

# Stewardship of the Wild & Scenic Tohickon Creek

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February 6, 2006

## **Abstract**

A vast majority of the Upper Bucks and the Lower Delaware River community agree that Lower Delaware River, its tributaries and watershed should be protected from degradation. There are signs that current and imminent human activity endangers this protection goal. The question arises, “Who or what institutional entity has been given the authority to enforce this will of community?”

## **Background**

From Upper Bucks County, we have been watching development, often referred to as Urban Sprawl, spread northward for many years. Some view this as an opportunity to receive economic value for their property; they cite the right of others to enjoy the area's beauty. The question many others ask is “Will we lose the very attributes that make this area so special?” The qualities that many value are:

- the Exceptional Value and Wild and Scenic streams that serve our residents as park amenities, game land water sources, recreational waters, and scenic vistas,
- the ample and pure on lot water supply residents currently enjoy. and
- the wetlands that cover large areas of townships and the wild life that live there.

Most of the characteristics of the region that we value, have water as a common theme. Some of us focus on wild life; some on hunting and fishing, others value the hydrological the ecosystem, or use our water for white water canoing or swimming. Others simply enjoy the scenery. These regional features add considerable value to our properties and community. However else we may use or appreciate our water resources, almost all of us are concerned with our water supply.

We recognized that Urban Sprawl would be a threat decades ago and prepared for the impending conflict between home owners and developers. We petitioned to have both the Tincum and Tohickon Creeks recognized as Exceptional Value waterways; the Tincum was given this designation, the Tohickon was not. The Tohickon was designated, however, as part of the Federal Lower Delaware Wild and Scenic Rivers System. We have crafted township ordinances to protect our water supply, and manage the impact of waste water disposal. We have studied and protected our wetlands, protected our scenic vistas and open space, maximized precipitation as a resource in our stormwater management, all to protect the rural character and natural resources of the region.

Essential to our stewardship of these resources, we recognize there is an interrelationship of the elements of the water cycle and have reflected this in our municipal regulations. These elements include

- recognizing the pollution that human activity produces, in this case surface water pollution ,
- maintaining water quality for the health of both the people and the fauna in the water shed,
- maintaining minimum stream base flow by managing groundwater withdrawal and recharge,
- encouraging those practices land use planning which improve water quality and quantity, and

- ranking sewage options by their ability to return waste water to the aquifers, remove pollutants<sup>1</sup> and have inherently failure-free operations.

The Lower Delaware River was added to the National Wild and Scenic River System in November 2000 with the signing of Federal legislation designating specific segments of the river as part of the National Park Service - Partnership Rivers Program. Residents of the area were active in developing the goals of this partnership. In summary they are:

- Water Quality – Maintain existing water quality in the Delaware River and its tributaries from measurably degrading and improve it where practicable.
- Natural Resources - Preserve and protect the river’s outstanding natural resources.
- Historic Resources - Preserve and protect the character of historic structures, districts and sites, including landscapes, in the river corridor.
- Recreation – Encourage recreational use of the river corridor that has a low environmental and social impact and is compatible with public safety, the protection of private property and with the preservation of natural and cultural qualities of the river corridor.
- Economic Development – Identify principles for minimizing the adverse impact of development within the river corridor.
- Open Space Preservation – Preserve open space as a means of maximizing the health of the ecosystem, preserving scenic views and minimizing the impact of new development in the river corridor.

The Bucks County Planning Commission recognizes that the Tohickon Creek has been identified as a Priority 1 preservation area in the *Natural Areas Inventory of Bucks County, Pennsylvania*.

## **Issues**

Our particular job of stewardship to the Wild and Scenic character of the Lower Delaware is to protect the Tohickon Creek. The question we must ask is “How do we achieve these goals for the Tohickon?” The overriding threat to the Tohickon Creek is water quality degradation due to development.

The health of the stream and its biota depends on an adequate minimum base flow, good water temperature, acceptable pH, plentiful dissolved oxygen and high water quality. Currently and historically, these elements have been present in the Lower Tohickon.

