did not evaluate the effectiveness of this new "Stormcatchers" program, it aims to improve the utility of stormwater permits. It would do so by better integrating permits with TMDLs, improving monitoring of stormwater, promoting use of ESD practices, and assisting communities in developing local program funding.

Limited Information and Guidance on Planning and Applying ESD

Some communities are unprepared to achieve the load reduction goals from developed and developing lands while accommodating economic and population growth. Some communities already have extensive responsibilities related to the Clean Water Act. Meeting the Chesapeake Bay goals adds further responsibilities not required under the Act. Communities may also be reluctant to invest in practices without further information on effectiveness. EPA can support local communities by:

(1) completing a set of stormwater management principles to guide growth and development through ESD;
(2) addressing potential conflicts between environmental and economic goals, and
(3) expanding educational opportunities so that community officials can make more-informed development decisions.

Completing ESD principles. EPA has not prepared a watershed-wide set of stormwater management principles to guide growth and new development. EPA promised these principles in response to a May 2005 *Urban Summit* of stakeholders. The principles should already be completed based on EPA's schedule. When interviewed in October 2006, the CBPO Director said that 2006

budget cuts prevented EPA from accomplishing this task. While some watershed communities are recognized national leaders in adopting mitigating practices to address growth (see box at top right), the trend of increasing loads from developed lands will be halted only if communities across the Bay watershed adopt ESD practices to minimize impacts of new development. The CBPO needs to complete the promised set of ESD principles and create a program endorsing these practices. Developers advised us that communities took a long time to approve new practices because they did not know how reliable the practices were. An endorsement program could help to provide information on effectiveness of practices and promote quicker acceptance of the practices.

Noteworthy Achievement

Leaders in ESD Practices

The watershed organization *Friends of the Rappahannock* has been promoting environmental awareness in the rapidly growing north-central part of Virginia (the southern extremes of the District of Columbia commuting area) since 1985. The *Friends* organization and others are featured in an educational video on ESD practices, *Reigning in the Storm.* The video, produced by the Northern Virginia Regional Commission, has been adapted for use elsewhere. Another community, Prince George's County, Maryland, has proven ESD practices can be effective even in heavily urban environments with space limits.

ESD practices should be considered at the beginning of new development planning (see box at bottom left). Traditionally, stormwater planning and permitting have been considered engineering steps that are accomplished at the end of development planning. However, effective stormwater management includes an initial assessment of site suitability and extends to consideration of collective impacts of numerous decisions that might reach beyond a municipality's boundary. EPA and its partners are working to better support this shift at the local planning level.

Noteworthy Achievement

Certification Program for Neighborhood Development

A certification program being developed by the U.S. Green Building Council, *Leadership in Energy and Environmental Design for Neighborhood Developments* (LEED-ND), emphasizes smart growth aspects of development, while also recognizing important green building practices that are the core of their current building certification program. LEED-ND will require proper siting and conservation of wetlands and waterbodies and will provide credit for minimizing site disturbance through site design and during construction and stormwater management, among other ESD practices. Over 20 developments in the watershed have applied for certification consideration under the pilot phase of LEED-ND.

Some Bay communities lack the resources to develop their own set of best principles and would benefit from EPA and its partners doing so. We understand that EPA needs to prioritize its tasks. However the absence of the promised set of principles hinders the achievement of load reductions in some communities. The set of practices for minimizing the impacts of development on the watershed (Appendix B), prepared by the OIG from EPA guidance documents with the assistance of experts, could be considered as a starting point.

Increased leadership from the CBPO is needed to reverse the trend of increasing loads from developed and developing lands. The principles will not achieve and sustain Bay restoration unless communities apply them. Therefore, CBPO needs to prepare and implement a strategy on how it will work with its State and local partners, developers, Federal agencies, and other stakeholders to adopt these principles. EPA should promote inclusion of these or similar principles into stormwater permits, local building codes, and new development plans.

Addressing potential conflicts. Potential conflicts between communities' environmental and economic goals have not been addressed completely. Determining the potential impacts of the tributary strategies on communities' growth is critical for ensuring that these communities will identify and surmount challenges. In response to a 2001 Government Accountability Office (GAO) report, EPA committed to review "key EPA rules and programs to determine if they conflict with local growth management efforts or have unintentional effects on development patterns." However, EPA has made limited progress in conducting these reviews and needs to evaluate how the Chesapeake Bay restoration may conflict with local growth management efforts.

