Nutrient Trading and Offsite Compliance in the State of Virginia and the Bay Watershed

A Discussion Paper

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ABOUT THE PAPER

This paper was produced by the Center for Watershed Protection (CWP) and the Williamsburg Environmental Group (WEG) as part of the *Extreme BMP Makeover* project, sponsored by the National Fish & Wildlife Foundation.

The *Extreme BMP Makeover* project is a three-year effort to aggressively improve the nutrient reduction achieved by stormwater BMPs serving new development and redevelopment in communities within the James River Basin and the Chesapeake Bay Watershed. Through the project, CWP and project partners have developed metrics for BMP runoff reduction and nutrient reduction performance, conducted a BMP performance and longevity survey, created detailed design specifications for both traditional and innovative BMPs, and trained hundreds of stormwater practitioners through a series of design charettes and workshops.

This paper on nutrient trading and offsite compliance strategies was developed to add to the discussion about these important tools to achieve overall nutrient reduction goals at the watershed scale. The paper recognizes the inherent limitations of a site-by-site approach for stormwater management and provides practical insights on if and how a local government should undertake an offsite compliance program.

The intended audience for the paper includes state, federal, and Bay regulatory agencies, local government stormwater managers, watershed organizations, and other interested stakeholders.

NOTE: The terms “trading” and “offsite compliance” are both used in this paper. Technically, the terms can mean different things in terms of the mechanics of a program. However, for the general discussion purposes of this paper, the terms are often used interchangeably.

I. AN OVERVIEW OF TRADING AND OFFSITE COMPLIANCE

A. Basics of Trading Programs

The Chesapeake Bay states anxiously await their sediment and nutrient load allocations from EPA in December. Present estimates of the "urban load reduction" to meet the nutrient TMDL could be as high as 36 percent at an estimated bay-wide cost of $7.8 billion annually. Because of the enormity and uncertainty of these numbers, it is difficult to predict what fate awaits the Stormwater Management/MS4 community. One thing is for certain, as EPA works with the state and local governments in crafting the Watershed Implementation Plans (WIP), "nutrient trading" will figure prominently in the toolbox of best management practices.

The proposed "Chesapeake Clean Water and Ecosystem Restoration Act of 2009" (H.R. 3852/S. 1816) would provide significant new resources to support trading (U.S. Congress, 2009). The bill would establish a bay-wide nutrient trading market for all nine major river basins within the Chesapeake Bay watershed, building on the existing and pending state-level nutrient trading programs in Maryland, Pennsylvania, Virginia, and West Virginia.

Before we get too far ahead of ourselves, let's take a step back to answer the question of what is nutrient trading and offsite compliance. Doesn't "trading" give nutrient sources a ticket to "pollute"? Have existing trading programs lived up to their expectations and generated the millions of dollars in revenue to fund agricultural BMPs? A better understanding of what nutrient trading is will help to answer these questions.

The type of trading with the greatest relevance to the Chesapeake Bay is a voluntary market-driven mechanism that helps to establish the most cost-effective approach to meet environmental outcomes (e.g., Total Maximum Daily Loads). A nutrient trading market allows sources that reduce their nutrient loadings below target levels to sell their surplus reductions or "credits" to other sources that cannot meet their target levels. Plain and simple, this approach allows nutrient sources that can reduce nutrients at low cost (e.g., agriculture) to sell credits to those facing higher-cost nutrient reduction options (e.g., waste treatment plants). **Table 1** provides some brief descriptions of different types of trading or offsite compliance programs.

Table 1. Descriptions of Different Types of Trading/Offsite Compliance Programs

Type	Description	Example
Point source to nonpoint	Point sources, such as wastewater treatment plants, pay a nonpoint source, such as a farmer, to account for discharges that exceed load caps in permits. The farmer may implement approved practices (e.g., no-till, land conversion) to reduce the load increase in a more cost-effective manner.	Chesapeake Bay Watershed Nutrient Credit Exchange Program in Virginia (VADEQ, 2009): http://www.deq.state.va.us/vpdes/nutrienttrade.html

