

# Town Water Problems and Solutions

## Town of Chevy Chase

Environment Committee

Water Subcommittee

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## Overview and Mission

The Town's Water Subcommittee was tasked last summer to devise feasible steps (in collaboration with the County) that can be taken with regard to storm water management issues, impervious surface lot coverage, and drainage. Three missions were given the Subcommittee by the Steering Committee:

*Short-term mission:* Devise feasible steps (in collaboration with the county) that can be taken with regard to water management and impervious surface coverage on individual lots to minimize flooding and drainage issues.

*Mid-term mission:* Work with town manager and a municipal water engineering contractor to assess the town drain infrastructure and its capacity.

*Long-term mission:* Initiate a public education program to inform residents and contractors about the options available for minimizing or diverting lot water runoff; demonstrate sustainable water management system; coordinate work with other neighborhoods in the Potomac watershed, and oversee the building plans as they relate to water management.

In pursuit of its short-term mission, the Subcommittee set to work gathering information on water problems in the Town, conducting a survey of residents about these, interviewing experts and other jurisdictions with expertise to offer, and deliberating in a series of weekly meetings about what would best serve Town residents, now and in the years to come.

Using the information gathered as described below, the committee developed a water drainage ordinance, in Appendix A, to satisfy its short-term mission. The ordinance has been reviewed by subcommittee and Steering Committee members, Town staff, external counsel, the Town attorney, civil engineers, builders, and Maryland Department of the Environment staff and others for its relevance, impact, scope, and potential problems. The final (40<sup>th</sup>) version is the result of an iterative process that took eight months. It is being presented to the Steering Committee for approval and transmission to the Town Council for deliberation and enactment.

## Historical Setting

Since the development of the original portions of the Town, residents have reported experiencing water problems. Surveying maps of the Town, it is clear that the primary storm drains were developed over the natural channels formed on Meadow, and Leland/Maple flowing towards Coquelin Run at East-West highway and Maple. Many of the original homes in the Town were built on foundations of honeycomb terracotta blocks, which have proved prone to leakage. The Town is hilly, with several natural drainage channels, including the aforementioned stream beds. In discussions with the County, it is apparent that the Town's storm drain infrastructure is quite old, and there are no accurate up to date system maps.

## Information Gathering Process

The subcommittee initially met with representatives from the Montgomery County Storm Water Division and the Building Permits Department to draw upon their expertise, experience and suggestions. The Subcommittee also found that the Town had little historical data on water drainage issues on record; most information was anecdotal. In order to gain more empirical data on water issues, a Town-wide survey instrument was developed. The survey was mailed to the Town residents, asking them to provide information on the type and magnitude of water problems they have experienced.

The results of this survey, which are detailed later in this report, validated that there are a substantial number of residents that have been adversely impacted by water drainage issues. The Town received 377 responses out of 987 occupied homes in the town, a response rate of 38%, a testament to the legitimacy of the concern.

The subcommittee also examined how other municipalities, both in Maryland and in Virginia, have addressed water drainage issues, either those related specifically to new house construction or to water management generally. It also looked into various water management tools and mechanisms.

In drafting the ordinance, Subcommittee members met with and had numerous telephone conversations with experts from the Maryland Department of the Environment, whose comprehensive Stormwater Manual is used as a baseline reference tool for water management, and is referenced in the ordinance.

In the subcommittee's first weekly meetings, it was agreed that any ordinance would have to exempt small construction projects so that the burden on the property owners and the town staff would not be unreasonable. Therefore, an ordinance was written that exempted additions having a footprint less than 700 square feet. Construction activity over this size or new homes would have to implement measures to control rain runoff by retaining runoff for a three-month storm event for 24 hours. A three-month storm event encompasses 90 percent of the annual storms. Storm events over this size could be diverted to the street. Construction projects requiring water management would require a water drainage plan and a maintenance agreement for owners that obligated them to keep their water control measures in good repair. The ordinance provides for variances and an appeal process to a newly established Water Appeals Board.

Finally, the committee hosted several panels to seek input from experts in architecture, construction, engineering, and environmental water management. In addition, several concerns relevant to water mitigation were identified during the December Visioning Committee exercise. These concerns, as well as comments from citizens in our public meetings, have been considered by the subcommittee as well.

## ***Meetings with Montgomery County***

Meetings were held with the Montgomery County Storm Water Division, and with the Building Permits Department. Key points from the meeting with the Storm Water Division were:

- The Town's storm drain system was old and not well documented.
- The County performs maintenance on the drainage system on an "as needed" basis; it is done by the same public works employees who remove snow and trim trees.
- There is no regular inspection of the storm drain system.
- The county appeared to be quite familiar with our storm drains; the system is supposed to handle a "10 year storm event", and the County feels that it has that capacity.
- The only known case of recent flooding at the storm drains, was the event at East and Stanford in the summer of 2004, they felt this was due to obstructed inlets, not overtaxing of the system.
- The County would be interested in any other data that the Town can provide.

The meeting with the Permits Department was to discuss their view on water management. Key points from this meeting were:

- They do not require any special stormwater permits for single residence projects; they are more concerned with overall stormwater systems as part of new developments or similar macro projects.
- They did indicate that the Town could adopt its own stormwater guidelines and ordinance in conjunction with the Maryland Department of the Environment (MDE) regulations.
- The county would not need to approve the Town's stormwater rules if they meet the MDE requirements.
- They also provided advice on specific water mitigation measures. Most notably, they felt that adequate conditioning of the soil prior to sodding would help.

## ***Survey***

During the September/October 2005 time period, the Water Subcommittee conducted a town-wide resident survey (see Appendix B) to gather reference points, insights, and some directional information as to the types and magnitude of water related issues facing the Town's homeowners. The Town received 377 responses from 987 occupied homes. The appendices contain the survey questionnaire, a summary of the responses, and graphics depicting the responses. A graphic representation of the distribution of various water issues overlaid on a town map appears on the title page of this report.

Key points from the survey results are as follows:

While over half the respondents had flooded basements, we can not make any general conclusions as to whether new construction is a cause of water problems.

Some residents report an increase in recent years of incidents of flooded yards, flooded basements and slippery or frozen sidewalks. Some attribute the increase to nearby construction.

Others indicated that flooding has been going on in the town for years and is not related to recent construction.

Several suggested that the increases in flooding did not happen immediately, but over time. Many houses have older terra cotta foundations that are starting to disintegrate slowly, and some residents near newer construction reported actual improvements (lessening) in flooding after the new construction was finished.

We do know that the average (mean) amount per household spent to deal with stormwater is \$3,070, spread out over a number of years.

Storm drains (or lack thereof) seem to be a problem in much of the town. Looking at the survey results map supports assertions from residents around certain locations (for example, Stanford and East, that more and/or better drainage infrastructure is necessary.

While it is often difficult to affirmatively correlate construction with drainage complaints, it is undeniable that water drainage problems routinely occur in the Town.

## ***Expert Panels***

At the September 29, 2005 and October 6, 2005 public meetings, builders, architects, and water experts attended, at our invitation, to answer questions shown in Appendix C and to give their opinions on related matters. We summarize their discussion here. A more complete version is in the meeting minutes, available in the Town Office or on the Town website at <http://www.townofchevy Chase.org/c/141>.

The Subcommittee met with the following experts:

Kim Currano, Greenhorne & O'Mara  
Paul Davey, Studio Z  
Carlos Fernandes, Chase Builders (resident)  
Michael Fox, Fox Architects  
Stephen Muse, Muse Architects (resident)  
Curt Schreffler, CAS Engineering  
Charles Wallis, Maryland Dept. of the Environment  
Neil Weinstein, Low Impact Development Center  
Bryan Whittington, Whittington Design Build

In general, they agreed that:

- The Town drains were designed for an earlier age; they must be maintained and rebuilt periodically, and their typical lifecycle is about fifty years;
- Each site is unique and has its own competing considerations of trees, water, design, marketability, owner desires, etc.;
- Any ordinance should allow flexibility as sometimes rules conflict (for example, what is best from the point of view of trees may cause problems for drainage management);

- The Town should do better/more frequent inspections/enforcement of drainage plans and mechanisms, and not rely on the County’s cursory enforcement or review;
- It would be better if a concept plan were available at the design stage and a meeting held by the builder with the Town *before* going for County permit on final design.

In addition, some but not all thought that:

- Any new water regulations must protect people with old terra cotta foundations;
- Many new houses are out of scale; two wanted a design review process;
- There is typically too much impervious surface on many plans;
- An education program is needed to inform residents about the desirability of keeping their drains clear of leaves, etc.;
- Drainage (and tree) review should be done by Town staff or consultants during regular business hours, not by a volunteer committee with evening meetings, since this burdens builders (the counterargument here is that daytime meetings make it a burden for working residents to fully participate).

Details of the questions asked of these panels and their responses are found in Appendix C.