An example of the type of analysis that is required surrounds the potential conflict between tributary strategy targets and anticipated growth in Cecil County, Maryland. The county is projected to nearly double in population between 2000 and 2030, partly due to the planned expansion of the nearby Aberdeen Proving Grounds. This projected growth could result in the wastewater treatment facilities reaching their nutrient allocation caps. If the treatment facilities cannot expand, county officials may abandon their efforts to concentrate development in designated growth corridors. This action may result in development at lower densities on septic systems, greater loss of forest and agriculture lands, and increased nitrogen loads to the Bay. Environmental and planning staff in Lancaster County, Pennsylvania, identified a similar challenge. When the nutrient and sediment allocations to meet Bay restoration are re-evaluated by EPA and its Bay partners in 2008, effects on local growth management should be one of the factors considered.

Expanding educational opportunities. EPA and its Bay partners need to expand educational outreach efforts for environmental and planning staff and municipal officials. EPA and its Bay partners have initiated a new support effort, the Chesapeake-oriented "NEMO" project (see box). However, as a pilot, it will not be able to assist a large number of communities. In addition, the Local Government Advisory Committee to the Chesapeake Executive Council has

Noteworthy Achievement

Educating Local Officials

NEMO (Nonpoint Education for Municipal Officials) is a national network of education programs teaching local land use decision makers about the relationship between land use and natural resources protection. The National Oceanic and Atmospheric Administration, National Park Service, and EPA are partnering to expand this network to include Chesapeake Bay watershed communities. However, efforts are limited to date.

initiated a program in which local governments are matched with other local governments that have applicable environmental protection experience. EPA and its partners should prepare and implement a strategy for wider application of these programs. Targeting specific geographic areas may better serve communities with the greatest needs and achieve the greatest environmental results.

EPA provides educational opportunities, such as the online watershed academy courses and the stormwater workshop, *Stepping up Your Local Stormwater Management Program,* held across the nation. In addition, EPA recently published and electronically distributed guidance material on stormwater practices and water-resource aspects of smart growth. EPA and its Bay partners could further promote to their local partners these nationally-provided education opportunities and guidance materials.

In addition to formal training, EPA and its jurisdiction partners may need to provide community-specific guidance. For example, technical analyses should consider cumulative downstream effects of numerous individual site management decisions that extend beyond the local municipal boundaries. Further, the technological and economical effectiveness of new technology may not be available. In the absence of this information, local jurisdictions may be reluctant to attempt to apply or endorse newer practices. The more comfortable the communities are with ESD practices, the more likely they are to approve such projects (see box).

Noteworthy Achievement

Developer's Scorecard

Developers interviewed said they would use ESD development practices more widely if they were assured their project plans would be approved more readily. To gain approval, developers in Spotsylvania County, Virginia, will be able to use a scorecard to rate their proposed development and ensure that they have enough management practices that are protective of the watershed, such as ESD, to gain approval.

Even when information is available, applying techniques may require special knowledge. Site-specific considerations – such as topography, soil conditions, and vegetative cover – need to be incorporated into estimates of the effectiveness of practices proposed at a particular site. Smaller communities that do not often engage in these analyses may find they need individualized support from EPA or States so that community officials can make more-informed development decisions.

Limited Funding Available for Costly Practices

In 2004, CBPO estimated that nearly two-thirds (or $18 billion) of the $28 billion for implementing all aspects of the tributary strategies will be needed for reducing loads from developed and developing lands. This is approximately $3,000 per household in the watershed. Funds have not yet been identified for the vast share of the anticipated need. Further, about two-thirds of the estimated $18 billion are

for practices not currently required by regulations, and thus would not be a top priority for funding.

Some municipalities established stormwater utility fees to provide a dedicated funding stream for capital improvements and annual maintenance costs (see box). However, these fees are not found in all communities, and stormwater costs may compete for general revenue funds against other worthy local needs, such as education and public safety.

Noteworthy Achievement

Stormwater Management Fees

A Montgomery County, Maryland, *Water Quality Charge* added to county tax bills has funded maintenance of the stormwater management systems within the county since 2002. In Fiscal Year 2006, $4.5 million was collected. A recent 30-percent increase in the charge will provide dedicated revenue for stormwater management capital-improvement projects, and for the first time will provide grants to homeowners to implement ESD projects, such as rain gardens.

Some communities use bonds or loans to finance major capital expenditures, such as stormwater retrofit and stream restoration projects. Communities can secure low-interest loans from the Federal- and State-financed Clean Water State Revolving Fund, but funding is limited. In 2006, the three signatory States provided about $300 million for projects across the States, not only those associated with Bay restoration. These funds supported a variety of clean water projects (wastewater treatment facility upgrades, nonpoint source controls, and estuary projects). Since 1990, the Bay States disbursed from their State Revolving Funds approximately $3 billion, or 18 percent of the estimated costs to reduce loads from developed and developing lands. Given these parameters, the State Revolving Fund cannot provide the magnitude of financing needed to implement the full range of actions laid out in the tributary strategies to reduce these loads.

