Recommendations for Vestal Storm Water Policies and Practices

Last year, Supervisor Andreasen asked the CAC to examine the current status of the town's creeks, and to develop recommendations for the town to consider. The creeks in Vestal have long been the source of a variety of chronic problems that, for most creeks, were documented in reports prepared over several decades for and by the CAC. The two major storm events of 2006 caused significant damage not only in the creeks, but also to important town infrastructure (e.g., roads, bridges) and adjacent properties. In preparing this report, CAC members obtained and reviewed information on modern storm water management practices, as well as relevant state and federal policies, procedures, and regulations, and past CAC reports on creeks. In then reviewing the consequences of the July and November 2006 storms, along with subsequent clean-up and repair efforts, we identified some excellent town practices, but also some quick, easy, "inexpensive" fixes that did not address the inherent problems that contributed to the extent of the damage. By not addressing the root causes of recurring problems, such quick fixes, in the long run, might be more costly than carefully planned modifications that reduce, if not correct, the underlying causes. We also identified need for more explicit policies concerning activities in not only the flood plain of creeks, but within stream corridors. Furthermore, since Vestal's creeks are the final destination of almost all storm water runoff throughout the Town, the source of many creek problems are well outside the stream corridor. Keeping in mind that experiencing a 100-year storm does not alter the probability of experiencing another one (e.g., in both 1972 and 2006, the town was hit with two 100 year storm events), we suggest that Vestal needs to operate with the assumption that it could be hit within the next decade, or even sooner, with flooding from another major (possibly 100-year) storm.

This report on creeks in Vestal has several goals:

1) Provide a brief functional guideline for compliance with state and federal regulations.
2) Summarize major underlying causes of creek-related problems, and then provide suggestions to be considered for addressing the underlying causes on a long term basis.
3) Summarize creek management practices, policies, and funding strategies implemented elsewhere that might be considered as Vestal develops long terms plans to address problems in its creeks.

Definition of Terms:

Creek: A more common local term for stream..

Stream Channel: The portion of a stream bed with flowing water for at least part of most years.

Flood plain: Land adjacent to the stream channel that is inundated by flood waters at intervals from frequent to rare. *Some streams in Vestal are mapped by FEMA on the Flood Insurance Rate Maps (FIRM), in some cases up to the 500 year flood plain*.

Transitional upland fringe: The transitional strip of land between the upper margin of the flood plain and the surrounding landscape.

Stream Bank: The land area immediately adjacent to the stream channel which slopes toward, and is necessary to maintain, the integrity of the stream.

Stream Corridor: The stream channel, it's flood plain, and its transitional upland fringe. *The current Vestal Code does refer to stream corridors, but only in its Timber Harvesting Ordinance.*

Stream Watershed: All of the area of land that drains into the specific stream.

Storm Water: All forms of precipitation (rain, snow, ice) produced by a storm.

Drainage System: Any natural or artificially created structure that conveys water away from its source. This includes gutters and drain pipes on private land, ditches, culverts, storm sewers, storm drain pipes, and creeks.

Navigable Waterway: Federal and state designations making the body of water subject to Army Corp or DEC jurisdiction. *Choconut Creek is a navigable waterway*. Creeks flowing directly into a navigable waterway may still be subject to some federal or state regulations.

Basic Principles of Stream Erosion:

The power of erosion is a function of the quantity and speed of water in the stream. Once water has entered the stream, the only way to reduce the volume of water is to divert some of the water from the stream; this may be practical in undeveloped upland regions of Vestal, but not in the developed lower reaches of streams. The speed of water in the stream can be reduced is by impediments that redirect water from the major axis of the stream channel, but such redirection usually applies erosion forces to the stream bank. Gravel bars in streams thus serve to reduce downstream forces, but this can be at the cost of erosion of banks adjacent to the gravel bars. Removal of gravel bars reduces the erosion of adjacent banks, but at the cost of greater erosion forces downstream. Riprap, and other strategies that "harden" the stream banks tend to speed the flow of water, and thus increase downstream erosion, and thus represent local solutions that shift the problems downstream. Thus, not a great deal can be done within a stream to reduce erosion. As a consequence because they do not correct the basic problem of too much water moving a too rapid, "repairs," or "fixes" to problems are, at best, temporary and often not cost-effective. Instead, efforts need to be made higher up in the watershed to reduce the volume of water in the stream, and work in stream channels needs to reflect broad, rather than local, segment of the stream.