Nonpoint to nonpoint	A class of nonpoint source with a load reduction requirement pays another site or facility to achieve some or all of the load reduction. For instance, a developer that cannot meet all load reduction requirements on the site may pay a farmer to implement land conversion (e.g., crop to forest) or another urban landowner to implement stormwater retrofits.	Virginia Soil and Water Conservation Board Guidance Document on Stormwater Nonpoint Nutrient Offsets (VADCR, 2009): http://www.dcr.virginia.gov/lr6.shtml
Urban to ag	This can be either point to nonpoint OR nonpoint to nonpoint. However, it connotes that an urban source (e.g., wastewater plant or developer) is trading to an agricultural operation to accomplish unmet load reductions at the urban source.	See two examples above
Urban to urban	This type of "offsetting" has not been as well defined programmatically, except by certain local governments. It connotes that unmet nutrient reductions form an urban source (e.g., developer) are offset by another urban site, operator, or facility. The reductions can be accomplished through stormwater retrofits, urban stream restoration, implementing BMPs for uncontrolled areas, or other practices.	Henrico County Watershed Management Program (Henrico, 2010): http://www.co.henrico.va.us/departments/works/engineering---environmental-services/stream-assmt--watershed-program/

The precedent for pollution trading has been established as part of the strategy to meet the goals of the Clean Air Act, where emissions trading (e.g., Nitrogen Oxides) has existed since the mid 1970's. To meet the goals of the Clean Water Act, EPA and several states have been promoting nutrient trading since at least 1996 with most of these programs involving trades between point source to point source or between point source and agriculture. However, in general, nutrient trading has been slow to catch on and, by and large, has not been a tremendous "cash cow" for agricultural BMPs as many had expected. The World Resources Institute suggests that this may be because trading programs were implemented before key drivers (e.g., TMDLs) were in place (Jones, 2010).

The Chesapeake Bay TMDL could change that and hopefully provide the incentives for a successful trading program. This would include the incentive for urban runoff producers (e.g., developers) to enter the nutrient trading game. Trading can be a valuable tool to help the urban sector to meet the proposed nutrient reduction requirements that EPA and states are proposing. The Chesapeake Bay Program estimates that MS4 Programs could save hundreds of millions of dollars per year if they purchase credits in lieu of implementing practices, such as Low Impact Development (LID) and retrofits, to meet at least a portion of their nitrogen reduction targets (CBP, 2004).

LID is an exciting innovative approach to managing runoff volume but may often be physically constrained, expensive to implement in a retrofit environment, and, as a stand-alone tool, may not be a practical means of satisfying the huge load reductions that will be required under the Chesapeake Bay TMDL. Add to this difficulty in retrofitting urban areas that were constructed prior to when stormwater quality management programs were in place. The costs for stormwater retrofits in Baltimore City can be as high as $100,000 per acre of impervious cover because of utility and space conflicts (Stack, 2010).

B. Primary Considerations

The following items are primary considerations for a trading or offsite compliance program. **Table 2** also provides a summary of these and other considerations.

Trading Credits and Offsets

The currency of exchange in a trading program is referred to as a "credit" and can be expressed as a load reduction such as pounds of total Phosphorus per year. Credits can be thought of as a load reduction requirement that is typically expressed on an annual, recurring basis. Although the terms are often interchanged, the term "offset" is more often utilized in trading urban stormwater pollutants. The on-site BMP requirements which are "offset" are assumed to be installed and maintained in perpetuity. Credits or offsets are usually secured upfront through a one-time payment (sometimes involving a maintenance fee) and sufficient assurances and enforcement mechanisms must be present to assure that the associated load reduction is sustained in the long-term. In the case of a TMDL where the nutrient loading rate is capped, credits can be purchased to "offset" increased loadings.

Trading credits are typically assigned for a standard list of approved BMPs using established efficiencies that have been cited in the literature (e.g., EPA Urban BMP Performance Tool or Runoff Reduction Method – USEPA, Hirschman et al., 2008).

Trading Ratios

Trading ratios can be applied as a margin of safety (MOS) to account for uncertainty in efficiency and effectiveness, location factors, or to meet other needs. For instance, a BMP located directly adjacent to receiving water may be given more credit than a BMP that is located further upstream in the watershed. This factor is referred to as the *delivery ratio* and is generally used to account for attenuation through natural processes (e.g., denitrification) along the delivery pathway (e.g., overland flow) to the receiving water body.

Other ratios are also applied to account for the uncertainty or variation in the reliability and efficiency of the BMP being used for credit. The ratios create an MOS to ensure that the credited practice provides a minimum level or reductions. For instance, Virginia's guidelines governing nutrient trading require a 2-to-1 nonpoint to point source ratio to account for uncertainty in non-point source performance (e.g., agricultural BMPs). In other words, two pounds of nonpoint source pollution reduction are needed to offset every pound of pollution from a point source (VADEQ, 2009).

Establishing a Baseline

Before a trading recipient is allowed to purchase credits or offsets, most programs require some baseline or minimum treatment level to be maintained on both the site generating and the site receiving the offset. Baseline requirements provide assurance that all participants achieve a minimum level of nutrient load reduction and are not currently impacting local water quality. This is where watershed scale is so critical.