EPA's nonpoint source grant to each State, otherwise know as a "319 grant" (after the section of the Clean Water Act authorizing the program), is a possible source of funds. These grants cannot be used by communities to meet stormwater permit requirements, but are available for projects that exceed regulatory requirements. The three signatory States and the District of Columbia were awarded a total of $141 million over the last 6 years (2000-2005) in 319 funding. However, some of the funding was awarded for projects outside the Bay watershed. In addition, only 16 percent of the funding was for developed land projects. Maryland and the District of Columbia exceeded, and Virginia and Pennsylvania were significantly below, the national average of 10 percent spent on developed land projects.

Bay watershed communities also have several other Federal funding sources specifically available to them. However, these programs provide a relatively small amount of money for reducing loads from developed and developing lands. CBPO awards about $8 million annually in implementation grants to the Bay jurisdictions. However, our review of the implementation grants showed few

funded activities in 2005 had a developed land focus. Two Chesapeake Bay grants programs are also available to fund local demonstration projects. In 2006, 2 out of 10 targeted watershed grants (approximately $1.35 million) had a developed land element. Also, 12 of 68 small watershed grants (approximately $458,000) included a developed land element, according to CBPO.

EPA and its Bay partners could also use recognition and incentive programs to increase the level of projects undertaken by communities. This is particularly true for projects that exceed current permit requirements. However, EPA's Office of Water has not awarded a Clean Water Act Recognition Award for stormwater management excellence in 2 of the last 5 years. A Chesapeake Bay watershed community was last recognized in 1998. A new awards program, recognizing innovative techniques to control stormwater, was piloted in Virginia in 2006 (see box). More recently, the program was expanded to include the entire region. Incentives, such as modest tax credits and streamlined permit processes, could prompt landowners and developers to voluntarily adopt ESD practices. Developers generally point to the need for incentives, particularly where local codes do not require action.

Noteworthy Achievement

Recognition Award Promotes Innovative Practices

Virginia and EPA's CBPO and Region 3 signed a May 2005 Memorandum of Understanding that included establishing a recognition program. In April 2006, five municipalities, universities, and organizations were recognized for their use of innovative techniques to control stormwater runoff. In January 2007, EPA Region 3 and the Low Impact Development Center announced a similar recognition program for all States in the region.

Conclusions

Development growth within the Chesapeake Bay watershed is outpacing progress in efforts to reduce nutrient and sediment loads from developed lands. Developing a strong partnership with local communities is the key to curbing these loads. Local communities determine how development will occur; they are also being relied upon to implement costly practices that often exceed regulatory requirements to restore the Bay. EPA and its State partners have focused their efforts primarily on the most cost-effective practices of upgrading wastewater plants and implementing agricultural practices, leaving communities without clear expectations of their role in reducing nutrients and sediment loads or how best to do so. A cost-effective start to reversing the trend of increasing loads is for communities to adopt more ESD practices. CBPO will need to take a greater leadership role by developing a strategy to work with its partners to set a direction for development consistent with the Chesapeake restoration goals. EPA and its State partners have an array of regulatory, incentive, and voluntary program tools they can use. While actions taken in response to the following recommendations will not resolve the wide range of Bay water quality problems, CBPO needs to take the first step in coordinating an effective approach.

Recommendations

We recommend that the EPA Region 3 Regional Administrator charge:

2-1 The CBPO Director to prepare and implement a strategy that demonstrates leadership in reversing the trend of increasing nutrient and sediment loads from developed and developing lands. Such a strategy should include steps to:

- develop a set of ESD practices that result in no-net increase in nutrient and sediment loads and flows in new developments and may be applicable to existing development and redevelopment;
- work with State and local partners, developers, Federal agencies, and other stakeholders to implement these practices through regulatory, voluntary, and incentive approaches;
- educate municipal officials on these practices and other aspects of ESD;
- target technical assistance to local governments interested in pursuing tools and strategies for reducing runoff from development;
- identify progressive local governments and leaders in the housing and commercial development fields and create forums for sharing information;
- report on progress through the existing annual reporting structure; and
- evaluate the effectiveness of the strategy.

2-2 The CBPO Director to work with the Chesapeake Bay partners to set realistic, community-level goals for reducing nutrient and sediment loads from developed and developing lands.