### ***Other Jurisdictions Considered***

The subcommittee looked into previous experience with storm water management in the Village of Chevy Chase, Takoma Park and Garrett Park. It also studied how the Maryland Department of the Environment (MDE) regulates storm water management. MDE provides a model ordinance for local jurisdictions to follow. After several iterations of the ordinance were drafted and discussed with MDE, it was determined that a Town ordinance did not need MDE approval if it only regulates lot-to-lot drainage, and not water quality. Consequently, the Subcommittee drafted a more concise ordinance that deals with the Town’s specific drainage issues and nothing else.

The Committee considered the new Montgomery County bill 26-05 (introduced by Councilmember Nancy Floreen in Fall 2005) but felt it was too vague and ultimately unenforceable. Based on numerous concerns expressed by residents, it decided to have performance-based (rather than “best efforts”) standards in the Town ordinance. These will be unambiguous for both residents and builders and should, we hope, diminish the apparently increasing number of complaints about excess drainage from neighbors’ properties.

Chairman Hoffman visited Councilmember Floreen and Vice Mayor Barnes testified on behalf of the Town in favor of stricter standards at a hearing before the County Council Committee.

Chevy Chase Section 3 has recently enacted a law similar to the Floreen Bill. However, for the aforementioned reasons, we decided not to go in this direction.

### ***Other Information Collection and Advice***

- David Podolsky, an attorney retained by the Town, provided comments on our draft ordinance throughout the process.
- Charles Wallis from MDE met and sat in on conference calls to provide advice.
- CAS Engineering was retained by the Town to provide outside review of several versions of the ordinance.
- Chairman Lance Hoffman of the Subcommittee met on several occasions with Todd Hoffman, the Town Manager, to discuss the workability of the ordinance.
- Mike Gravitz (Subcommittee member) provided a Water 101 overview to the subcommittee. From this overview, the subcommittee determined that if measures were put in place on a site that could control up to a three month storm, which has one inch of rainfall, 90% of the Town's drainage runoff would be controlled.

## **Conclusions**

### ***Short Term Issues***

The short term mission of the Subcommittee is as follows:

“Short Term: Devise feasible steps (in collaboration with the county) that can be taken with regard to water management and impervious surface coverage on individual lots to minimize flooding and drainage issues.”

For the short term, the subcommittee recommends:

1. passage of the Water Drainage Ordinance for the reasons described above in this report;
2. as required by that ordinance, appointment of members to the Town Water Appeals Board;
3. development of educational information on drainage runoff along with information on practical abatement techniques available for residents.

The Water Drainage Ordinance is described in more detail below.

### ***Intermediate Term Issues***

The mid-term mission of the Subcommittee is as follows:

“Mid-term mission: work with Town manager and a municipal water engineering contractor to assess the town drain infrastructure and its capacity”

Like the Town itself, the storm water system was built in a piecemeal fashion. Some sections of the storm water system may not be linked together. There are indications that this drainage infrastructure may now be insufficient to handle the increase in runoff in certain areas, and that certain areas of the town are lacking in drain inlets as compared to other sections of the Town. Consequently, the subcommittee recommends that the Town proceed with the engineering study that had almost commenced in 2005 but was suspended when the six-month building moratorium went into effect.

## ***Long Term Issues***

The long term mission of the Subcommittee is as follows:

Long-term mission: initiate a public education program to inform residents and contractors about the options available for minimizing or diverting lot runoff; demonstrate sustainable water management system; coordinate work with other neighborhoods in the Potomac watershed, and oversee the building plans as they relate to water management”

The first and last items under the Subcommittee’s charge in “Long Term Actions” actually must be done in coordination with the implementation of the drainage ordinance, and thus should be accelerated as discussed earlier.

Regardless of the level of success with containment in new construction, drainage issues are likely to increase as a result of Town-wide loss of open surface for water absorption. Projects that use a bigger footprint than existing property, paved driveways, patios, and basketball courts all contribute to a loss of permeable surfaces. The Town and its citizens need to be mindful of the impact of these projects.

At this writing, there is an effort at the State level to grant the Town overlay authority. If this is successful, the Town could have the authority to establish a maximum impervious coverage rule for all lots. Several local jurisdictions have already enacted similar regulations to lower the percentage of lot coverage. Other jurisdictions, such as Arlington County, are contemplating utilizing Chesapeake Bay Area Watershed standards for determining lot coverage. The Town needs to monitor these developments.

The subcommittee feels that benefit can be gained from an educational program that explains the significance of water runoff to the load on the Town’s drain system and encourages use of simple abatement techniques (e.g., rain barrels, rain gardening, redirection of roof downspouts). In addition, benefit can also be gained from an education / awareness campaign on the amount of polluted runoff flowing from the Town into Coquelin Run, the Potomac River and ultimately the Chesapeake Bay. Information on this could easily be included in the general public information handbook for Town residents. Finally, the pollutant level in stormwater runoff is of increasing

regional concern, and we believe that the Town and its residents should be aware of and take sensible steps in our local community to address this.

## **Recommendations for Immediate Action**

*For the short term, the subcommittee recommends:*

- 1. passage of the Water Drainage Ordinance for the reasons described above in this report;*
- 2. as required by that ordinance, appointment of members to the Town Water Appeals Board;*
- 3. development of educational information on drainage runoff along with information on practical abatement techniques available for residents.*

### **Water Drainage Ordinance**

#### **Highlights of Ordinance**

The complete ordinance and a Power Point presentation on it are given in Appendices A and E2. This section highlights how the ordinance addresses some oft-heard concerns from residents.

The subcommittee's survey, recorded comments during moratorium public hearings, and participants in the Visioning Day exercise all identified concerns about lack of transparency during construction projects and the tendency for neighbors to be notified too late in the development process to have an opportunity for meaningful exchange. Particularly when substantial earth contouring, regrading or excavation will be involved, residents want to be included early on.

In the subcommittee's first weekly meetings, it was agreed that any ordinance would have to exempt small construction projects so that the burden on the property owners and the town staff would not be unreasonable. Therefore, an ordinance was written that exempted additions having a footprint less than 700 square feet. For construction activity over this size (and thus for almost all new homes), measures that retain rain or snow runoff for a three-month storm event for 24 hours on the property must be put in place. For storm events over this size, overflow rainwater can be diverted to the street. (A three-month storm event encompasses 90 percent of the annual storms.)

Construction projects to which the ordinance applies require a water drainage plan and a maintenance agreement that obligates owners to keep their water control measures in good repair. The ordinance provides for variances and an appeal process to a newly established Water Appeals Board.

Other highlights of the ordinance include:

- Before any permits are approved for new projects with a footprint of over 700 square feet (for example a teardown, a major addition that significantly enlarges the footprint of the house, or a large landscaping project), the applicant files a water drainage plan with the Town. These water drainage plans require that drainage from an upstream property will be held and distributed over the property in a manner that mitigates the problem for downstream neighbors.
- Once the Town receives the plan, it will be delivered by the Town to all owners of adjacent and confronting properties and an opportunity made available to all members of the public to inspect and comment upon the proposals.
- Any discharge towards the street cannot run over the sidewalk, but rather must be channeled under the sidewalk and through curbing.
- The ordinance has a refundable performance bond provision that ensures that for the first year after construction, monies will be held in escrow, in case a water drainage problem appears that was not effectively controlled by the filed water drainage plan.
- For these properties, the maintenance schedule conveys with deed to that property, ensuring that any future owners have both access to the information and an understanding of their responsibility (which usually will just mean keeping things cleared out and functional).

Enforcement of the ordinance has been coordinated to mesh with the updated Enforcement Ordinance, scheduled to be introduced in April 2006. Violation of any provision of ordinance or of an approved Water Drainage Plan is a municipal infraction, subject to a fine of up to \$1,000 for each day. Repeated violation is a misdemeanor, with a fine of up to \$1,000 per day or prison up to six months or both. The Town Manager may issue a stop work order in appropriate circumstances.

## **Workability and Costs**

The Mayor and Town Manager raised concerns about the workability and cost of a drainage ordinance, and Councilmember Enelow, Council liaison to the Environment Committee, always had these issues in mind, so the Town commissioned a short study by CAS Engineering, a well-known engineering firm that has done work for Pat Keating, who has built a significant number of new houses recently in the Town, and for others. The purpose of the study was to analyze the proposed drainage management ordinance.

After a draft of their report was received, a meeting was held with Lance Hoffman, CAS, MDE, Town Manager Todd Hoffman, and Councilman Rob Enelow. The consensus was that a drainage ordinance would address the most immediate concerns of town residents while not requiring a lot of excess wording and regulation meant mainly to deal with stormwater quality as well as quantity, often written for larger lots than we have in the Town. At that time and in subsequent phone and email conversations, the Subcommittee elicited from CAS (and from Bryan

Whittington, a builder with Whittington Design Build) ranges of expected financial costs for a property owner, given the scaled-down ordinance we were then considering.

It also received expected financial costs to the Town for plan review, administration, management of the permitting process, and inspection of all projects subject to this ordinance; the administrative implications to the Town in terms of additional staffing, consultative needs, implementation costs, and other resources; and whether the Town would need to have a civil engineer on staff or on a consulting basis to review the plans and perform inspections.