I. Federal and State Regulations for Streams and Stream Corridors

Federal

Federal regulation of streams is done under the Clean Water Act (CWA), which was adopted in 1972 and covers rivers, creeks, and wetlands. The Army Corps of Engineers (ACOE) is responsible for administering the CWA for the Environmental Protection Administration (EPA). The Corps determines CWA jurisdiction, issues permits to dredge and fill regulated waters, and imposes penalties when the act is violated. The CWA only applies to "dredge" and "fill" of navigable waters and does not regulate activities such as building near streams or in stream corridors. [This federal regulations section applies to any water of the US, including wetlands and rivers].

The CWA applies to creeks considered "navigable," or adjacent to a "navigable," water body, but recent Supreme Court decisions, all involving wetlands, have left somewhat uncertain the definition of "navigable" and "adjacent." At present, whether or not a "water" course comes under the CWA is decided on a case by case basis by the regional ACOE office having jurisdiction. The Buffalo office has jurisdiction over Vestal.

In Vestal, current Army Corps guidelines indicate that Choconut Creek is "navigable" and thus subject to CWA jurisdiction. The other creeks (e.g. Willow Run and Fuller Hollow) that flow directly into the Susquehanna River are adjacent to "navigable" water, and thus also need permits for any dredge and fill operations. Smaller creeks that are tributary to these creeks may or may not be exempt depending on the location of the work within the smaller creek.

When any planned action by a government agency (including the Town) or a private developer involves dredging or putting fill into a "navigable" creek, the Army Corps Buffalo office **must be contacted** to determine if the action is covered under the CWA. If the particular creek has previously been determined by the Corps as not "navigable," consultation will not be necessary.

If the action is covered and the Corps has jurisdiction, it still might be possible to complete the dredge and fill under a Nationwide Permit. Nationwide Permits are a list of common actions in

creeks that are automatically approved. Such actions include construction or maintenance of bridges, culverts, certain ditches. A complete list of current permits applicable in Vestal is available from the Buffalo Army Corps office (www.lrb.usace.army.mil/). If a Nationwide permit is not appropriate, the town can apply for an individual permit.

State

New York State (NYS) regulation of creeks is done under Article 15 of NYS Environmental Conservation Law (6NYCRR Part 608) and is administered by the New York State Department of Environmental Conservation (DEC).

Under article 15, all waters in the state are classified according standards that reflect existing or expected best usage of each water or waterway segment.

AA or A are assigned to waters used as a source of drinking water.

B indicates usage for swimming and other contact recreation, but not for drinking water.

C is for waters supporting fisheries and suitable for non - contact activities.

Types A, B, and C also may have a sub classification of (T) to indicate possible support of a trout population, or (TS), to support trout spawning. Special restrictions apply to such waters. Regulation of each body of water is based on its classification.

To determine the classification and standard of a given watercourse, the DEC regional office must be contacted. The Town of Vestal falls in Region 7, with the closest DEC office handling creeks located in Cortland. DEC regulations cover <u>any</u> actions in creeks and, in contrast to federal regulations, not just dredge and fill. DEC permits must be obtained before beginning work in a creek, with failure to obtain required permits subjecting the violator to DEC enforcement action.

Permits and regulations vary depending upon type of activity. Some regulations apply only to protected creeks, whereas others apply to all creeks. For details of all permits, consult the DEC web site (www.dec.state.ny.us, with flood control regulations at http://www.dec.ny.gov/regs/2490.htm). Some permits apply to the type of work Vestal does in its creeks. These are discussed below:

- **<u>Protection of Waters: Disturbance of The Bed or Banks of a Protected Stream or Other Watercourse</u>** - *A Protection Of Waters Permit* is required for disturbing the bed or banks of a stream with a classification and standard of C(T) or higher, whether the disturbance is temporary or permanent in nature. <u>This permit is the most pertinent for the Town</u>.
- **<u>Construction, Reconstruction or Repair of Dams and other Impounding Structures</u>** - A *Protection Of Waters Permit* is required for constructing, reconstructing, repairing, or modifying dams and water structures that permanently or temporarily impound water as a result of the structure being placed across the watercourse, overland drainage way, or water from an external source such as drainage diversion or the pumping of ground water.
- **<u>Excavation or Placement of Fill in Navigable Waters</u>** - A *Protection Of Waters Permit* is required for navigable waters of the state for excavating or placing fill below the mean high water level, whether the action is in the waterway or in adjacent and contiguous marshes and wetlands.
- **<u>Water Quality Certifications for Projects Requiring a Federal Permit</u>** - In accordance with Section 401 of the Clean Water Act, applicants for a Federal license or permit for activities (including but not limited to the construction or operation of facilities that may result in any discharge into waters of the United States) also are required to apply for and obtain a *Water Quality Certification* from DEC indicating that the proposed activity will not violate water quality standards. This statute enables the state to approve or put its own qualification on a federal permit or declaration of "no jurisdiction" by ACOE.

II. Identifying Problems and Suggestions for Solutions

Background: Vestal's storm water system, which was developed piecemeal over many decades, uses the Town's creeks as the main channels of its drainage system. Increases of impervious surface (e.g., roofs, driveways, parking lots, roads), which are a by-product of decades of development, has resulted in significant volume and velocity of water entering the storm water system. The magnitude of eroding forces in the creeks is largely a function of the quantity and speed of water in creeks. Erosion, in turn, is a major source of damage not only in the creeks and to the creek banks, but also to private and public land and town infrastructure (e.g., roads, bridges) adjacent to the creeks. Detention ponds do capture some of this increased flow, compensating, in part, for the loss of natural wetlands. Water that retained in the uplands has an opportunity to percolate into the ground and recharge the water table on which depend landowners who have wells. Infiltrated water also provides even year-round stream flow, which enhances stream habitat.

In 2006, two very different types of storm events caused flooding in the Town of Vestal. In the first event, several days of heavy rains caused flooding and significant damage to most streams corridors, with water from local streams adding to the major flooding of the Susquehanna River. In the second event, several inches of rain fell in the upland areas of Vestal within a few hours. Because the storm water system could not handle the volume of water from either event, roads were flooded and in some cases washed away, and some bridges were partially undermined. After examining the underlying causes for some of the recent storm damage in Vestal, we provide suggestions that, if implemented, could reduce the extent of damage from future major storms, and thus the cost and urgency of needed repair.

Bridges. Changes in the design of some bridges could significantly reduce future problems. The capacity of a creek at a bridge location is limited by the width of the channel during flood and the height of the bridge deck. If the bridge supports are too close together, water flow is impeded and the dammed waters erodes the steam banks upstream of the bridge, which can lead to undermining of the bridge supports and approaches. If the height of a bridge is too low, storm water in the creek, especially when confined to a narrow bridge underpass, can directly damage the bridge deck. The height and width of some bridges in Vestal are not adequate for the amount of water carried by the creek during severe storms. The reconstructed Main Street Bridge over Choconut Creek at the south end of Lincoln Drive is an example of good design, one appropriately scaled for the current (or even projected) size of the creek. This bridge was not threatened by either of the major storms in 2006.

If a bridge has a history of being damaged or closed by floods, its structure may be too low or too narrow for the creek. For these bridges, simply repairing damage will not correct the inherent problems, and thus may be no more than a temporary patch. Furthermore, the accumulated long-term costs associated with repeatedly repairing such structures may exceed the cost of a one-time replacement with a better designed structure. The bridges over Choconut Creek at West Hill, Meeker and Juneberry Roads are examples of bridges that have been closed more than once because of high water. These bridges, and probably others, should be evaluated as part of the long term planning recommended below.