2-3 The Water Protection Division Director to establish, with the delegated States, a documented permitting approach that achieves greater nutrient and sediment reductions in MS4 permits across the watershed by:

- incorporating measurable outcomes in line with waste load allocations, when established for local waters and the Chesapeake Bay, through the TMDL regulatory program;
- including retrofitting of developed areas where these actions would benefit local waters as well as the Bay; and
- disallowing increases in loads and flows from new development unless offsets or trades are obtained.

Agency Comments and OIG Evaluation

The Agency concurred with the recommendations in this report. See Appendix D for its response. These recommendations will remain open until the Agency has completed the agreed actions.

Status of Recommendations and Potential Monetary Benefits

RECOMMENDATIONS						POTENTIAL MONETARY BENEFITS (in $000s)	
Rec. No.	Page No.	Subject	Status[1]	Action Official	Planned Completion Date	Claimed Amount	Agreed To Amount
2-1	20	Charge the CBPO Director to prepare and implement a strategy that demonstrates leadership in reversing the trend of increasing nutrient and sediment loads from developed and developing lands. Such a strategy should include steps to: • develop a set of ESD practices that result in no-net increase in nutrient and sediment loads and flows in new developments and may be applicable to existing development and redevelopment; • work with State and local partners, developers, Federal agencies, and other stakeholders to implement these practices through regulatory, voluntary, and incentive approaches; • educate municipal officials on these practices and other aspects of ESD; • target technical assistance to local governments interested in pursuing tools and strategies for reducing runoff from development; • identify progressive local governments and leaders in the housing and commercial development fields and create forums for sharing information; • report on progress through existing annual reporting structure; and • evaluate the effectiveness of the strategy.	O	EPA Region 3 Regional Administrator			
2-2	20	Charge the CBPO Director to work with the Chesapeake Bay partners to set realistic, community-level goals for reducing nutrient and sediment loads from developed and developing lands.	O	EPA Region 3 Regional Administrator			
2-3	20	Charge the Water Protection Division Director to establish, with the delegated States, a documented permitting approach that achieves greater nutrient and sediment reductions in MS4 permits across the watershed by: • incorporating measurable outcomes in line with waste load allocations, when established for local waters and the Chesapeake Bay, through the TMDL regulatory program; • including retrofitting of developed areas where these actions would benefit local waters as well as the Bay; and • disallowing increases in loads and flows from new development unless offsets or trades are obtained.	O	EPA Region 3 Regional Administrator			

[1] O = recommendation is open with agreed-to corrective actions pending
C = recommendation is closed with all agreed-to actions completed
U = recommendation is undecided with resolution efforts in progress

Appendix A

Details on Scope and Methodology

Primary documents consulted included:

- Chesapeake Bay Commission Annual Report
- Chesapeake Bay Foundation review
- Chesapeake Bay Watershed Blue Ribbon Finance Panel Report
- *Chesapeake 2000* Agreement
- EPA and jurisdiction regulation and guidance documents on stormwater
- EPA smart growth reports
- Tributary strategies
- Maryland's implementation strategy
- Local community stormwater and planning documents

Interviews included:

EPA Headquarters
- Office of Water
  - *Nonpoint Source Control Branch*
  - *Municipal Permits Branch*
- Office of Policy, Economics, and Innovation
  - *Smart Growth Office*

EPA Region 3
- Water Protection Division
  - *Director and Associate Directors*
  - *Stormwater and nonpoint source program managers*
  - *TMDL coordinator*
  - *Geographical Information System team leader*

EPA CBPO
- Director,* Deputy Director, and Associate Directors
- Program managers for land and nonpoint source data
- Coordinators for various committees and workgroups

Developers

Experts in stormwater and land management

Nonprofit advocacy and watershed organizations

Jurisdiction staff
- Stormwater coordinators
- Tributary strategy coordinators

* The CBPO Director retired and a new Director was appointed in April 2007; we interviewed both Directors.

We limited our inquiry to the four signatory jurisdictions: Maryland, Virginia, Pennsylvania, and the District of Columbia. More than 90 percent of the loads from developed and developing lands in the Bay watershed come from these four jurisdictions.

CBPO groups urban runoff, mixed open, and septic systems together when reporting on progress in reducing loads from developed and developing lands. However, not all lands grouped in mixed open are developed lands. Septic systems are discussed in this report only in relation to new development and the possible effects of limiting discharge from wastewater treatment facilities. Most of this report focuses on runoff from developed and developing lands and the stormwater management practices used to control that runoff.