Explosive development in the watershed, however, particularly along the Deep Run tributary, threatens the exceptional value qualities of the stream. Most particularly the pollution from waste water disposal that transcends municipal boundaries is the issue. The most prominent pollutants found in our area are

- N(itrates),
- P(hosphates),
- Particulates,
- Endocrine disrupters,
- Health care products, excreted and not removed, and
- Fecal coliform and streptococcal bacteria.

These last three would be dangerous for recreational contact during summer low flow conditions. These are all attributable to development.

We need to be able to predict the level of development and wastewater treatment that will preserve

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<sup>1</sup> Those options which export water from a watershed or increase evapotranspiration are unwelcome, for example.

the water quality and quantity of the Tohickon.

First, with the goal of quantifying the pollution on the Lower Tohickon, we should estimate the sources of the pollution and set limits. For example, one can do this by calculating balances of the quantity of the N(itrates) and P(hosphates) into and out of the watershed.

- 1) Estimate the input. Assume that the only input is from the two major sewage plants, the Dublin plant on Stonebridge Rd and the Bedminister plant on Elephant Rd. (Although there are a few additional individual sewage permits, their contribution is minor in comparison.) The monthly Discharge Monitoring Reports submitted to the Bucks County Health Department (BCHD) should supply us with the data. However, the monthly report for Dublin Boro STP does not report nitrates at all, nor phosphates before April 2005. For the Elephant Road plant we have only plant design numbers.

We do, however, have some screening water analyzes taken up and down stream of these facilities this summer. The data indicate that the Dublin Plant is not reducing nitrates significantly. With the dilution from the up stream flow, this would not be inconsistent with raw sewage nitrate concentration of 45 ppm N(itrate). The Dublin Plant was discharging roughly 19 #/d P(hosphates) from the April 2005 BCHD report. These assumptions are supported by green algae growth below the Dublin Plant.

There are known non-point sources of nitrates, for example, from farming along the creek. While it has been difficult to estimate the loading from these sources, they would only exacerbate the conclusions of this study. The Bedminster Conservancy has been addressing this issue in conjunction with the Township. It is suspected that its contribution to the nitrate loading would be significantly less than that projected to come from development.

The tables below illustrate the present conditions<sup>2</sup> and the probable consequences of projected development on N(itrates). Are these estimates consistent with Wild & Scenic Rivers program?

Table 1  
Current Sewage Plants  
Estimated Creek Nitrate Concentration for  
Various Stream Flows and Sewage Treatments  
at Iron Bridge Rd USGS Gaging Station

| Sewage Plant            | Flow Rate gpd | NO3 ppm   | Nitrate #/d | NO3 ppm | Nitrate #/d |
|-------------------------|---------------|-----------|-------------|---------|-------------|
|                         |               | Untreated | Untreated   | Treated | Treated     |
| Dublin Stonebridge      | 400000        | 45        | 150.15      | 10      | 33.37       |
| Bedminister Elephant Rd | 200000        | 10        | 16.68       | 10      | 16.68       |
| Total gal/d             | 600000        |           | 166.83      |         | 50.05       |
| Total #/d               | 5005000       |           |             |         |             |

| Tohickon Flow Rate | Estimated Nitrate Concentrations for Various Flows and Treatments |          |           |         |
|--------------------|-------------------------------------------------------------------|----------|-----------|---------|
|                    | Cu Ft /Sec                                                        | lbs/d    | NO3 ppm   | NO3 ppm |
|                    |                                                                   |          | Untreated | Treated |
|                    | 1.9                                                               | 10243584 | 16.29     | 4.89    |
|                    | 6                                                                 | 32348160 | 5.16      | 1.55    |

Note: The 10<sup>th</sup> percentile flow rate of the Tohickon Creek at Iron Bridge Rd is 6 cu ft /sec; 50<sup>th</sup>, 76 cfs and 80<sup>th</sup>, 200 cfs. A mean daily flow rate of 1.9 cfs or less is expected once per/year. (Data since 01/01/1971)

<sup>2</sup> These estimates are of limited accuracy due to inadequate data. All sewage plants should be required to report measured nitrate N and phosphorous. However, these calculations do indicate the nature of the problem.