With help especially from Don MacGlashan on the computations and the Town staff with scanning, it examined every building permit in the period August 2003 through June 2005 except for those related to new construction or tear-downs to see how the proposed ordinance would financially have affected the homeowners who were building significant additions. The subcommittee wanted to verify that it was not proposing something that presents a significant financial burden for current homeowners.

## **Cost to Owners**

The actual data (Appendix D) was analyzed. Based on this analysis, the subcommittee recommends exempting lots with less than a 700 square feet footprint from the ordinance. Many residents doing moderate additions will have their projects exempt from the ordinance. Based on the two years' worth of data we are using, we find that the estimated incremental cost for complying with the ordinance (over and above current requirements) is \$15,200. The percentage cost increase for the average job (mean value = \$373,800) would be 4.1%. Fully 35% of the properties that put on additions would have been exempt from the ordinance. This data does not include teardowns or complete new buildings, none of which we expect would be exempted.

The subcommittee considered and rejected a lower cost alternative that would allow much more drainage/runoff in the street; we felt that this would be essentially abandoning our aforementioned short term goal and that the projected costs for the larger additions that require a water drainage plan and for new houses are not that burdensome, given the overall cost of these projects.

Some projects will require additional drainage structures which must be examined periodically to insure they are not collecting debris and becoming blocked. In almost all cases, the owner will be able to do this himself or herself, or hire local labor (for example, Town Teens) to do the usually uncomplicated tasks such as clearing infiltration trench inlets when they get clogged (under a half hour's work). This can also be professionally done.

## Cost to Town

Additional costs to the Town would in essence be the cost of a (contract) civil engineer to inspect and monitor development activity on large additions and tear-downs and new homes. Based on past data, we assume 23 permittees per year requiring this work for additions and another ten new home permittees (demolition permits) per year, resulting in 33 construction projects costing an average of \$1,950, based on the outside estimates we were given. Thus, the incremental cost to the Town would be \$64,350 per year.

In addition, we project a one-time cost for education program development of \$20,000 and a one-time cost (perhaps to a contract civil engineering firm or perhaps done by Town staff) for establishing formal procedures, design guidelines, agreements, forms, etc., of \$15,000. Thus, we project total one-time (start-up) costs of \$35,000.

These costs can partially or completely be recovered by additional fees related to the relevant permits. The Committee recommends that the Town increase various permit fees to cover part or all of these costs. Some possibilities are illustrated in this table:

<i>TOTAL ADDED ANNUAL COSTS TO TOWN BEFORE ADDITIONAL FEES</i>	\$64,350	\$64,350	\$64,350	\$64,350
Additional building permit fee for new houses	\$1,000	\$1,250	\$500	\$0
Additional building permit fee for nonexempt additions	\$500	\$500	\$500	\$0
Additional demolition fee for structures over 1000 sf	\$4,285	\$1,250	\$500	\$0
Total in additional fees received by town	\$64,350	\$36,500	\$21,500	\$0
<i>TOTAL ADDED ANNUAL COSTS TO TOWN AFTER ADDITIONAL FEES</i>	\$0	\$27,850	\$42,850	\$64,350

Possibilities for Permit Fee-Based Recovery of Water Drainage Ordinance Costs

## ***Accompanying Guidelines***

Voluntary supplementary guidelines are given below. Under the new ordinance, they may also be considered by the Town when deciding whether to grant a permit. Examples (not a complete list) are:

- Impervious surface limits (includes house, garage, tool shed, concrete or asphalt driveway, walkways, stoops, retaining walls, patios, and swimming pools) relative to lot size
- Use of permeable materials for driveways, patios, and sidewalks
- Downspouts pointing onto property, not to neighbors' or street
- Sump pump usage during construction running water through a silt filtration box
- Use of gutter guards or other mechanisms to prevent leaves from clogging up parts of the drainage system
- Decompaction of construction site soil before placement of top soil to ensure maximum infiltration of runoff

## ***Establishment of Water Appeals Board***

A Water Appeals Board is created (similar to the new Tree Board) that hears appeals. This Board may affirm, reverse, or add conditions to the decision of Town Manager. It renders written decisions within thirty days. Persons still dissatisfied can request judicial review in Montgomery County court.

## ***Creation of Town Engineer Position***

A Town Engineer will advise the Town Manager on technical aspects of drainage, carry out inspections, and may also prepare educational programs related to drainage and water management. This could be a contractor or an employee.

## ***Education on Drainage Ordinance and Guidelines***

Education is critical in this effort, and this report is just the first element of several necessary. The education effort will ramp up once an ordinance is passed, and will target homeowners, new residents, builders, realtors, architects, and landscaping and lawn service companies.

# Appendices

## **A. Water Drainage Ordinance**

*(will be inserted after final legal review)*

## ***B. Survey***

# Survey Instrument

Dear Neighbor:

Please take a few minutes to answer the following questions. The Town's Water Subcommittee wants your views on issues and options facing Town residents. Your experiences will help shape our recommendations to the Moratorium Project Implementation Committee.

As you know, we have limited time. Please respond by **October 15**. You can mail the survey back after completion or drop it off at the Town office. Any additional comments about water on your property or in your immediate neighborhood would be most helpful and can be placed on the back of this sheet. Thanks in advance for your help.

1. My property, and homes around us, have faced the following water problems: (Check as many as applicable.)

<input type="checkbox"/> Flooded basement	<input type="checkbox"/> Overflowing storm drains	<input type="checkbox"/> Clogged storm drains
<input type="checkbox"/> Icy sidewalks	<input type="checkbox"/> Flooded yard	<input type="checkbox"/> Standing water
<input type="checkbox"/> Erosion from storm water	<input type="checkbox"/> Sediment buildup	<input type="checkbox"/> Other _____

2. These water problems existed before neighboring construction began.

Strongly agree	Agree	Neutral	Disagree	Strongly disagree	No opinion
<input type="checkbox"/>					

3. My water problems have been worsened by nearby construction.

Strongly agree	Agree	Neutral	Disagree	Strongly disagree	No opinion
<input type="checkbox"/>					

4. Some or all of my water problems have been/are a direct result of neighboring teardowns and construction.

Strongly agree	Agree	Neutral	Disagree	Strongly disagree	No opinion
<input type="checkbox"/>					

5. Have you tried to fix or improve your water problems?

Yes	No	Considering options now
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

If so, how? (Check as many as applicable, and indicate if this worked.)

<input type="checkbox"/> Dry wells	<input type="checkbox"/> <i>Worked</i>	<input type="checkbox"/> Sump pumps	<input type="checkbox"/> <i>Worked</i>	<input type="checkbox"/> Retaining walls	<input type="checkbox"/> <i>Worked</i>	<input type="checkbox"/> Plantings	<input type="checkbox"/> <i>Worked</i>
<input type="checkbox"/> Re-grading	<input type="checkbox"/> <i>Worked</i>	<input type="checkbox"/> French drains	<input type="checkbox"/> <i>Worked</i>	<input type="checkbox"/> Rain barrels	<input type="checkbox"/> <i>Worked</i>	<input type="checkbox"/> Swales	<input type="checkbox"/> <i>Worked</i>
<input type="checkbox"/> Other _____		<input type="checkbox"/> <i>Worked</i>					

6. Approximately how much have you paid to fix your water problems or repair damages to your house or property by a flood or stormwater problem?

Less than \$500	\$501-1000	\$500-\$1000	\$1001-\$5000	\$5001-\$10000	\$10001-\$25000	Over \$25000	No damage
<input type="checkbox"/>							

7. Does stormwater runoff flow from your property onto town sidewalks or streets?

Yes	No	Don't know
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

8. Do Town storm drains on your block get overwhelmed in a large rain and overflow?

Yes	No	Don't know
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

9. Do you have a town storm drain or culvert on your property?

Yes	No	Don't know
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Name: \_\_\_\_\_

Address: \_\_\_\_\_

If there are questions, may we contact you for clarification?  yes  no

Email address: \_\_\_\_\_

Daytime phone \_\_\_\_\_ Evening phone \_\_\_\_\_

Please add additional comments on the back of this sheet, then fold, tape, and return.

# Survey Results

(NUMBER OF SURVEYS RECEIVED = 377)

1. My property, and homes around us, have faced the following water problems: (Check as many as applicable.)

Flooded basement 196 52%	Overflowing storm drains 67 18%	Clogged storm drains 60 16%
Icy sidewalks 146 39%	Flooded yard 129 34%	Standing water 93 25%
Erosion from storm water 89 24%	Sediment buildup 46 12%	Other 36 10%

2. These water problems existed before neighboring construction began.

Strongly agree	Agree	Neutral	Disagree	Strongly disagree	No opinion
98 26%	87 23%	27 7%	37 10%	41 11%	45 12%

3. My water problems have been worsened by nearby construction.

Strongly agree	Agree	Neutral	Disagree	Strongly disagree	No opinion
55 15%	48 13%	45 12%	70 19%	74 20%	47 12%

4. Some or all of my water problems have been/are a direct result of neighboring teardowns and construction.

Strongly agree	Agree	Neutral	Disagree	Strongly disagree	No opinion
42 11%	40 11%	35 9%	65 17%	101 27%	54 14%

5. Have you tried to fix or improve your water problems?

Yes	No	Considering options now
222 59%	60 16%	42 11%

If so, how? (Check as many as applicable, and indicate if this worked.)