We visited nine communities that together accounted for about 19 percent of the total watershed population (see Table A-1). They included 4 (2nd, 5th, 6th, and 8th) of the top 10 most populous communities. Communities were chosen based on their estimated contribution to the loads from developed lands, projected 2030 population, recent development rates, and geographic location. We limited our visits to nine in accordance with Office of Management and Budget's rules for compliance with the Paperwork Reduction Act.

Table A-1: Communities Visited

Focus on Retrofits	Focus on New Development
Albemarle County, VA	Cecil County, MD
Baltimore, MD	Lancaster County, PA
Charlottesville, VA	Montgomery County, MD
District of Columbia	Spotsylvania County, VA
Richmond, VA	

Source: EPA OIG review

With the assistance of experts, we developed a set of practices for minimizing the impacts of development on the watershed (see Appendix B). EPA CBPO and Headquarters staff reviewed this set of practices; they generally concurred with the set and provided input that was incorporated into the final version. We used the set in our four visits focusing on new development to assess community interest in adopting practices that minimize impacts of development on the watershed. The group of experts included:

- Chet Arnold, Nonpoint Education for Municipal Officials, Connecticut
- Vladimir Novotny, Northeastern University, Boston, Massachusetts
- Tom Schueler, Center for Watershed Protection, Maryland
- Neil Weinstein, Low Impact Development Center, Maryland

Management Controls

To assess management controls, we obtained an understanding of the controls EPA has available to assist the Bay partners in achieving their goals for reducing loads from developed and developing lands. Bay partners are relying on control of stormwater quality and quantity, promotion of ESD, upgrade of septic systems, education of the public, and decrease of sources to meet these goals. Federal regulations do not control small scale, domestic septic systems or land use decisions, leaving the Federal stormwater program as EPA's primary means of assisting the Bay partners. We reviewed applicable regulations and guidance related to EPA's stormwater management program. However, because widespread adoption of ESD practices will be important in sustaining the goals of reduced loads from developed lands, we did conduct some work in this area and found that EPA recently provided guidance.

EPA reported in its 2005 Performance and Accountability Report that current pollutant loads continue to exceed the level needed to meet water quality standards. EPA financial data is subject to annual audit by the OIG. Chapter 2 identifies findings and recommendations where EPA and its partners can improve their management of the Chesapeake Bay Program.

Limitations

The data in several figures and tables in this report are results from EPA's Chesapeake Bay watershed model (v. 4.3). The model relies on data collected from and generated by other sources, such as data on implementation of best management practices required by stormwater permits. We did not assess the accuracy of the inputs to and results from the model or assess the appropriateness of EPA's use of the model.

Prior Reviews

- **GAO, *Federal Incentives Could Help Promote Land Use That Protects Air and Water Quality*, GAO-02-12, October 2001**
  GAO recommended that the EPA Administrator review key rules and program activities "to see if they conflict with states' and localities' growth management efforts." In EPA's 2002 response, EPA agreed with the recommendations and committed to developing a draft prototype process by June 2002. In response to an OIG request for followup information, an EPA official in the Office of Policy, Economics, and Innovation reported in March 2006 that a formal process had not been put into place, noting the office "handles reviews of key rules and programs as they become aware of them."

- **GAO, *Chesapeake Bay Program: Improved Strategies Are Needed to Better Assess, Report, and Manage Restoration Progress,* GAO-06-96, November 2005**
  GAO recommended that the EPA Administrator instruct the CBPO "to (1) complete its efforts to develop and implement an integrated assessment approach; (2) revise its reporting approach to improve the effectiveness and credibility of its reports; and (3) develop a comprehensive, coordinated implementation strategy that takes into account available resources."

- **EPA OIG, *EPA Grants Supported Restoring the Chesapeake Bay,* 2006-P-00032, September 2006**
  EPA OIG noted EPA awarded grants that contributed toward meeting Clean Water Act and *Chesapeake 2000* Agreement goals, and did not make recommendations.

- **EPA and U.S. Department of Agriculture OIGs, *Saving the Chesapeake Bay Watershed Requires Better Coordination of Environmental and Agriculture Resources,* EPA OIG 2007-P-00004/USDA OIG 50601-10-Hq, November 2006**
  The OIGs reported that Bay partners have committed the agricultural community to making the largest nutrient reductions, but numerous practices abound and are generally performed on a voluntary basis. The OIGs recommended that EPA improve its coordination and collaboration with its Bay partners and the agricultural community.