Table 2  
Impact of Projected Sewage Plants  
on Tohickon Water Quality @ USGS Gaging Station

| Sewage Plant           | Flow Rate gpd | NO3 ppm Effl<br>Untreated | Nitrate #/d<br>Untreated | NO3 ppm<br>Treated | NO3 #/d<br>Treated | ft <sup>3</sup> /sec |
|------------------------|---------------|---------------------------|--------------------------|--------------------|--------------------|----------------------|
| Dublin Stonebridge     | 400000        | 45                        | 150.15                   | 10                 | 33.37              | 0.62                 |
| Bedminster Elephant Rd | 200000        | 10                        | 16.68                    | 10                 | 16.68              | 0.31                 |
| Cactus Grill           | 100000        | 10                        | 8.34                     | 10                 | 8.34               | 0.15                 |
| Tinicum                | 200000        | 10                        | 16.68                    | 10                 | 16.68              | 0.31                 |
| Total                  | 900000        |                           | 191.85                   |                    | 75.07              | 1.39                 |
| Total #/d              | 7507500       |                           |                          |                    |                    |                      |

  

|                          | Cu Ft /Sec | lbs/d     | NO3 ppm<br>Untreated | NO3 ppm<br>Untreated |
|--------------------------|------------|-----------|----------------------|----------------------|
| Undiluted sewage         | 1.39       | 7507500   | 25.55                | 10                   |
| Lower Tohickon Flow Rate | 1.9        | 10243584  | 18.73                | 7.33                 |
|                          | 6          | 32348160  | 5.93                 | 2.32                 |
|                          | 76         | 409743360 | 0.47                 | 0.18                 |

Table 2 is based on available NPDES applications as of September 2005. It is assumed that the Dublin Stonebridge Rd Plant has no nitrate reduction capability. This would be consistent with the measured nitrate level in the Deep Run downstream of the facility.

Table 3  
Estimated Water Quality based on  
Projected Developments @ USGS Gaging Station

|                                        | Units | NO3 #/d @<br>2.7 per/HU | H2O gpd  |
|----------------------------------------|-------|-------------------------|----------|
| <b>Bedminster</b>                      |       |                         |          |
| Pulte-Bedminster Square                | 237   | 17.53                   | 47992.5  |
| Piper-Kulp Farm                        | 173   | 17.54                   | 35032.5  |
| Piper Bedminster Hunt                  | 99    | 10.04                   | 20047.5  |
| THP-Cliffside                          | 64    | 4.73                    | 12960    |
| THP-Wickham                            | 35    | 2.59                    | 7087.5   |
| Heritage-Bedminster Xing               | 64    | 4.73                    | 12960    |
| Stonebridge                            | 285   | 28.89                   | 57712.5  |
| Total                                  | 957   | 86.05                   | 193792.5 |
| <b>Tinicum</b>                         |       |                         |          |
| Wehrung-Cooper                         | 268   | 19.82                   | 54270    |
| Ottsville Square                       | 192   | 14.2                    | 38880    |
| Durham Village                         | 63    | 4.66                    | 12757.5  |
| Durham Quarters                        | 16    | 1.18                    | 3240     |
| Tohickon Valley Farm                   | 60    | 4.44                    | 12150    |
| Future Growth                          | 170   | 12.58                   | 34425    |
| Donner Apts                            | 4     | 0.3                     | 810      |
|                                        | 773   | 57.18                   | 156532.5 |
| <b>Dublin</b>                          |       |                         |          |
| Sewage Plant                           |       | 150.15                  | 400000   |
| <b>Grand Total</b>                     | 1730  | 293.38                  | 750325   |
|                                        |       |                         | cuft/sec |
| Estimated NO3 ppm<br>w/o NO3 reduction |       | ppm                     | 1.16     |
| Lower Tohickon @ 1.9 cfs               | 1.9   | 28.64                   |          |
| ' @ 5.4 cfs                            | 5.4   | 10.08                   |          |

Table 3 estimates the total nitrates created from the **current** residents in Bedminster, Dublin and Tinicum plus the **proposed** developments before the townships boards that would use sewage plants. The assumptions are that there will be on average 2.7 occupants per housing unit (HU). Furthermore, it is assumed that each occupant produces 10 pounds of nitrate per year and that each occupant will produce 75 gallons per day of waste water. It is proposed that there be 1730 units in the Lower Tohickon Watershed. These assumptions would estimate the creation of 293.38 pounds of nitrates per year and 730325 gallons per day of waste water. This is equivalent to 1.16 cubic feet per second, about 60% of the Tohickon at minimum flow. Without nitrate remediation, this would suggest that the Lower Tohickon would have nitrate levels greater than the drinking limit of 10ppm 8.5% of the time.