[TOTAL, % TRIES OF TOTAL, TOTAL TRIES, % WORKED OF TRIES]

Dry wells 22 6% Worked 7 32%	Sump pumps 93 25% Worked 63 68%	Retaining walls 35 9% Worked 26 74%	Plantings 75 20% Worked 37 49%
Re-grading 136 36% Worked 73 54%	French drains 66 18% Worked 41 62%	Rain barrels 7 2% Worked 3 43%	Swales 25 7% Worked 17 68%
Other 67 18%		Worked 33 49%	

6. Approximately how much have you paid to fix your water problems or repair damages to your house or property by a flood or stormwater problem?

Less than \$500	\$500-\$1000	\$1001-\$5000	\$5001-\$10000 damage	\$10001-\$25000	Over \$25000	No	AVERAGE
51 14%	50 13%	54 14%	41 11% 75 20%	15 4%	15 4%		\$3,070

7. Does stormwater runoff flow from your property onto town sidewalks or streets?

Yes	No	Don't know
171 45%	133 35%	53 14%

8. Do Town storm drains on your block get overwhelmed in a large rain and overflow?

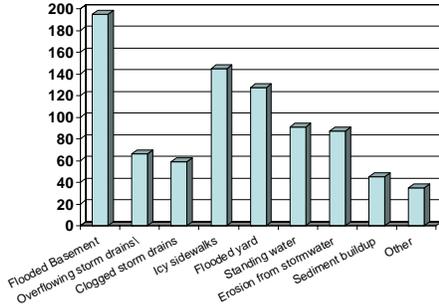
Yes	No	Don't know
117 31%	148 39%	87 23%

9. Do you have a town storm drain or culvert on your property?

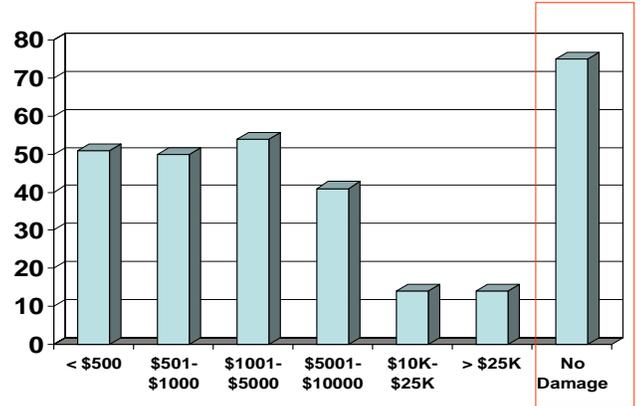
Yes	No	Don't know
55 15%	234 62%	63 17%

# Graphical Representations of Survey Results

Water Problems of Town Residents

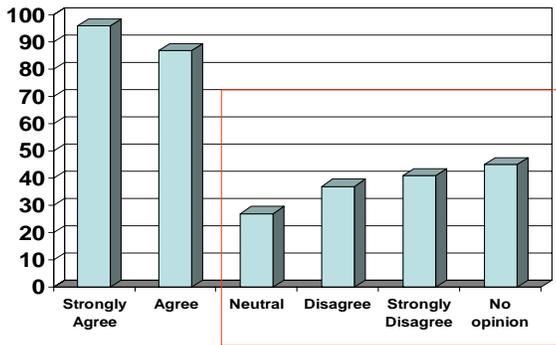


Amount Spent Dealing with Water Issues

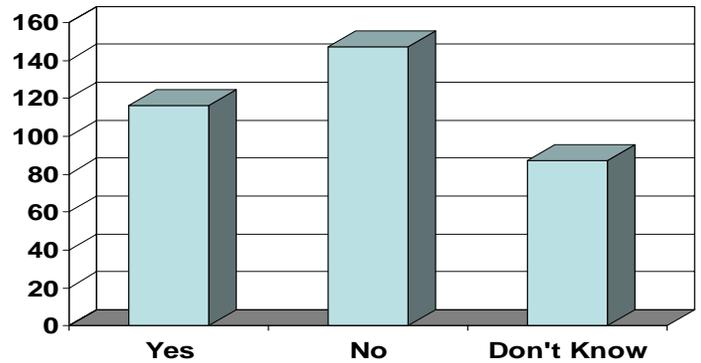


Weighted average spent per house = \$2,973

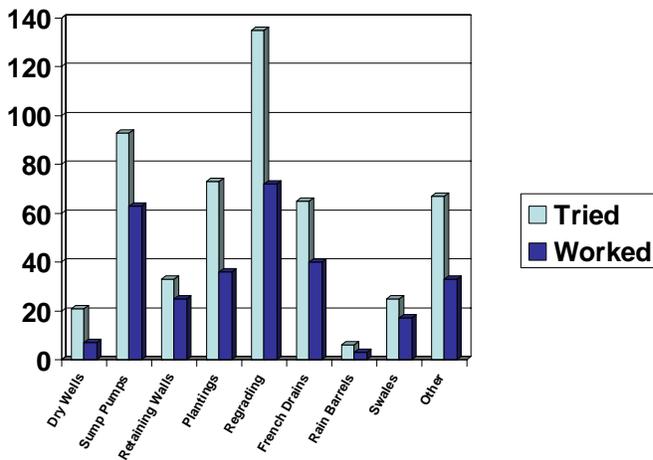
Problems Existed Before Neighboring Construction Began



Do storm drains on my block get overloaded in a large rain and overflow?



Rainwater Control Solutions Don't Always Work



Town of Chevy Chase  
Water Survey Results



## **Selected Comments from Survey Responses**

Some comments that the Committee found to be especially interesting or helpful are shown. All comments are on file in the Town Office.

*After construction at ..., we are flooded from the east every storm. Because the town will not allow French drains to go into the street, the water dumps on the sidewalk and forms ice all winter. The only sewer on Hillcrest or Rosemary is in front of my home, where water routinely rises half way up my front yard, causing a sink hole. The drainage "grill" on the county strip is less than 12"by12", and it is almost immediately covered in sediment (along with my sidewalk and driveway). The parking lot at the elementary school does not get the water; it is graded to the south drain ....my home!*

*We had to purchase a generator to run sump in basement; not previously required. ... the builder .... was advised on many occasions that he was creating a severe drainage problem that did not previously exist, and that the modest measures that he had taken to address the problem were wholly inadequate. He ignored our complaints and pleas for adequate measures to fix problems he caused. Montgomery Co government advised that there were no statutes or ordinances that would help us.*

*Flooding in our area is not only expensive but dangerous. Twice two large floods swept away most everything in our basement. On the first occasion, April 4, 1984, we put in a pumping system around the whole basement at a cost of \$5221 and redesigned the garden adding dry wells, two tons of gravel and a retaining wall. The recent storm of September 2004 was much worse with 3 feet of water and our utilities a complete loss. Mold set in and we had a large bill to remedy the situation, including carpentry to replace wet dry wall and painting. All utilities, my kiln, my art materials and books were lost.*

*The issue of overbuilding elsewhere in the Town causing drainage problems probably needs addressing, but I believe the principal case (in the vicinity of the East Ave,- Oakridge Ave block from Stanford Street to Thornapple Street is more of a legacy situation of inadequacy of the drains through the interior of the block, going back to when the area was re-subdivided to eliminate the original right-of-way for Chestnut Street. This, I believe, may have been aggravated by lack of system maintenance and that it was probably under designed by the standards established by the WSSC. I think overbuilding upstream is a less significant factor.*

*When construction was taking place, I could see my neighbor's back yard being graded higher. I called the Town to ask if my neighbor had submitted a drainage runoff plan. The assistant manager came to the site and saw for himself that there was no provision for PVC pipes or grading away from my property and said "such a plan was not required." INFURIATING!!!*

*Most of my water problems are a direct result of neighboring teardowns and construction.*

*There are two inadequate storm drains within our property. They are partly or completely blocked. Directly behind, a large new house was built about 6 years ago .... All the water from the roof has been channeled into our property by underground pipes during the construction. The builders tore down part of our fence to channel two big pipes into our property. (The Town) gave them authority against our complaints to do this. Now the major part of our backyard is flooded after rains, and is muddy for part of the year. We could not let our dog out in our backyard after rain because the dirt it carried into our home. We live in our home here since 1960. We will have trouble because of the bad flooding now, when we shall sell our home*

*Many on our block have sump pumps that pump to the front, so sidewalks are icy in the winter. I really like the new homes who have pipes draining under the sidewalks into the street because it is much safer to walk because the sidewalks don't ice up.*

*Either these questions were created by people who have no experience in crafting such questions, or the Committee already is predisposed to a result, and is trying to create a record to support its position.*

*water problems have "been here forever."*

### ***C. Expert Panel Questions***

1. How do you determine how much water is coming off the roof of:
  - A. the house
  - B. other impervious surfaces like driveways, walkways, walls, etc?
2. Are your calculations based on a 10 year storm (5-6" over 24hrs) or some other standard?
3. What means do you use to control storm water runoff from going onto adjacent properties?
4. What means do you use to limit the rate of storm water from going into the street?
5. Do these control techniques require periodic maintenance?
6. If so, how often, and what would that maintenance entail?
7. What is the volume discharge standard for the amount of storm water going into the street from a single property?
8. For a basically flat lot with 6000 square feet of impervious surface, what volume of water would be coming off that property assuming a 10 year storm?
9. In the final grading around the house, is it your practice to de-compact the soil where heavy equipment has run and then lay down six inches of top soil before putting in sod?
10. Describe current and near future techniques, other than trees, for controlling storm water runoff.