- **EPA OIG*, EPA Relying on Existing Clean Air Act Regulations to Reduce Atmospheric Deposition to the Chesapeake Bay and its Watershed,* 2007-P-00009, February 28, 2007**
  EPA OIG reported that Federal Clean Air Act regulations designed to decrease nitrous oxide emissions are reducing the amount of nitrogen that reaches the Bay. The OIG recommended that the CBPO develop actions and strategies needed to address nitrogen deposition from animal feeding operations.

Appendix B

Community Practices to Minimize Impacts of Development on a Watershed

This set of community practices for minimizing the impacts of development on the watershed was drafted by the OIG with the assistance of a team of experts. It is provided here for use by the CBPO as it develops a set of ESD practices that result in no-net increase in nutrient and sediment loads and flows in new development, and may be applicable to existing development and redevelopment.

Planning and Coordination

- Community establishes, promotes, and ensures implementation of goals to protect, preserve, and restore environmental resources, including streams and rivers and natural lands, and incorporates these goals into comprehensive plans, open-space plans, and watershed plans.

- Environmental resources, including water resources, are inventoried and their value to the community is determined.

- Land use, community development, and environmental strategies complement each other and achieve community's environmental goals. These strategies include land preservation; planning for commercial, residential, and transportation growth; stream restoration; stormwater management; air-quality goals; drinking-water-source protection; community standards of quality of life; and TMDL development and implementation.

Stormwater Management

- Community stormwater management strategy includes EPA's Phase II six minimum measures, regardless of regulatory requirements based on urban area classification:

  - public education and outreach;
  - public involvement and participation;
  - illicit discharge detection and elimination;
  - construction site runoff control;
  - post-construction stormwater management in new development and redevelopment; and
  - pollution prevention and good housekeeping for municipal operations.

- Stormwater is managed systematically across the community: metrics are established, the system is maintained, the effectiveness of the system and its components is evaluated, and results of evaluation are used to continually improve the system of management practices.

- Stormwater management, a key component in watershed preservation, is considered early and throughout the development design process, including commercial, residential, and transportation projects.

Land Development

- Land use regulations and ordinances are changed to guide the location, density, and design of development to protect priority water and other environmental resources.

- The community appropriately directs development to existing growth centers, transportation hubs, and underutilized properties, such as brownfields, greyfields, and vacant properties.

- The community employs a wide range of land use strategies based on local factors, which include a range of building densities and preserve critical ecological areas.

- Impervious area is limited by design and runoff from area is managed to the extent possible to preserve predevelopment hydrology and to remove pollutants.

- The community leads by example and incorporates better site design and green building techniques into municipal construction projects.

- Land disturbance activities, such as clearing and grading and cut-and-fill, are limited during development to reduce erosion, sediment loss, and soil compaction.

Natural Resources

- Areas that provide important water quality benefits or are particularly susceptible to erosion and sediment loss are protected through conservation easements, public land ownership, or other conservation practices.

- Tree canopy is restored, promoted, and maintained in urban and suburban areas.

- Natural drainage features and vegetation are preserved and maintained to the extent possible. Infiltration is promoted where soils are appropriate; where soils will not allow infiltration, other means of restoring or maintaining natural hydrologic functions of the watershed are promoted.

- Streams within the community are restored to their full ecological function, including restoring their natural denitrification potential.

Source Reduction

- On-site wastewater treatment systems are permitted, developed, and maintained that adequately protect surface water and ground water quality, using nitrifying/denitrifying systems where appropriate and feasible.

- Sources of nitrogen are reduced through education of land owners and resource managers on use of commercial fertilizers and through implementation of fertilizer reduction strategies on public lands.

- Municipal services are provided to make personal stewardship of environmental resources more convenient for residents. These services may include rain barrel construction programs, pet waste bags supplied at all parks, and education programs on lawn care management.

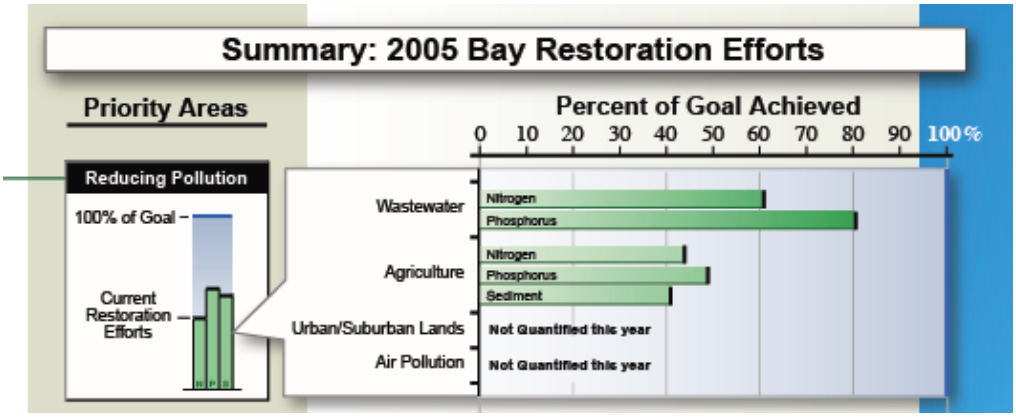
Regional Coordination and Cooperation

- Coordination and cooperation with neighboring communities are established and maintained so that watersheds crossing political boundaries are adequately protected.