If a nutrient trading program is established to address nutrient impairments at a 10 digit watershed scale, care must be taken to assure that the trade does not contribute to the impairment of local watersheds at a smaller scale (e.g., 14 digits). Trading must also adhere to codes, policies, and plans for the protection of local watersheds and receiving streams.

A baseline can include a minimum load reduction or a minimum level of treatment or standard of practice. The state of Maryland's trading program requires that, to be eligible for trading, the applicant must first achieve reductions sufficient to meet the local Tributary Strategy requirements (or TMDL) (MDE, 2010b). The new Stormwater Management Act of 2007 requires redevelopment sites to provide low impact development BMPs to a "maximum extent practicable" standard before purchasing credits from a trading program (MDE, 2010a).

Tracking and Verification

Tracking and verification are critical to ensure approved practices and activities are being implemented and maintained and that the generator of credits meets the baseline or threshold cap allocations of the trading program. The regulatory agency can provide for tracking and verification through random spot visits or through a certified third party vendor.

Enter the Middleman

The calculation and approval of credits or offsets is challenging and usually handled by a state or local agency. However, a private "middleman" or *aggregator* can collect and compile credits from different sources. These credits can then either be sold on the credit marketplace or sold directly to a developer, point-source, or third-party.

Aggregators are typically private entities that purchase large quantities of credits from nonpoint sources for the purpose of re-sale to potential buyers, such as regulated point sources. They are generally firms that are willing and able to accept and manage the inherent risks associated with trading. They guarantee the credits will be available throughout the permit cycle, despite the volatility associated with the unregulated BMP market (such as when farms cease operations or BMPs fail due to poor operation and maintenance) (Selman, 2008).

Table 2. Summary of Primary Considerations for a Trading/Offsite Compliance Program

Consideration	Explanation
Establishing a Baseline – minimum level of effort FOR THE TRADER (the party that is generating the load increase)	The regulated party must perform a certain baseline load reduction on-site or at the facility in order to be eligible for trading. The "traded" part is the load in excess of this baseline level of performance. For instance, a developer must achieve a certain load reduction on-site in order not to impair receiving waters or cause harm to downstream properties. The remaining "unmet" load can be traded.

Establishing a Baseline – minimum level of effort FOR THE TRADEE (the party that is accepting payment to implement an equivalent load reduction)	In some programs, the recipient of the payment must meet certain baseline conditions before being eligible for payments. For instance, a farmer may need to implement "baseline" Tributary Strategy practices (e.g., cover crops, nutrient management, livestock exclusion) first, and then be eligible to receive payments for additional practices that go above and beyond the baseline.
Trading Ratios	Many trading programs incorporate a trading ratio, whereby the "purchased" load reductions must be more than the original unmet load. A common trading ratio is 2:1, which means that the regulated party must purchase twice the amount of load reduction that he or she is generating. This represents a margin of safety and also acknowledges that certain mitigation efforts (e.g., planting a riparian buffer) take time to fulfill their anticipated load reduction functions.
Delivery Ratio	Delivery ratios can be used to account for the location of the offset (where it is generated) relative to the location of the offset where it is consumed, to better reflect the effect of the load in protecting water quality at an area of interest. This helps to account for pollutant uptake as it is transported to the area of concern.
Margin of Safety (MOS)	Margins of Safety (MOS) are incorporated into many trading programs to better assure that the program will ultimately achieve the results. An MOS can help to account for the effect of uncertainty in trading between different sources of pollutants, and can often ease the way for innovative practices to be employed.
Scale of Trading	A scale of trading must be established. Should trades take place within the same and/or adjacent watersheds, and how large should the watershed be? Often, scale issues are determined by policy and programmatic factors, such as a TMDL watershed or local criteria. If the scale is too small, it may be difficult to find suitable mitigation projects or accumulate adequate funds to undertake the proposed projects. If the scale is too large, mitigation or offset dollars can leave the community or watershed where they are most needed (e.g., MS4 community or TMDL watershed).
Kick-outs	Certain criterion may constrain the use of a trading program in a particular jurisdiction. Specifically, effluent limits on certain industrial activities covered by Sec. 402 discharge permits pursuant to the NPDES criteria, certain TMDLs which may have a different target pollutant that is difficult to trade, or other such overlapping criteria may limit the usefulness of a trading program of rule out it's use altogether. Load limitations of this nature may affect the establishment of the baseline criteria (see above)
Allowable Practices	A major program decision is what types of practices are authorized in relation to the impact. For instance, if the impact is stormwater runoff from a development site, what practices can be used for the mitigation? Some practices are directly related to the impact (e.g., using stormwater BMPs elsewhere in the watershed) and others have a more indirect link (e.g., stream restoration, land acquisition, education and outreach). Whatever practices are chosen, the program must account for the loads generated and loads removed through the mitigation practice.