Debris washed into Creeks: Damage to stream banks and, as a consequence, adjacent roadways and properties can be increased significantly by the accumulation of debris in the creek. In addition, massed debris can block culverts. It also can cause erosion by redirecting the force of water against stream banks or critical structures, such as bridge pilings. Besides rocks and gravel from eroded banks, sources of debris include yard waste discarded in the stream, trees and structures washed into the stream by a storm, and even riprap dislocated by storm flow. The Route 26 intersection at Vestal Center was completely rebuilt within the last 10 years, but after November 2006 storm, this intersection had to be closed because debris blocked the culverts that carry Sugar Creek under the road. Sugar Creek also crosses under Powderhouse Road in several places, and the 2006 storms caused extensive damage in some of these areas. These same storms

washed out the rip rap at the culverts in smaller Town creeks.

Recommendations: Effective design and implementation of infrastructure, or repair of infrastructure, can and should foster future development in the Town with minimal negative impact. The following is a list of specific suggestions, many preventative in nature, intended to help reduce the potential for future damage, and thus the need for subsequent repair. They also address four important general goals: (1) reduce the volume of water entering the streams, (2) reduce the 'flashiness' of the watershed (allowing the same volume of water to pass over a much longer duration), (3) reduce the energy of the water within the streams, and (4) minimize collateral damage, such as from debris washed into streams. Development or implementation of some of the following recommendations may require either consultation with experts at the county or state level, and may even require hiring a consultant. We also urge a long term analysis of costs and benefits of upgrading major infrastructure, such as bridges, recognizing that this kind of program might take decades to complete.

1- Current stream corridors, especially flood plains, should be mapped for all creeks and watersheds in the town, and should specify 100 and 500 year flood levels. This information is important to current and potential residents and should be available to Vestal's various boards as they evaluate proposals for new construction. Once the mapped, guidance on building practices for flood plain areas should be developed and specified in the Town Code, with the goal of minimizing the danger of damage to new construction from floods and lessening the danger of debris from damaged structures being swept into the streams.

2- Wetlands and other areas of natural infiltration, as well as protective buffers around them, serve important, and difficult to artificially replace, functions in watersheds and need to be preserved, and even expanded.

3- Additional storm drains and underground catch basins are probably needed in some locations, especially on steep roads where water runs faster. Coupling drains with above ground ponds or forms of underground water storage would reduce the volume and slow the speed of water in the creeks.

4- NY Storm Water Management regulations are designed to reduce the danger of flooding. Beyond adherence to these regulations, the Town might wish to enact additional protections appropriate for the steeper slopes typically found in Vestal and for threatened watersheds. For example, when new roads are sited for developments on steep terrain, the Town might consider requiring that road culverts direct water into wetlands, holding ponds, or other structures, rather than directing storm water into the nearest creek.

5- Straightening of stream channels increases water speed, which increases the erosion of stream banks and consequently volume of sediment deposited downstream. Straightening of stream beds should be discouraged.

6- Bridges should be evaluated in relation to the projected volume of water in the underlying creek during heavy storms. If there is a high likelihood of significant damage to the bridge, consider developing long-term, cost-effective plans to modify or replace the existing structure.

7- The manner in which riprap in installed should be reevaluated. In a number of locations, the 2006 storms were able to erode soil behind the rip rap, creating the potential for severe damage in the formerly protected region of the creek (e.g., Washington Drive bridge over Fuller Hollow Creek). If riprap is installed only to protect a limited section of a creek bank, the upstream end needs to be designed to prevent flood water from getting behind the riprap, washing it out and, and compounding the original problem.

8- Town management practices that affect stream banks should be evaluated to assess how well they contribute to water management goals. For example, Town Parks are not just a

place for recreation, but are (or should be) an important and easily accessible part of the town's system of stream corridors. Management of park land is the town's responsibility, and park planning, design, and maintenance should address, and not exacerbate, problems in the town's stream corridors. A former holding pond in Arnold Park and the current wetland at the entrance to Harold Moore Park are examples of park installations that helped reduced problems of water discharge from the upland regions. In recent years, parking lots have been installed many parks, with storm water from the parks apparently piped directly into creeks, rather than into catch basins or holding ponds that delay, and reduce, the magnitude and force of storm water in the creeks. Another example of a helpful practice would be a setback in mowing of lawns in Town parks that leaves a strip of riparian vegetation along creek banks, and possibly even the installation of bank-stabilizing plantings. Such strips of vegetation would not only slow discharge of storm water into the creeks and reduce creek bank erosion, but also could reduce the possibility of injury from park-users falling into the creek, would remove nutrients that otherwise now enters the creek, and would improving park aesthetics.