Details on Load Reduction Progress

In March 2006, EPA and its Bay partners were not able to report on progress in reducing loads from developed and developing lands in the report *Chesapeake Bay 2005 Health and Restoration Assessment, Part Two: Restoration Efforts* (Figure C-1a). The reason given was that current tracking of efforts was not uniform throughout the Bay watershed. EPA and its Bay partners have worked to correct these reporting problems. CBPO in April 2007 published the 2006 Restoration Report showing negative progress in reducing loads from developed and developing lands (Figure C-1b).

a)



b)

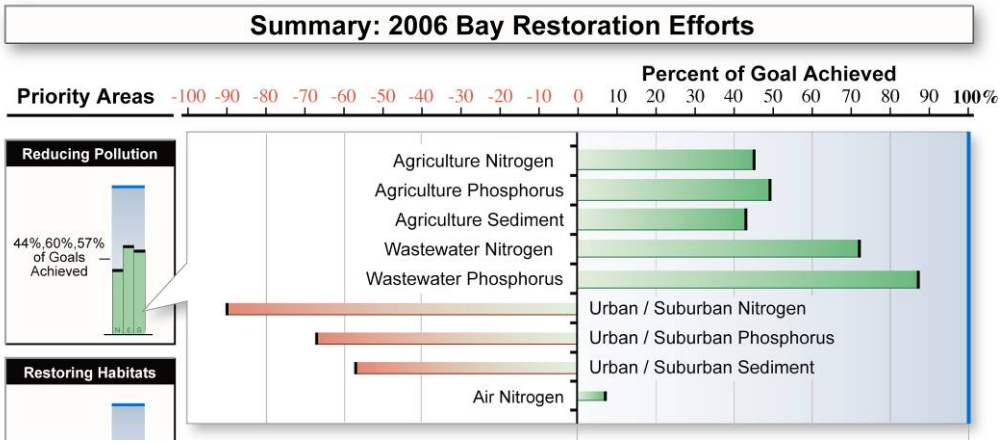


Figure C-1. Chesapeake Bay Program report of restoration progress: a) 2005 (published in March 2006) and b) 2006 (published in April 2007)
(Source: CBPO)

In Chapter 2 of this report, we note that little progress has been made in reaching goals to reduce nutrient and sediment loads from developed lands. However, more importantly, population growth with its accompanying land development is increasing the loads. These increases

threaten the attainment of the reduction goals and also make sustaining the restoration of the Bay highly unlikely.

Loads from developed and developing lands are increasing as population increases and new development continues across the watershed, as evident in Figure C-2. On each graph, colored areas extend down from the axis at "0 Percent of Goal Achieved." These areas show the magnitude of the net, normalized increase in the loads from developed and developing lands – the increase in each load due to new development minus the decrease in load from the implementation of management practices, normalized by the reduction goal (relative to the 1985 loading rates). The magnitudes of the net increases are great relative to the reduction goals – 57 to 90 percent. However, the goals to reduce loads from developed and developing lands are small relative to those in the agriculture and wastewater facility sectors. The net increases shown in the Figure C-2 graphs represent fairly small increases in actual loading rates, only a fraction of a percent of the overall loading rates from all sectors. Even though these increases are currently small, any unplanned increase should be cause for concern and should not be neglected if EPA and its Bay partners hope to sustain restoration in the future.