II. LOCAL PROGRAM ILLUSTRATION

To explore how a local nutrient trading strategy might be beneficial, let's review watershed management alternatives for "Lottaproblems Creek" (LC). This theoretical example (exhibit in Attachment A) is intended for illustrative purposes only, although the numbers and outcomes are realistic for watersheds of this nature. Of course, for an actual program, these numbers would be dependent on watershed target loads, fee structure, implementation levels, trading ratios, and actual costs, among other factors.

Current land uses in the approximate 2 square mile LC watershed are comprised of a mix of commercial, industrial, agricultural, roadways, and mixed residential land uses, with 200+ acres slated for new development and 100 acres slated for redevelopment (Attachment B, Table 1). Stream channels receiving uncontrolled runoff from existing developed areas are exhibiting down-cutting and widening, resulting in additional sediment and nutrient inputs to downstream waters (Attachment B, Table 2). Net projected nutrient loading from the overall watershed is approximately 1600 pounds per year of Total Phosphorus.

Now, let's explore various treatment options:

Alternative A – Regulate New Development and Redevelopment on a Site-By-Site Basis

In this alternative, the proposed new development would be mandated to achieve, on-site, a net load of 0.45/lb/ac/yr and redevelopment would be required to exact a 20% net reduction versus existing loads (both consistent with proposed Virginia criteria). While this scenario would satisfy the regulatory mandate, the results basically "hold the line" on watershed loads, but do not result in an overall reduction (Attachment B, Table 3). The net cost for treatment for both new development and redevelopment exceeds an estimated six million dollars.

Alternative B – Nutrient Trading

Alternative B pursues an approach whereby on-site load control criteria (for new development and redevelopment) are relaxed in exchange for contributions/participation in an off-site compliance program (pro-rata, private trading program, cooperative effort, etc.). The establishment of such a fee base could allow for restoration of approximately one mile of degraded urban stream channels, stormwater retrofits treating 10% of the most intense commercial and industrial land uses, agricultural buffer programs, and a variety of other pollution prevention programs that have a direct effect on nutrient loads (septic pump-out programs, clean marina programs, street sweeping, public outreach and education, etc.). Overall capital costs in this scenario are reduced by approximately one million dollars.

The collective costs and results are summarized as follows:

- The trading scenario (Alternative B) reduces net nutrient loading from the 2 square mile watershed by approximately 11%. The "site-by-site" (Alternative A) basically holds the line or allows a slight increase.

- The gross nutrient reductions under Alternative B are 260% of the current regulatory approach.

- The net capital costs for Alternative B are approximately 20% less than Alternative A.

This example does not address the specific type of program or fee mechanism, but is intended to illustrate how, in many instances, watershed management strategies that expand the focus beyond on-site BMP implementation can achieve greater results with lower overall costs. As noted, the actual outcomes would depend on the specific credit or offset costs and how the funding is generated. The example is presented using typical values or ranges of values and is shown for illustrative purposes only.

III. THE DECISION TO IMPLEMENT A TRADING PROGRAM

There are several questions that need to be asked before committing to a nutrient trading or offsite compliance program. The following represents some of the considerations that are important to having a well-crafted and effective program.

A. Planning the Program

There are several questions that a jurisdiction should ask before developing a local nutrient trading approach. These can help to identify issues at an early stage and will direct the data-gathering needed to make an informed decision whether to proceed and to craft an effective program.

Is a Trading Program Right for Our Watershed?

Local Water Quality Protection Objectives – Has the locality clearly identified the water quality protection objectives? Many localities may have objectives and goals which exceed state and federal minimum treatment requirements. These should be clearly identified and considered in the crafting of a trading program.

Credit Demand and Supply – What are the demands for credits and offsets that are anticipated under the program? What are the opportunities within the watershed to generate those credits and offsets? Are the opportunities feasible and cost-effective at first glance and worthy of further analysis?

Credit Program Administration – How will the locality administer the credit and trading program? Is the program envisioned to be publicly verified and administered but implemented by private entities or NGOs? Is the program compatible with the jurisdiction's capital improvement program or other vehicles for funding and implementing projects?

Local Support/Interest – What is the general level of local support and interest in watershed improvements? How can the locality build consensus amongst various stakeholders? Is the program likely to be supported by officials and the public?

Can We Integrate the Program With Other Local Concerns & Regulations?

While a trading program may be allowed under the stormwater regulations, there are numerous other layers of regulatory oversight that need to be considered to ensure that the program will ultimately be beneficial.