9- The State Pollution Discharge Elimination System permit, developed by DEC, applies to construction activities, and the associated permit manual, addresses standards for storm water runoff at new construction sites. In addition, the Broome County Soil and Water District is a source of information on how to protect and maintain stream corridors. Finally, the Town of Vestal might consider adding its own storm water management guidelines for construction activities. Such guidelines could address storm water control needs specific to the town, including stream bank protection in areas that are already developed.

10- Periodically, Code Enforcement should survey various part of the Town to ensure that Town regulations, especially those related to storm water and drainage, are being followed, with consequences for violations.

11- Because of the potential to spread disease, no septic system should be located within any stream corridor, or within one hundred (100) feet of a stream bank.

III. Other Suggestions for Town Actions

Flood Plain Maps and Flood Mitigation Planning: Maintaining updated flood plain maps allows development of both flood mitigation plans and zoning regulations specific to flood plains. Once flood mitigation plans are in place, priorities for implementation can be developed in a rational fashion, sources of funding can be more easily identified, and permits obtained in advance. The larger context provided by the plans should make it easier to obtain permits and funding. Plans could identify properties to be acquired, with their structures either demolished or relocated to elevations above the 100-year flood level. A flood mitigation plan also serves as a community's documentation for the National Flood Insurance Program (NFIP) Community Rating System, which is an essential step in implementing any disaster assistance after a major flood.

Zoning: Construction in flood zones, especially if steps are not taken to minimize flood damage, invites future problems for the property owner and any tenants. More important, what is done on private property can have a significant impact on a stream corridor. If debris is washed into the creek, problems are created for neighbors and the Town. For example, in the November 2006 Flood, a shed was washed into Sugar Creek, blocking a culvert, with the resulting diverted water damaging the stream banks as well as two houses below the blockage. Damage in the creeks thus can result in the need for taxpayer resources to correct the problems, Thus, zoning specific for flood zones should be different than for other areas, and probably should set not only flood-specific construction standards, but also prevent the placement of structures and objects near

stream banks.

Liability Considerations: A complicated problem faced after flood damage is the expectation that the Town is, and thus the taxpayers are, responsible for repair. Furthermore, if the Town acts either unilaterally or at property owners' requests to correct problems in streams, this action reinforces this expectation. Thus, part of flood planning should involve education, which could include the zoning changes (see above) and explicit designations of responsibilities, including possible and not possible arrangements with property owners along streams. Explicit statements of general policies could be part of either zoning or published flood plans. In addition, specific arrangements could be made with individual property owners who would benefit by Town work in adjacent creek, with explicit designation of fiscal responsibilities, with the property owner's contribution possibly being in the form of granting an easement or donating title to a portion of their property, or as well as direct payment for a share of the repair cost.

Maintenance and Repair: Ownership of stream beds and banks varies across Vestal, and even within a single creek. A complicating factor is that the Town uses the creeks as its main storm water drainage system. Thus, any property (residential, commercial, industrial, or tax-exempt) that contributes storm water to the drainage system is contributing to the water in creeks, and thus to the problems in the creeks. Responsibility for creek maintenance thus needs to be both considered broadly and also determined on a case-by-case basis. Such a determination should be made when work is to be done by the town in the creek, when a property owner want to make modifications to the stream bank, or when the property owner requests a variance to flood plain zoning.