## **ISSUES**

Issue 1. Pollutant Loading. Currently the pollution measure is focused on the use of the Tohickon as a source of drinking water. the Commonwealth doesn't anticipated potable water withdrawals. However, some data indicate that, like the Tinicum, the Tohickon may have losing reaches that supply nearby domestic wells with water. Use for fishing, state and county park facilities, and swimming apparently have no water pollution standards. There is a need for a target pollutant loading (in the maximum pounds of pollutants per day) that would

- define a maximum tolerable pollutant concentration at low water flow rates on the Tohickon, while
- protecting the diverse existing uses.

From Table 3 we see that there is a potential for the nitrate concentration in the Lower Tohickon at low flow to be in excess of 20 ppm, over twice the drinking water limit.

Issue 2. Non-reporting of critical pollutant elements. These estimates are the best available within the available data. See for, example Dublin Sewage Plant on Stonebridge Rd. All sewage plants should be required to report monitored N(itrate) and P(hosphorous) concentrations. However, these assumptions and calculations indicate the magnitude of the problem as an incentive to a more complete study and monitoring program.

Issue 3. Failure of sewage plants. Private/Subdivision Package plants are notoriously prone to failure. The most immediate example is the now closed Stonebridge Estates package plant.<sup>3</sup> Private sewage plants represent tied up capital and operating management attention; neither of which are attractive to developers.. Operation and maintenance of a package plant by a home owners association is onerous, and required professional consultation and assistance. Such plants are frequently neglected and fail.

Issue 4. Permitting process based on individual sewage facilities. If there is a limited pollution capacity, is the allocation of that capacity "First come, first served."? This has become the Tragedy of the Commons<sup>4</sup> as everyone scrambles to exploit the resource which then destroys the resource. There has to be

1. a formal recognition of a total pollutant capacity of this Wild and Scenic Stream and then
2. a formal regulatory enforcement of that policy.

The PADEP is entrusted to protect our resources against degradation.

## **Water Quality Antidegradation Implementation Guidance<sup>5</sup>**

<sup>3</sup> The plant had been regularly discharging excessive levels of fecal coliform.

<sup>4</sup> *Tragedy of the Commons* Science 13 Dec 1968 p1243-1248

<sup>5</sup> *Water Quality Antidegradation Implementation Guidance* PA/DEP Doc # 391-0300-002 Nov 29, 2003

**POLICY:** It is the policy of the Department of Environmental Protection DEP to protect the existing uses of all surface waters, and the existing quality of High Quality (HQ) and Exceptional Value (EV) Waters. Existing uses are protected when DEP makes a final decision on any permit or approval for an activity that may affect a protected use. Existing uses are protected based upon DEP's evaluation of the best available information {which satisfies DEP protocols and Quality Assurance/Quality Control QA/QC) procedures} that indicates the protected use of the waterbody, For a new, additional, or increased point source discharge to an HQ or EV water, the person proposing the discharge is required to utilize a nondischarge alternative that is cost-effective and environmentally sound when , compared with the cost of the proposed discharge.

These resources are threatened by the development which is degrading the water quality of the Lower Tohickon. This *Taking of Value* by private development has not been agreed to by the community holders of these values.

### **Additional Unresolved Issues**

1. What accountable institution is responsible for the Lower Tohickon? The abutting municipalities, the State, the Delaware River Basin Commission, the Federal Government through the National Park Service as mandated by the Wild and Scenic designation or the Federal EPA?
2. How is this institution to be held accountable?
3. How does one allocate such a limited resource as the pollution capacity of the stream?
4. What Total Maximum Daily Loadings (TMDL) have been set? Should be set?
5. What coordination of land use planning is there? Should there be?
6. Would (Should) there be pollution (emission) resource trading?
7. Shall we continue to be unregulated until a solution is found (resource maybe destroyed) or we seek an injunction until there is participant agreement?