Linking With TMDL Goals – Are there local TMDLs and/or water quality impairments? If so, are the practices, credit structure, and tracking consistent with the TMDL goals and objectives and can they be integrated effectively?

Other Local Conflicts – Are there other water resources issues which prevail within the jurisdiction that would be inconsistent with a trading program or that may add additional complexity to program administration (e.g. localized issues such as a species of concern in the watershed where the trading is envisioned)?

The effective application of a trading program should take into account other water resources and environmental initiatives and permit requirements so it can effectively be used to meet multiple management objectives.

What (Specifically) Do We Want to Accomplish?

The specific objectives and milestones for the plan should not be based solely on statewide nutrient reduction mandates. The goals should also reflect the local community interests and priorities. The first step is a goal-setting exercise where a clear and concise "result" that is desired can be defined (see Table 3).

Table 3. Examples of Trading Program Goals & Objectives
Enable dense development in comprehensively planned areas while providing for restoration of degraded aquatic resources in watersheds X and Y
Achieve compliance with TMDL Waste Load Allocation for runoff in watershed X.
Restore Creek X water quality through a comprehensive nutrient management approach
Reduce sedimentation to a downstream reservoir to reduce dredging and operational costs and improve in-lake water quality.
Reduce costs, complexity and maintenance burdens to private developers to facilitate economic development

Once the overall goals have been defined, more specific objectives and associated milestones can be added that will provide the "how-to" for achieving the broader objectives.

What are the Technical and Administrative Prerequisites?

Staffing – How many staff will it take to administer the program? What is the associated administrative cost?

Fund allocation – Do we have a vehicle for receiving funds, administering the funds, prioritizing projects, allocating funds, and tacking and verifying that the funds are clearly connected to the established goals, objectives, and milestones?

Local ordinances/administrative provisions – Is this enabling authority to undertake this effort and what local ordinances and administrative provisions must be adopted?

Policies and Procedures – Has the program prepared a document which clearly identifies programmatic roles, expectations, and performance benchmarking?

Seed money – How will we generate the initial capital required to get the program started? Will this be generated publicly or privately?

What are the Tools I can Use?

Programs can take many forms and employ many tools and techniques. Just a few are listed below:

- Urban Nutrient Management
- Agricultural Offsets
- Stream Restoration/Stabilization
- Small-scale Retrofitting
- Pond Retrofits
- Street Sweeping
- Education and Outreach
- Buffer Reforestation/Aforestation
- Land Conversion
- Ecological Improvements (wetland enhancement)
- PDRs/TDRs

What is the Overall Financial Sustainability of the Program?

Based on the initial approach, assumptions for credit demand and supply, funding sources, and administrative costs, an analysis of projected cash flows should be developed and properly budgeted to assure that the objectives and milestones established for the program can be met in a sustainable fashion. Project budgeting should be coordinated with the various parties responsible for administering and funding the program. Provisions should also be made for program adjustments, corrections to fees, and other modifications that will be necessary to achieve and verify the desired load reductions.

Consideration should be given to the timing of when the fees collected will actually be used to implement projects. In the past, localities have pooled monies collected from fees and implemented projects once sufficient funds were available. This may or may not be acceptable dependent on the nature of the program and regulatory drivers. Careful consideration should be given to whether or not the initial projects generating pollutant removal for trades or offsets will be implemented prior to the sale of credits. If so, this can dramatically increase the startup costs and may necessitate creative financing.

B. Do's and Don'ts of Trading

Do:

Your Homework: The success or failure of a trading program will depend largely on carefully estimating credit demand, opportunities to generate credits, and the costs and administrative burden associated with the program. You need good quantification of the costs and complexities involved before committing to a program.

Involve Community Stakeholders: Credit and trading programs can be an effective way to protect water quality and direct available funding resources to the most cost-effective solutions. However, it is important to engage community stakeholders in the vision and crafting of a program so that it is not perceived as a "tax," a "way to enable sprawl," a way to let developers "off the hook," or various other epithets that may be ascribed to trading programs without thorough community outreach and involvement.

Aim High: Trading programs are in place to allow a wide array of tools and techniques to meet ambitious water quality improvement goals. Aim high with the goals and objectives of your program, but set realistic milestones and performance metrics.

Compare: To effectively communicate the benefits of a trading program, it is important to compare the anticipated benefits to other management structures. The benefits of a trading program need to be evident to both participants and the regulated community in order to obtain the buy-in needed to succeed.