## D. Cost Analysis - Recent TOCC Building Permit Data

What Will It Cost Me? (\$0 if under 700 sq ft footprint for addition)  
Plan Needed and Worst Case Percentage of Project Cost to Comply

Address	Size of addition Footprint (sf)	Est. cost of addition	Would have needed drainage plan?	Additional costs	as a % of Bldg costs if plan needed	
			700 sq ft limit for footprint	ESTIMATE		
4001 Thornapple	Tamara Harris	1885	\$650,000	Y	\$15,200	2.34%
3905 Leland	Mark & Cathy Nolan	784	\$325,000	Y	\$15,200	4.68%
7412 Ridgewood	Pat Ruggles	1292	\$450,000	Y	\$15,200	3.38%
7400 Meadow	Peter & Rose Edwards	2023	\$300,000	Y	\$15,200	5.07%
4123 Aspen	Noel Fisher	611	\$150,000	N	\$15,200	NONE
4314 Curtis	Robert Greenfield	687	\$220,000	N	\$15,200	NONE
7111 Oakridge	Lewis Bloom	616	\$200,000	N	\$15,200	NONE
4416 Ridge	Alhadi Alwazir	966	\$325,000	Y	\$15,200	4.68%
4422 Ridge	Myron Brilliant	1058	\$500,000	Y	\$15,200	3.04%
7210 Ridgewood	Pat Keating	921	\$600,000	Y	\$15,200	2.53%
6908 Oakridge	David Valenstein	843	\$300,000	Y	\$15,200	5.07%
6902 Maple	Neville Meijers	2521	\$332,000	Y	\$15,200	4.58%
(7001 Hillcrest)	(Pat Keating)	788	\$450,000	Y	\$15,200	3.38%
4105 Stanford	Stephen Muse	2163	\$150,000	Y	\$15,200	10.13%
3910 Woodbine	Sharon Pohoryles and Jim Gelb	721	\$295,000	Y	\$15,200	5.15%
4002 Rosemary	Blaney & Virginia Harper	669	\$217,000	N	\$15,200	NONE
3903 Underwood	Marc Kaufman & Katie Carey	265	\$100,000	N	\$15,200	NONE
6807 East	Martha Westin & Sam Brightman	499	\$240,000	N	\$15,200	NONE
4319 Leland	Charles & Eliz Fleischman	2594	\$550,000	Y	\$15,200	2.76%
(4303 Curtis)	(Julio Fernandes)	902	\$200,000	Y	\$15,200	7.60%
7315 Maple	James O'Brien	639	\$260,000	N	\$15,200	NONE
7109 45th	Richard & Susan Calderone	1293	\$180,000	Y	\$15,200	8.44%
4336 Leland	Mark Simundson	649	\$150,000	N	\$15,200	NONE

35% of additions are exempt; non-exempt additions average costs = 4% of mean project cost of \$373,800

## ***E. Presentations***

# Town Water Problems and Solutions (this report in slides)

## Water Drainage Subcommittee Report

Lance Hoffman, chair  
Keith Blizzard  
Mike Gravitz  
Shelley Lowenstein  
Don MacGlashan  
Jim Mich  
Arthur Schatzkin  
Jean Shorett

## Committee's Initial Focus

- **"Short Term (moratorium): Devise feasible steps (in collaboration with the county) that can be taken with regard to water management and impervious surface coverage on individual lots to minimize flooding and drainage issues"**

-- Mission Statement, Committee on Environment

## Overview

- General Process and Rationale
- Collecting Information on Current and Potential Stormwater Problems
- Solutions
- Costs (Monetary and Other) of Solutions
- Related Issues
- Future Work

## How We Gathered Information

- Survey
  - (377 returned out of ~1,000 sent out)
- Meetings and discussions with builders, architects, water experts
- Research on what other municipalities have done
- Research on water management tools and mechanisms

## General Process and Rationale

- Weekly Meetings in late 2005
- Survey on Current and Potential Stormwater Problems
- Examine what other jurisdictions have done
- Understanding who can do what (town, county, state) and what we can not do
- Trying to Triage "Solution"
  - Short Term
  - Medium Term
  - Long Term

## Survey Results (highlights)

- Over half the respondents had flooded basements
- Can't conclude whether new construction is "to blame" in general for water problems
- Average amount per household spent to deal with stormwater = \$3,070
- Storm drains (or lack thereof) a problem in much of the town

## Triaged "Solutions"

- **"Short Term (moratorium): Devise feasible steps (in collaboration with the county) that can be taken with regard to water management and impervious surface coverage on individual lots to minimize flooding and drainage issues"**
- **Mid-term: work with Town manager and a municipal water engineering contractor to assess the town drain infrastructure and its capacity**
- **Long-term: initiate a public education program to inform residents and contractors about the options available for minimizing or diverting lot runoff; demonstrate sustainable water management system; coordinate work with other neighborhoods in the Potomac watershed, and oversee the building plans as they relate to water management"**

-- Mission Statement, Committee on Environment



## Survey Results Prose Highlights

- After construction at 4004 Rosemary Street, we are flooded from the east every storm. Because the town will not allow French drains to go into the street, the water dumps on the sidewalk and forms ice all winter. The city sewer on Hillcrest or Rosemary is in front of my home, where water routinely runs half way up my front yard, causing a sink hole. The drainage "grill" on the county strip is less than 12" by 12", and it is almost immediately covered in sediment (along with my sidewalk and driveway). The parking lot at the elementary school does not get the water; it is graded to the south drain - my home!
- We had to purchase a generator to run sump in basement, not previously required. Patrick Keating, the builder of the property at 4402 Ridge that has damaged our property, was advised on many occasions that he was creating a severe drainage problem that did not previously exist, and that the modest measures that he had taken to address the problem were wholly inadequate. He ignored our complaints and pleas for adequate measures to fix problems he caused. Montgomery Co government advised that there were no statutes or ordinances that would help us.
- Flooding in our area is not only expensive but dangerous. Twice two large floods swept away most everything in our basement. On the first occasion, April 4, 1984, we put in a pumping system around the whole basement at a cost of \$3221 and redesigned the garden adding dry wells, two tons of gravel and a retaining wall. The recent storm of September 2004 was much worse with 3 feet of water and our utilities a complete loss. Most set in and we had a large bill to remedy the situation, including carpentry to replace wet dry wall and painting. All utilities, my kids, my art materials and books were lost.
- The issue of overloading sewers in the town causing drainage problems probably needs addressing, but I believe the principal cause (in the vicinity of the East Ave/Oakridge Ave block from Stanford Street to Thornapple Street) is more of a lack of maintenance of the drains through the interior of the block, going back to when the area was re-subdivided to eliminate the original right-of-way for Chestnut Street. This, I believe, may have been aggravated by lack of system maintenance and still is probably under-maintained by the standards established by the WSSC. [Link to ordinance upstream is a less significant factor.](#)
- When construction was taking place, I could see my neighbor's back yard being graded higher. I called the Town to ask if my neighbor had submitted a drainage runoff plan. The assistant manager came to the site and saw for himself that there was no provision for PVC pipes or grading away from my property and said "such a plan was not required."
- INSURANCE:
- Most of my water problems are a direct result of neighboring teardowns and construction.
- There are two inadequate storm drains within our property. They are partly or completely blocked. Directly behind a large new house was built about 6 years ago by "Chevy" builders. All the water from the roof has been channeled into our property by underground pipes during the construction. The builders tore down part of our fence to channel two big pipes into our property. And Mr. Plummer gave them authority against our complaints to do this. Now the major part of our backyard is flooded after rains, and is muddy for part of the year. We could not get our dog out in our backyard after rain because the dirt it carried into our home. We live in our home here since 1960. We will have trouble because of the bad flooding now, when we shall sell our home. Please bring this to the attention of the Council. (4008 Underwood)
- Many on our block have sump pumps that pump to the front, so sidewalks are icy in the winter. I really like the new homes who had have pipes draining into the street because it is much safer to walk because the sidewalks don't ice up.
- Either these questions were created by people who have no experience in crafting such questions, or the Committee already is predisposed to a result, and is trying to create a record to support its position.
- water problems have "been here forever."