Financial Considerations: Implementation of long term plans for storm management and infrastructure improvements is likely to result in increased expenses. Faced with such increasing costs, municipalities have sought to increase revenues either through traditional taxes, or through various types of storm water management fees that are assessed to property owners. Because little of the storm water originates in the creeks, and yet must be managed, all property owners benefit from new storm water management programs, and also (usually unknowingly) contribute to problems in the creeks. The following are some alternatives that could be considered in addressing funding:

- Implement a storm water utility fee assessed to all property owners in the watershed of individual creeks.
- Properties utilizing well water and/or a septic system still contribute to storm water entering the drainage system, and thus should be subject to the same fees as properties utilizing Vestal's water and sanitary sewer system.
- Consider a credit program that encourages property owners to reduce the storm water runoff directly attributable to their specific property. (e.g., property owners in a neighborhood where storm water drains into a retention pond might receive a credit)
- Assess penalties to property owners who violate existing zoning regulations that result in increased runoff. For example, there are properties that pipe water from roof gutters directly into the street.

Storm Water Management Plan:
Plan needs to establish a standardized methodology for the control of stream(s) and their restoration, defining the complexity of stream restorations and utilizing an integrated approach to restoration.
The plan as a minimum should contain the following:

- Overview of stream corridors.

- Stream corridor processes and characteristics.
- Disturbances to stream corridors.
- Organization, identifying problems and opportunities.
- Develop goals, objectives and restoration alternatives.
- Implement, monitor, evaluate and adapt.
- Analyses of corridor conditions.
- Restoration design.
- Managing and monitoring stream corridor restoration.

IV. Inventory of VESTAL CREEKS

A. <u>Creeks flowing directly into Susquehanna River</u> (listed from east to west)

Fuller Hollow

Bunn Hill

Willow Run

Choconut Creek

Tracy Creek

B. <u>Major tributaries of Above Creeks</u>

<u>Choconut Creek tributaries</u> (listed from south to north)

State Line Creek	(upper part located in PA) flows in from east near State Line Rd
Castlemen Rd Creek	(not sure of correct name) flows in from west between Underwood and Castleman Rds
Sugar Creek	(flows in from east at Vestal Center, at Powderhouse Rd)) Largest tributary of Choconut located in NY state.
West Hill Creek	flows from west at Vestal Center, West Hill Rd
Raylene Drive	(not sure of correct name) flows from west near Raylene Drive; possibly the second largest tributary located with Town of Vestal.
nameless creek	small creek that flows from west very near Raylene Drive Creek -starts in a small pond
Sheedy Rd Creek	(not sure of correct name) flows from east near Sheedy Rd. Creek has two distinct branches.
Nameless Creek	flows from west near Sheedy Rd
Meeker Rd Creek	(not sure of correct name) flows from east near Meeker Rd
Echo Rd Creek	(not sure of correct name) flows from west near Echo Rd
Pierce Hill Creek	flows from east south of Piece Hill Rd. origin is in Arnold Park

Any tributaries that originally existed north of here have been so channel zed and modified by humans that they no longer could be called “creeks”

<u>Tracy Creek tributaries</u>

Tracy Creek has between 5 and 7 smaller tributaries flowing in from both east and west. Unknown whether any of these have names. Tracy Creek watershed is much less developed than the watersheds of the other creeks listed above.

V. Inventory of Scientific Reports of Vestal Creeks - prepared for Town of Vestal (specifically for the CAC) by Binghamton University personnel.

Willow Run. Effects of Urbanization on Stormwater Runoff for Watersheds in the Willow Run Area, Vestal, N.Y., Ann S. Robbins, January 1984.

Fuller Hollow. Watershed Urbanization: Response by Fuller Hollow Creek, Vestal, N.Y., Ellen Jeanne Fillo, 1984 (2 copies).

Raylene Drive. A Study of the Raylene Road Drainage Basin for the Town of Vestal, New York, Cynthia Hawkinson, Feb. 1988.

Sugar Creek. A Study of Erosion and its Relation to Development along Sugar Creek, Vestal Center, New York, Karen E. Salzer, Aug.1989.

Some Useful Examples From Other Municipalities:

Holmdel Township, NJ has a code that could be used as a model for Vestal as it considers developing its own code. The URL for this code is http://www.anjec.org/html/ord-streamcorridor.htm, with some excellent, broader information found at http://www.anjec.org/html/waterresources.htm .

Normal, Illinois is an example of a municipality that implemented an effective long-term storm water management program, and is cited as producing tangible results at a minimal cost. The URL is http://www.normal.org/Resident/Stormwater.asp

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