Don't:

Neglect Your Baseline: Trading programs are not an excuse to allow degradation of one aquatic resource for the benefit of another. Baseline practices should be set to provide assurances that local receiving waters are not degraded through trading. Baseline practices normally are protective (anti-degradation) based, while the tradable portion of the load achieves the net improvement in water quality that is sought by the program or regulatory requirement.

Forget your MOS: Trading programs have certain inherent uncertainties in trading between various pollutant sources. Since trading programs often incorporate innovative practices, it is appropriate to build a Margin of Safety (MOS) to ensure that the targeted load reductions are achieved in practice. An MOS can help assure the public and the community of the benefits of the trading program and that sufficiently conservative assumptions have been used in the crafting of the program. It should be noted that an MOS that is set too high can also discourage use of the trading program.

C. Local program Examples

Trading programs, in various forms, have been employed in Virginia under the current regulatory provisions and it is anticipated that interest in new and innovative ways to deal with urban runoff issues

will be even stronger as society struggles with more challenging restoration goals and limited financial resources. These programs can take the form of pro-rata share contributions to a local watershed enhancement effort, cooperative efforts to trade credits between multiple parties in the same watershed, or formal offset/credit trading programs. Two programs are briefly highlighted below to depict how different approaches might be used to achieve equivalent or greater collective benefit.

Henrico:

Henrico County, Virginia has adopted an innovative pro-rata program which includes a variety of ecological enhancements and urban drainage retrofits to "offset" nutrient loads from smaller sites, which would previously have implemented marginally effective on-site BMPs. While no credits are traded, per se, contributions to the pro-rata program (in-lieu fee fund) are used to demonstrate site compliance (when allowed) and the fund is then used to undertake watershed improvement projects which collectively achieve greater benefits. Their program started with a global look at stream quality and divided sub-watersheds into three categories (Henrico, 2010):

1. Watershed Protection (currently healthy) – no contributions allowed
2. Watershed Enhancement (in need of some restoration) – targeted contributions allowed
3. Watershed Restoration (already degraded) – contributions required

The program has resulted in significant net nutrient and sediment reductions, further innovations in urban stream protection and restoration, and reduced compliance costs for the regulated community.

City of Fredericksburg:

The City of Fredericksburg, Virginia worked with the Friends of the Rappahannock to identify a strategy to reduce runoff *volumes* for urban development and redevelopment. This volumetric target -- infiltration of the first 1/2 inch of runoff -- was established in addition to the requirement for basic on-site water quality and quantity treatment. Based on feedback from the local development and building industry, the City worked collaboratively to allow for an off-site volume offset if the corresponding retrofits generating the credit were provided in the same watershed. This enables redevelopment in challenging, highly constrained sites where volume reduction options are constrained, while also still providing for net reductions in urban pollutants, runoff volumes, and associated erosion in the City's streams. Off-site volume offsets must be at a compensatory ratio of 1.5:1 for new development or 1.25:1 for re-development. This allows the locality to also address some of the baseline volume and pollutant loads from existing projects that were developed prior to stormwater management regulations (Tippett, 2010).

IV. GETTING A PROGRAM APPROVED

There are several options in Virginia's proposed stormwater regulations (as well as the pre-existing version) which allow for creative local program development considering the use of alternative, off-site BMPs to satisfy overall nutrient loading criteria. Refer to Section 4VAC50-60-69 (offsite Compliance Options) in the "final" revised regulations. These options are summarized in **Table 4**.

Table 4. Off-Site Compliance Options in Virginia "Final" Revised Regulations (December 9, 2009)

Reg. Section. (4VAC50-60-69)	Offsite Option	Summary/Description
A.1	**Comprehensive Watershed Plan**	Localities have the option of developing comprehensive watershed plans for watersheds or sub-watersheds which can allow for the use of off-site practices to provide offsets or alternatives to enhanced on-site treatment. Comprehensive watershed plans may employ off-site practices and allow developers desiring credits to contribute to fund such efforts to offset their site's loadings.
A,2	**Pro Rata Fee**	Localities have the ability to establish pro-rata fee programs which would require mandatory contributions for regulated activities within the designated service area. These programs are not voluntary for participants and may provide more predictable funding sources.
A.3	**Nonpoint Nutrient Offset Purchase**	Under certain circumstances, localities may allow the purchase of credits of agricultural nutrient offset credits through the Chesapeake Bay Watershed Nutrient Exchange Program. The final offset guidance approved by the Virginia Soil and Watershed Conservation Board can be located at http://www.dcr.virginia.gov/lr6.shtml.
A.4	**Offsite Stormwater Management Facilities**	Off-site stormwater facilities can be cooperatively utilized under certain circumstances to satisfy a site's loading requirements. Localities may allow trading of excess credits generated within the watershed to other development activities. This can aid in small watershed-scale planning for projects developed under a common plan of development or a stormwater or watershed master plan.
B	**"Buy-Down" Program**	A state-level "buy-down" program is described in the regulations which would allow for contributions to a DCR-administered offset program. Funds received by the program would then be allocated to activities achieving equivalent or greater load reductions throughout the Commonwealth. *This option is provided only in the event that more stringent nutrient loading targets than 0.45 lb TP/yr are established in the Bay watershed.*