## Builders, Architects, Water Experts Consulted

- Neil Weinstein, Low Impact Development Center
- Bryan Whittington, Whittington Design Build
- Michael Fox, Fox Architects
- Kim Currano, Greenhorne & O'Mara
- Paul Davey, Studio Z
- Stephen Muse, Muse Architects (resident)
- Carlos Fernandes, Chase Builders (resident)
- Curt Schreffler, CAS Engineering
- Charles Wallis, Maryland Dept. of the Environment

## Comments from Builders, Architects, Water Experts

- Each site unique: competing considerations of trees, water, design, marketability, owner desires, etc.
- Allow flexibility, sometimes rules conflict
- Town should do better/more frequent inspections/enforcement of stormwater plans; can't rely on County's cursory enforcement or review
- Concept plan at design stage, meet with Town BEFORE going for County permit on final design
- Town drains designed for an earlier age, typical lifecycle 50 years, must be maintained and rebuilt periodically
- Comments from some, not necessarily all agree with:
  - Must protect people with old terra cotta foundations
  - Many new houses just out of scale; two wanted design review process
  - Too much impervious surface
  - Education program needed: "help keep drains clear", etc.
  - Stormwater (and tree) review should be done by Town staff or consultants during regular business hours, not a volunteer committee with evening meetings (burdens builders) [counterargument is that it is harder for residents to participate]

## Other Jurisdictions Considered

- Village of Chevy Chase
- Section 3
- Fairfax County
- Arlington
- Garrett Park
- Montgomery County
- State Law (Md. Dept. of Environment)

## Water Drainage Ordinance Highlights

- Exempt if total footprint of development activity less than 700 sq ft
- Water Drainage Plan (WDP) prepared by professional engineer required: contains site characteristics, analyses, plans, cost estimate
- Can file written request for variance
- Town can not issue a building permit unless WDP approved by Town Engineer; Performance Bond required
- Water Drainage Measures
  - Water can't flow to adjacent property at rate greater than pre-construction
  - Retain all stormwater from impervious surfaces on property for 24 hours for a three-month storm event
    - (encompasses 90% of rain storms)
  - Events above that level may discharge into street
  - Cover excavated soil to prevent migration onto adjacent and abutting properties
  - Overflow pipes to street must pass under sidewalks and through curbing
  - Infiltration systems at least 5 feet from property line and 20 feet from existing buildings with foundations on adjoining properties
  - Supplementary guidelines may also be considered by Town Manager in evaluation of WDP
- Inspections Required at specified stages during and upon completion of construction
- Maintenance Agreement and Schedule Recorded by Covenant in land records
- Appeals
  - Ten-day notice required for public hearing; any aggrieved party may appeal
  - Water Appeals Board may affirm, reverse, or add conditions to decision of Town Manager
  - Written decisions within thirty days; can request judicial review in County court
- Enforcement
  - Violation of any provision of ordinance or of an approved WDP is a municipal infraction, subject to a fine of up to \$1,000 for each day
  - Town Manager may issue stop work order
  - Repeated violation a misdemeanor: up to \$1000 per day or prison up to six months or both

## Supplementary Guidelines (Voluntary)

- Examples (not a complete list)
  - Impervious surface limits (includes house, garage, tool shed, concrete or asphalt driveway, walkways, stoops, retaining walls, patios, and swimming pools)
 

Residential Zone	Impervious Surface Limit (%)
R-50	35
R-90	30
- use of permeable materials for driveways, patios, and sidewalks
- demonstrating using percolation tests that the relevant soil will percolate the design standard volume of stormwater in a reasonable period of time
- placement of overflow pipes in accordance with town tree ordinance
- downspouts pointing onto property, not to neighbors' or street
- sump pump usage during construction runs water through a silt filtration box
- adequate infiltration under permeable decks
- use of gutter guards or other mechanisms to prevent leaves from clogging up parts of stormwater management system
- decompaction of construction site soil before placement of top soil to ensure maximum infiltration of stormwater runoff

## What Will It Cost Resident? (\$0 if under 700 sq ft footprint for addition) Is Plan Needed? and Worst-Case Percentage of Project Cost to Comply

Address	PLAN NEEDED?	Maximum Add'l Costs for Water Drainage Plan and Mgt average \$15,200
4001 Thornapple	Y	2.3%
3905 Leland	Y	4.7%
7412 Ridgewood	Y	3.4%
7426 Meade	Y	5.1%
4123 Aspen	N	NONE
4314 Curtis	N	NONE
7111 Oakridge	N	NONE
4418 Ridge	Y	4.7%
4422 Ridge	Y	3.0%
7210 Ridgewood	Y	2.5%
6908 Oakridge	N	5.0
6902 Maple	Y	4.4%
7029 Woodbine	Y	3.4%
4105 Starbird	Y	10.1%
3910 Woodbine	Y	5.2%
4002 Rosemary	N	NONE
3963 Underwood	N	NONE
6807 East	N	NONE
4319 Leland	Y	2.8%
4303 Curtis	Y	7.6%
7315 Maple	N	NONE
7105 Elm	Y	8.4%
4308 Leland	N	NONE

35% of additions are exempt; non-exempt additions average costs = 4% of mean project cost of \$373,800

Town Spends Less than \$65K/year, can recover some/all from permit fee hikes

Cost increase for Average Affected Addition = 4%  
Smaller Additions (35%) Do Nothing, Pay Nothing

## Three Different Permit Fee Hike Scenarios

Scenario	Cost	Cost	Cost
Add'l Cost to Town Before	\$64,350	\$64,350	\$64,350
Add'l Fees			
Add'l bidg permit fee for new houses	\$1,000	\$1,250	\$500
Add'l bidg permit fee for non-exempt additions	\$500	\$500	\$500
Add'l demolition fee for structures over \$1,000 ft	\$4,288	\$1,250	\$500
Total Add'l Fees Received by Town	\$64,350	\$36,500	\$21,500
Add'l Cost to Town After	\$0	\$27,850	\$42,850
Add'l Fees			

## Estimated Monetary Costs to Town

Ordinance (Phase 1) only,  
not Education, Drains, etc. (Phases 2,3)

- \$500 engineering review
- \$500 appeals (assume 1 in 2)
- \$1000? increased inspection cost
- Total per property: \$1950?
- 33 properties per year = \$64,350
- Can increase permit fees to recover costs
- Examples:
  - Additional fee for demolition of structures over 1000sf \$4,285 would allow Town to break even yearly
  - Or could increase building permit and demolition fees each by \$500 and save the Town 1/3 of the costs

## Changes Required in Town Administrative Structure

- Water Appeals Board
  - (similar to Tree Board)
- Town Engineer

## Environmental Considerations

(summarized from Mike Gravitz' presentation)

- Town of Chevy Chase, MD
  - 290 acres sub-watershed (~0.5 sq mile)
    - 25 acres of schools, parks, public facilities
    - 35 acres of roads
    - 1000 houses
    - 10 miles of trails
    - 15 miles of sidewalk
    - Housing density (on roads, parks, schools, and public facilities) is about 4 houses/acre
    - Storm water ponds
    - Most drainage to Cispark Run (1<sup>st</sup> order stream)
- Major Nonresidential Stormwater Sites
  - Three sites cover approximately 20 acres of Town or 69%
    - Leland Park Center
    - Chevy Chase Elementary
    - National Art Center
  - Probably more than 7% of stormwater and pollution because these are largest single impervious areas
  - Obviously, need additional facilities elsewhere to control sediment (60%) and trash (10% of Town) stormwater
  - Road stormwater into downstream facilities
    - Zimmerman Park
    - Area next to East-West Highway
    - Columbia Country Club
- Residential issues
  - Yard and lawn conditions and practices
    - Fertilizer and herbicide use
    - Grass cover & tree cover
    - Soil erosion
    - Soil compaction
    - Pool discharges
  - Driveway/sidewalk curbs
    - Evidence of illegal dumping into drains or curbs
    - Car washing runoff
    - Driveway sweeping runoff
    - Use of drains
  - Rooftops
    - Downspout connections to driveways, patios, streets
  - Common areas
    - Pet waste
    - Littering
    - Maintenance practices (e.g. fertilization)
- Example Solution: Leland Recreation Center
  - Total area: 3.7 acres, parking lot is 0.8 acres
  - Parking lot runoff: 2,750 cubic feet
  - Site runoff: 3,075 cubic feet
  - Open areas for use in stormwater management:
    - Stage along Willow St. (50x200) = 7,000sq ft
    - Top at end of Willow (30x65) = 2,000 sq ft
    - Area behind playground and courts = 77 sq ft

Can at relatively modest annual cost over 10 years of \$18-110 per household per year (not counting MDCS, County, 41% or State money) do much better job with stormwater runoff  
Major uncertainties: Where to put downstream treatment, Effectiveness of public information/outreach, Utility of residential subsidy for rain gardens and such, Funding source for the town, Commitments from other responsible parties

## Triaged "Solutions": Moving Forward

- **"Mid-term: work with Town manager and a municipal water engineering contractor to assess the town drain infrastructure and its capacity"**
- **"Long-term: initiate a public education program to inform residents and contractors about the options available for minimizing or diverting lot runoff; demonstrate sustainable water management system; coordinate work with other neighborhoods in the Potomac watershed, and oversee the building plans as they relate to water management"**