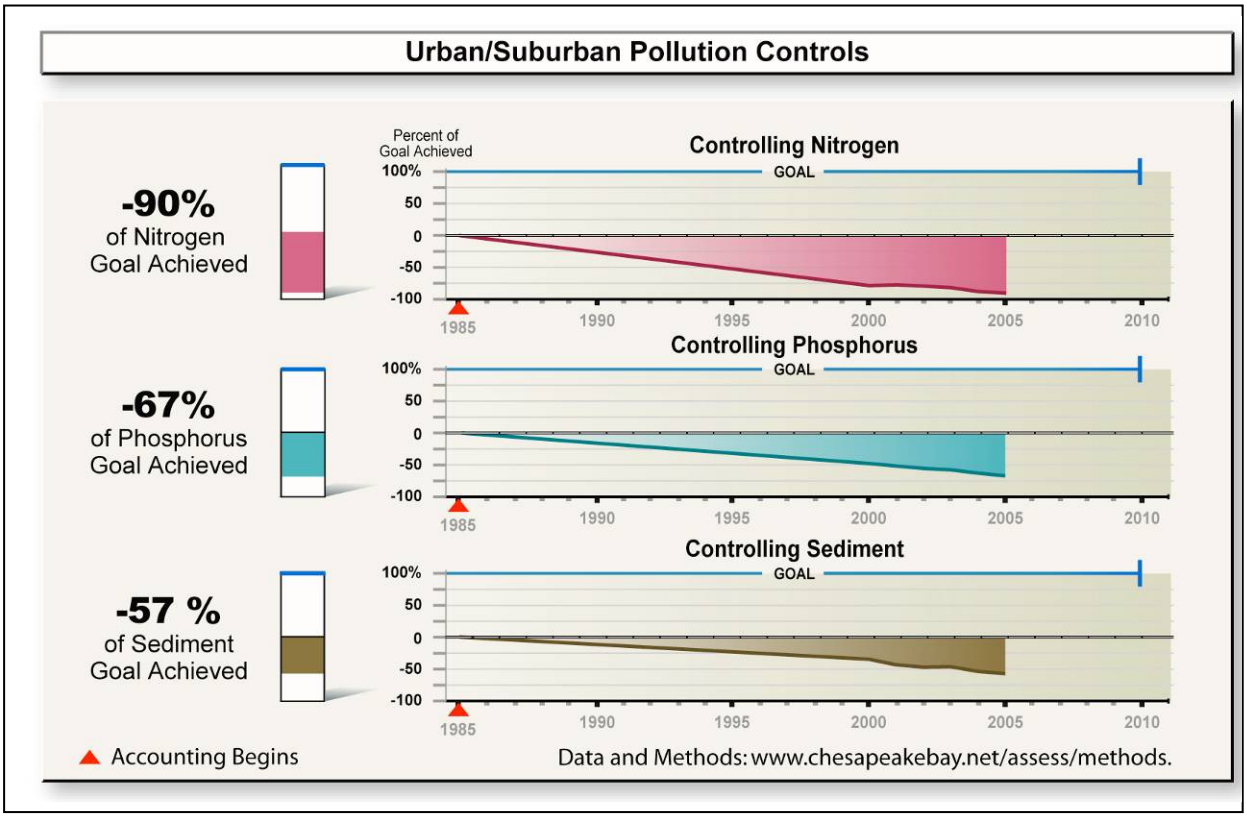


Figure C-2. Estimated backwards progress in achieving reduction of loads from developed and developing lands relative to the 1985 baseline
(Source: CBPO)

Appendix D

Agency Response to Draft Report

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

August 20, 2007

SUBJECT: EPA's Response to OIG Draft Assignment No. 2006-000303 dated July 3, 2007 entitled, "Runoff from Developing Land Needs to be Reduced to Restore Chesapeake Bay Watershed"

FROM: Donald S. Welsh /s/
Regional Administrator

TO: Dan Engelberg, Director for Program Evaluations, Water Issues
Office of the Inspector General

We concur with the attached revised recommendations.

If you or your staff has any questions related to our response to the draft report and the revised recommendations, please contact Jeff Lape at 410-267-5709 or Carin Bisland at 410-267-5732.

cc. Benjamin Grumbles, Assistant Administrator, Office of Water
Jon Capacasa, Director, Region 3 Water Protection Division
Jeff Lape, Director, Region 3 Chesapeake Bay Program Office
Richard Batiuk, Associate Director for Science, Chesapeake Bay Program Office
Carin Bisland, Associate Director for Communications and Administration, Chesapeake Bay Program Office
Lorraine Fleury, Audit Coordinator, Region 3
Michael Mason, Office of Water

NOTE: Attached recommendations, referenced in the above memo, are the same as those that appear on page 20.

Appendix E

Distribution

Office of the Administrator
Regional Administrator, Region 3
Assistant Administrator, Office of Water
Director, Chesapeake Bay Program Office
Director, Water Protection Division, Region 3
Office of General Counsel
Agency Followup Official (the CFO)
Agency Followup Coordinator
Associate Administrator for Congressional and Intergovernmental Relations
Associate Administrator for Public Affairs
Audit Followup Coordinator, Region 3
Audit Followup Coordinator, Office of Water
Acting Inspector General