It is anticipated that DCR will review program proposals as part of their determination of whether or not a locality operates a "Qualifying Local Program" and that further programmatic guidance will be developed by DCR and through additional advisory committee efforts to evaluate the equivalency of different trading and offset programs.

This paper serves as a general overview of some of the available options available.

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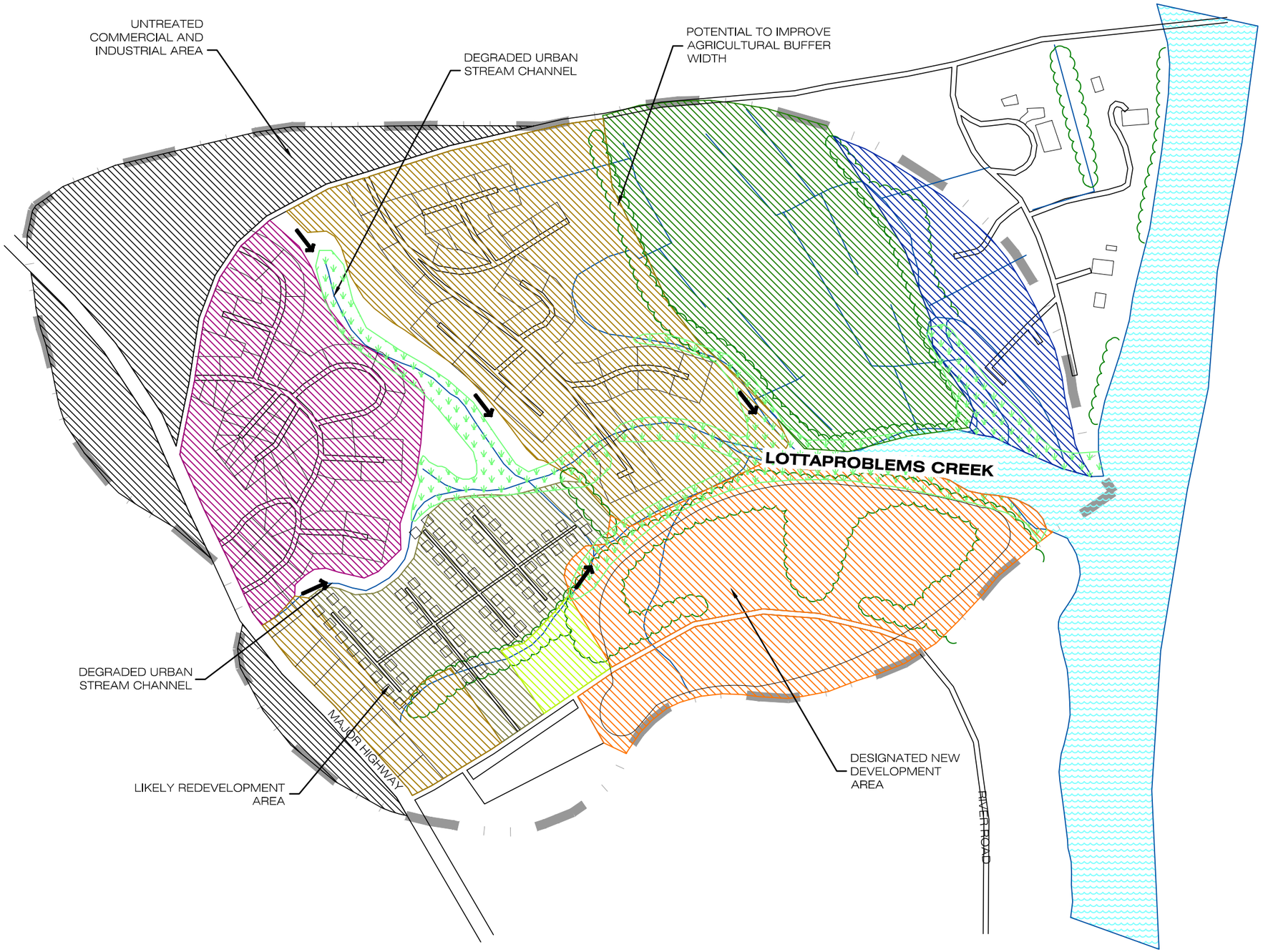
ATTACHMENT A