-- Mission Statement, Committee on Environment



# Can Chevy Chase Help Save the Bay?

## Do Inner Suburbs Have a Role in Saving the Chesapeake Bay?

### Stormwater Management Options for the Town of Chevy Chase, MD

Michael Gravitz  
4302 Curtis Road  
Chevy Chase, MD 20815

September 2005

## Why Care About Nutrients & Stormwater?

- The Bay Is Dying Slowly Primarily from Nutrients
  - Over enrichment by nutrients (N and P)
  - Approximately 7 times more than before humans
  - Dead zone in 40% of mainstem in summer (Baltimore to mouth)
- Major Declines in Keystone Species
  - Submerged Aquatic Vegetation (only 10% of potential area of 600,000 acres is covered)
  - Crabs (50% lower than 1993 harvest)
  - Oysters (98% reduction since mid-50's)
  - Frequent fish kills
  - Possible overfishing for menhaden

## Huge Excess Nutrient Pollution

%-Mill. Lbs	Agriculture	Urban Storm-Water	Sewage Plants & Septics	Air	Totals % Mill lbs.
N	33% 96	24% 70	22% 64	21% 60	100% 290 M Pounds
P	47% 9	20% 4	25% 5	8% 2	100% 20 M Pounds

## What are the Nutrient Goals for the Bay?

- 1987 (2000), and 2003 (2010) Bay Agreements
- Nutrients must be reduced by 40% below current levels in Bay watershed
  - 115 Million pound reduction in N
  - 8 Million pound reduction in P
  - Potomac (MD only) has cap of 11.8 and 1.1 million pounds of N and P respectively
- Remove Bay from 303(d) Impaired List by 2010

## Role of Urban Stormwater

- Second largest source of Nitrogen
- Third largest source of Phosphors
- After Biological Nutrient Removal at Sewage Plants, Stormwater will be second largest source of Phosphorus
- Can't meet Nutrient Goals without Stormwater reductions

## Impact of Stormwater on Streams

- Hydrology
  - Increased volume & velocity & faster high flows
  - Lower base flows
  - More frequent bankfull events and flooding
- Physical
  - Change channel width, depth & sinuosity (geometry)
  - Change in streambed characteristics (embeddedness)
  - Changes in streambank stability and erosion
  - Increased sedimentation
  - Less large woody debris
- Water Quality
  - **Nutrients**
  - Temperature
  - Sediment
  - Hydrocarbons
  - Metals, toxics, etc.
  - Bacteria, pathogens

## Biological Effects Summarize Impact

- As percentage impervious surface and stormwater volume increase, biological health declines as measured by IBI and other indices
- Aquatic insect species and diversity decline
- Fish species and diversity decline
- Percentage of species that are tolerant to pollution increases

## Relationship of Impervious Cover to Stream Health

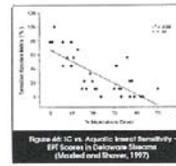


Figure 43: IC vs. Aquatic Insect Benthos - IBI Scores in Chesapeake Stream (Modified from Shreve, 1977)

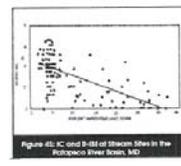


Figure 44: IC and IBI of Stream Sites in the Potomac River Basin, MD

## Evidence from Coquelin Run

- Coquelin Run begins by draining most of Town of C.C.
- 1<sup>st</sup> order stream emptying to Rock Creek after 1-2 miles
- Travels underground, under several major roads, through golf course, next to houses, apt buildings, commercial office, and parking lots
- Sampling station below Town showed in 2002:
  - "Poor" epifaunal substrate, "Marginal" embeddedness, "Poor" sediment deposition
  - "Marginal" riffle frequency, "Marginal" channel flow
  - "Marginal" to "Poor" bank vegetation
  - Low summer DO at 3.8, pH 6.7,
  - "Poor" fish IBI, mostly blacknose dace
  - "Fair" bug IBI, mostly Lumbriculidae and Chironomidae family

**Conclusion: Stream is significantly effected in a negative way by upstream development and stormwater runoff**

## Town of Chevy Chase, MD

- 290 acre sub-watershed (<0.5 sq mile)
  - 23 acres of schools, parks, public facilities
  - 30 acres of roads
- 1000 houses
- 10 miles of roads
- 15 miles of sidewalk
- Housing density (ex roads, parks, schools, and public facilities) is about 4 houses/acre
- Approx. 3000 people
- Most drainage to Coquelin Run (1<sup>st</sup> order stream)

## Method for Calculating Stormwater Loadings

1. Calculate % impervious cover from
  - Direct measure from aerial photography
  - Land use & density
  - Population
  - Road density
2. Estimate rainfall and runoff
3. Identify pollutant concentrations
4. Calculate nutrient loadings

## Calculate Impervious Area

- Land use and density
  - 290 acres minus 23 acres (institutional) minus 30 acres roads (9.9 miles x 26' width) equals 236 residential acres divided by 1000 houses equals house density of 4.2 per acre

Estimated percentage impervious cover is:

1. 27.8% +/- 0.6 N=23 sites for ¼ acre lot residential\*

2. 34.4% +/-3.45 N=30 sites for institutional use\*

\*Capiella & Brown, *Impervious Cover and Land Use in the Chesapeake Bay Watershed*, January 2001, Center for Watershed Protection, page iv

## Estimate Rainfall and Runoff

- Runoff = Rainfall event fraction x Runoff coefficient
  - Runoff in annual inches
  - Fraction of annual rainfall events that produce runoff (assume 0.9 for this area)
  - Runoff coefficient (percentage of rainfall that becomes runoff)
  - Runoff coeff. =  $0.05 + (0.91 \times \text{Impervious } \%)$

## Estimate Rainfall and Runoff (cont.)

- Runoff coeff. =  $0.05 + (.9 \times .3) = .32$
- R (Annual Runoff)

$$R = 41'' \times 0.9 \times 0.32 = 11.8 \text{ inches runoff/yr}$$

$$\text{Runoff for Town} = 11.8'' \times 290 \text{ acres} = 285 \text{ acre feet}$$

$$285 \times 325,851 \text{ gals/acre ft} = 92,867,000$$

## Identify Pollutants in Stormwater Event Mean Concentration (Region 3 – MD)

Annual Rainfall	41"
TSS	120 mg/l or ppm
Total N	2.15 ppm
Total P	0.31 ppm
BOD	14.4 ppm
Zinc	143 ppb
Copper	18 ppb
Lead	12.5 ppb

## Calculate Pollutant Loadings: The Simple Method\*

- $L = 0.226 \times R \times C \times A$
- L = Annual load in pounds
- R = Annual runoff in inches
- C = Pollutant concentration in stormwater – event mean concentration as mg/l
- A = Area in acres

0.226 is unit conversion factor

\*Center for Watershed Protection, Impacts of Impervious Cover on Aquatic Systems, March 2003, page 59, 61

## Calculating Pollutant Loadings from Entire Town of Chevy Chase

- $L(\text{TN}) = .226 (11.8) (2.15) (290) = 1,663 \text{ lbs of Total Nitrogen}$
- $L(\text{TP}) = .226 (11.8) (.31) (290) = 240 \text{ lbs of Total Phosphorus}$
- $L(\text{Lead}) = .226 (11.8) (.0125) (290) = 0.8 \text{ lbs of Lead}$
- $L(\text{BOD}) = .226 (11.8) (14.4) (290) = 11,136 \text{ lbs of Biological Oxygen Demand}$
- $L(\text{TSS}) = .226 (11.8) (120) (290) = 92,804 \text{ lbs of Total Suspended Solids}$

## Residential Stormwater Load (House and Driveway Only)

- Assume 3,600 sq ft house (1,200 sq ft roof) and 10x35' drive for total impervious surface of 1,550 sq ft
- Impervious area = 17% if lot is 9,000 sq ft
- Excludes: walks, sheds, patios, walls, and other impervious surfaces most houses have some of
- Assume 41" of annual rainfall and rainfall fraction of .9 (% rain events that produce runoff) = 36.9" per year = 3.075' per year
- Roof and driveway produce 4,776 cu ft or 35,650 gallons per year of runoff\*

\* $3.075' \times 1550 \text{ sq ft} = 4,776.25 \text{ cu ft}$   
 $7.48 \text{ gals of water per cubic foot}$   
 $4,776 \text{ cu ft} \times 7.48 \text{ gals/cu ft} = 35,651 \text{ gals}$

## Residential Load (Whole Site)

- Est. Runoff (ER) = Runoff Coeff (RC) x Event Fraction (EF) x Annual Rainfall (AR)
- RC is based on 30% impervious area (almost twice impervious area in prior calculation)\*
- ER = .32 x .9 x 41" = 11.8 inches per year
- Runoff from a 9,000 sq foot lot
- 9,000 sq ft x 11.8"/12" = 8,850 cu ft
- 8,850 cu ft x 7.48 gals/cu ft = 67,320 gals per year

\*30% is from CWP studies and from Mansionization Impact Study, Torti Gallas and Partners, June 2003, pg. 13 where actuals range from 27.9% to 35% of lot depending on area of Town.

## Residential Stormwater Containment

- Design for 1" event (captures 90% of annual stormwater)
- 1,200 sq ft roof x 1" = 100 cu ft
- 7.48 gals per cu ft
- Event produces 748 gallons of water
- 2 year storm produces 3.2" water in 24 hours, so roof would shed 2,394 gals with 50% chance each year.

## Some Containment Options

- 7 downspouts with 50 gal rain barrels contains 350 gals or almost half of the 1" storm
- Barrels used for watering, infiltration or slow release to lawn
- Lawn – surface infiltration
- Rain gardens – surface infiltration
- Misc. devices – subsurface release

## Process for Stormwater Reduction Study\*

1. Neighborhood Source Assessment and preliminary inventory of retrofit sites
2. Field assessment of potential sites
3. Prioritize sites & behavior for implementation
4. Public involvement and review of plans
5. Retrofit and public information campaign design
6. Permitting facilities
7. Construction and public information dissemination
8. Maintenance plan for facilities and education

\*Much of the following material about process and methods is adapted from publications of the Center for Watershed Management and specifically Pollution Source Control Practices: Manual 8, Center for Watershed Protection, February 2005, Ellicott City, MD

## Neighborhood Source Assessment

- Yard and lawn conditions and practices
  - Fertilizer/pesticide use
  - Grass cover & tree cover
  - Soil erosion
  - Soil compaction
  - Pool discharges
- Driveways, sidewalks, curbs
  - Evidence of illegal dumping into drains or curbs
  - Car washing runoff
  - Driveway sweeping runoff
  - Use of de-icers
- Rooftops
  - Downspout connections to driveways, gutters, streets
- Common areas
  - Pet waste
  - Dumping
  - Maintenance practices (e.g., fertilization)

## General Types of Opportunities for Stormwater Control

- Residential
  - Rain barrels
  - Rain gardens
  - Pervious pavement in appropriate applications
  - Disconnect downspouts from driveways and curbs
  - Green roofs
  - Lawn/garden, car, and pool care behavior
  - Construction practices that effect erosion, trees and soil compaction
- NonResidential
  - Onsite stormwater retention and treatment
  - Green roofs
  - Lawn, planting areas, and tree maintenance activities
  - Dumpsters
- Streets & Sidewalks
  - Downstream stormwater retention and treatment
  - Use of de-icers on roads in winter
  - Reduction in curbs/gutters, fewer sidewalks (one side only)
  - Stormwater inlet devices

## Potential Nonresidential Sites for Stormwater Controls

- Leland Recreation Center
  - Parking lot (0.8 acres) on 3.7 acre site
- Chevy Chase Elementary School\*
  - Parking lots and paved playground (.7 acres) on 3.7 acre site
- National 4-H Headquarters\*
  - Parking lot (4.6 acres) on 12.3 acre site
- Parks & Playgrounds
  - Zimmerman (1.2 acres)
  - Elm St. Park and playground (2.0 acres)
- Sidewalks (15 miles estimated)
- County parking lots in downtown Bethesda (on town border-46<sup>th</sup> Street)
- Chevy Chase Country Club (across Bradley Blvd)

\*Source for paved area square footage: Personal communication with Dave Walton, Town of Chevy Chase, using MapInfo supplemented by ground measurements by Mike Gravitz

## Example: Leland Recreation Center

- Size: Total is 3.7 acres, parking lot is 0.8 acre
- Facilities: Rec Center, Town Offices, Playground, 2 Tennis Courts, Basketball Court, Parking Lot
- Slope: Slopes to S.E. corner
- Parking lot runoff: 2,759 cubic feet
- Site runoff: 3,975 cubic feet
- Open areas for use in stormwater management:
  - **Strip** along Willow St. (35'x200') = 7,000sq ft
  - **Tip** at end of Willow (30'x65') = 2,000 sq ft
  - Area behind playground and courts = ?? sq ft

## Calculating Runoff for Stormwater Management Facilities: Short Cut Method\*

- Runoff Coefficient (Rv) = .05 + (.009 x impervious %)
- Water Quality Volume (WQV) in cubic feet = Rainfall (inches to capture\*\*) x Rv x area in acres x 43,560 sq ft / 12

Leland Parking Lot runoff to treat for each rainfall event:  
 $WQV = 1.0^{**} \times .95 \times .8 \times 43,560 / 12 = 2,759$  cubic feet

Rest of Leland Recreation site runoff from roof, playground, tennis courts:  
 $WQV = 1.0 \times .365 \times 3 \times 43,560 / 12 = 3,975$  cubic feet

\*Claytor and Schueler, Design of Stormwater Filtering Systems, Center for Watershed Protection for Chesapeake Research Consortium, December 1996, page 2-24 and 2-25

\*\*90% Rule = How much rain in average rainfall event that would allow you to capture 90% of rainfall in the year using Washington DC rainfall amounts and frequencies. Equal to 1.0 inch. Ibid, page 2-22 and 2-23

## Stormwater System Characteristics

Criteria	Ponds	Wetlands	Infiltration	Filters
Space	2-3% of site	3-5%	2-3%	2-7%
Head (drop req)	3-6 feet	1-6	2-4	1-8
Cost	Low	Moderate	High	Moderate-High
N Removed	35%	25	50	35 or some higher for gravel filter or bioretention
P Removed	65%	50	60	60
Longevity	20-50 years	20-50	1-5	5-20??

## Example: Leland Parking Lot

- 2,700 cubic feet of water from the 0.8 acre parking lot can be stored in a 30'x30'x3' area or in the Tip with pond depth of 16" or in the Strip with pond depth of 5"
- Favored Options: filter systems and wetlands
- Cost range based on WQV-storage volume:
  - Filter System (bioretention) \$10,000-15,000
  - Filter System (sand, gravel) \$30,000-40,000
  - Wetland \$???
- Cost range from Chesapeake Bay Program Nonpoint Strategies estimates based on acres treated:
  - \$1,890/acre ultra urban to \$3,529/acre pg. 62
  - \$6,336/acre to \$14,912/acre pg. 70
- **Important to note large range in cost estimates; smaller sites are more costly on a per acre or volume basis**

Sources: "The Economics of Stormwater Treatment: An Update", Technical Note #90, Watershed Protection Techniques, Center for Watershed Protection  
 An Evaluation of Cost and Benefits of Structural Stormwater Best Management Practices in North Carolina, NC State University, November 2003

## Summary Cost Estimate for 3 Sites

Site	Area to Treat	Method	Cost
Leland Rec. Center	3.7 acres @ \$15k/acre	Wetland or filtration	\$55,500
Chevy Chase Elementary	3.7 acres @ \$15k /acre	Wetland or filtration	\$55,500
National 4H Center	4.6 acre parking only	Pond	\$69,000
<b>Total Capital</b>			<b>\$180,000</b>

## Need More Than 3 Site Strategy

- Three sites cover approximately 20 acres of Town or only 7%
- Probably more than 7% of stormwater and pollution because these are largest single impervious areas
- Obviously, need additional facilities elsewhere to control residential (82%) and road (10% of Town) stormwater
- Residential strategies
  - Rain gardens, rain barrels, green roofs, limit impervious surface %
- Road stormwater into downstream facilities
  - Zimmerman Park
  - Area next to East-West Highway
  - Columbia Country Club

## Additional Strategies & Costs

- Public information and outreach
  - EPA estimate of \$3.00/yr/household
  - \$3,000/year for public information, etc
- Subsidy program for residential systems
  - 50/50 match for residential raingarden or other solution
  - 20% participation rate = 200 homes
  - \$4,000 total per house means \$2,000 subsidy
  - Total public cost = \$400,000
- Downstream facilities
  - Assume \$2,000 per acre with 266 acres = \$532,000

## Conclusions: Does Town Have a Role to Play in Saving the Bay?

- Stormwater management for medium density inner suburb is not cheap:
  - \$180,000 if only 3 institutional sites treated
  - \$700,000 for institutional sites and installing community based treatment if can find suitable site(s)
  - \$1.1 million if do all above plus subsidize 200 individual home projects at 50-50 match up to \$2,000 per house
- Costs range is wide:
  - \$180 - \$1,100/household (individual households bear no specific burden)
  - \$600-\$3,700/acre of town
- Sites are very hard to find and small; making storage and treatment expensive
- Assuming 50% pollutant removal rate (at best), if all stormwater treated, almost 1,000 lbs/year of nitrogen and phosphorus combined will be removed from the Town's stormwater contribution to the Bay

## Can Chevy Chase Help the Bay?

- **Yes, we can** at relatively modest annual cost over 10 years of \$18-110 per household per year not counting MCPS, County, 4H, or State money
- Major uncertainties:
  - Where to put downstream treatment
  - Effectiveness of public information/outreach
  - Utility of residential subsidy for raingardens and such
  - Funding source for the town
  - Commitments from other responsible parties