Lottaproblems Creek Exhibit

LEGEND:

- COMMERCIAL/INDUSTRIAL LAND
- HIGH DENSITY RESIDENTIAL
- MEDIUM DENSITY RESIDENTIAL
- AGRICULTURAL LAND
- URBAN REDEVELOPMENT AREA
- CHURCH SITE
- NEW DEVELOPMENT AREAS
- ESTATE LOTS (5-10 ACRES)

NOT TO SCALE



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ATTACHMENT B

Lottaproblems Creek Example Tables

Lottaproblems Creek - Example

EXISTING CONDITIONS

Evaluate Land Use Conditions and Loads Associated with Existing Conditions

Table 1 Land Uses

Land Use	Acres	Description
Agricultural	240	Approximately 120 acres of row crops not slated or zoned for development
Highway/Arterial	100	Approximately 50 acres of major roadway/arterial ROW unserved by SW treatment
Commercial/ Industrial	220	Existing commercial.light industrial district.
Medium Density Residential	400	Mixed medium density residential land uses
High Density Residential	100	Trailer village land use, high density, slated for redevelopment
Slated for New Development	210	Mixed open land uses slated for redevelopment
Estate Lots	120	5-10 acre Estate Lots
Marina/Waterfront Development	30	Need improved pump-out
	1420	

Table 2 Land Use Loadings

Land Use Loadings	Acres or Units	Unit Area Loading (lb TP/Ac/yr)	Total Estimated Load (lb TP/yr)	
Agricultural	240	1.00	240	
Highway/Arterial	100	1.31	131	assumes 50% IC, 50% turf
Commercial/ Industrial	220	1.57	345.4	65% IC, 35% turf
Medium Density Residential	400	0.94	376	35% IC,40% turf
High Density Residential (redevelopment area)	100	1.18	118	45% IC, 45% turf
Slated for New Development	210	0.23	48.3	Current load (50% turf, 50% forest)
Estate Lots	120	0.27	32.4	6% IC, 30% turf
Marina/Waterfront Development	30	0.79	23.7	30% IC, 30% turf
Other				
Stream Erosion (reach 1&2)	8300 l.f.	0.06 tons/yr/ft	250	assumes 0.5 lb TP/ton sediment
			1564.8	**Total Load - Existing Conditions**

ON-SITE TREATMENT ONLY

Evaluate loadings and costs associated with on-site treatment only

Table 3 Loadings with controls at 0.45 lb/ac/yr for new development and 20% net reduction for redevelopment

	Acres or Units	Total Load (existing)	Unreduced Load	Required Treatment	Total Endpoint Load	
Agricultural	240	240	240		240	
Highway/Arterial	100	131	131		131	
Commercial/ Industrial	220	345.4	345.4		345.4	
Medium Density Residential	400	376	376		376	
High Density Residential **(redeveloped)**	100	118	118	23.6	94.4	
New Development (35% IC, 35% turf)	210	48.3	193.2	98.7	94.5	
Estate Lots	120	32.4	32.4		32.4	
Marina/Waterfront Development	30	23.7	23.7		23.7	
Other						
Stream Erosion (reach 1&2)	8300 l.f.	500 tons.yr sediment	250		250	
			1709.7	**122.3**	**1587.4**	**Total Load - On-site T**

Table 4 Estimated Costs for Treatment - Conventional Approach (NO TRADING STRATEGY)

Treatment Category	Acres	Capital Cost/Ac Treated	Total Cost
New Development	210	$15,000	$3,150,000
Redevelopment	100	$30,000	$3,000,000
			$6,150,000

OFFSITE COMPLIANCE OPTIONS

Evaluate load reductions achievable with an off-site compliance strategy

Table 5 Offsite Compliance Options

	Units	Unit Cost	Total Cost	lbs TP/yr Reduced	
5000 l.f. Stream Restoration	5000 l.f.	$180	$900,000	150.6	estimated
Retrofit 10% of Existing Commercial/Industrial	22 Ac	$30,000	$660,000	34.5	
Treat New Development to 0.60 lb/yr (with offset credit)	210	$10,000	$2,100,000	67.2	(Total Load = 210*0.6 = 126)
Apply Agricultural Buffering Program to 10% ag-lands	24	$20,000	$480,000	24.0	
Pollution Prevention/Education			$800,000	40.0	estimated
			$4,940,000	**316.3**	

Endpoint Load: **1393.4**

260% of typical load reduction achieved
11% net reduction in loads vs. 1% increase (typical)
20% reduction in costs