DELAWARE FLOODPLAIN AND DRAINAGE STANDARDS AND RECOMMENDATIONS

A Report to the Delaware General Assembly by the Delaware Department of Natural Resources and Environmental Control

March 15, 2013

The full report is available at:

www.dnrec.delaware.gov/swc/Pages/FloodplainandDrainageCodeWorkGroupCommittee.aspx

DELAWARE DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL

DUFFIELD ASSOCIATES

Floodplain and Drainage Advisory Committee

The Delaware Department of Natural Resources and Environmental Control (DNREC), Division of Watershed Stewardship, would like to thank the following organizations for their active participation on the Committee:

- American Council of Engineering Companies
- Committee of 100
- Delaware Association of Conservation Districts
- Delaware Association of Counties (3 representatives)
- Delaware Association of Realtors
- Delaware Department of Transportation
- Delaware Emergency Management Agency
- Delaware Insurance Commissioner's Office
- Delaware League of Local Governments (2 representatives)
- Federal Emergency Management Agency
- Home Builders Association of Delaware
- Sussex County Association of Towns
- DNREC Division of Watershed Stewardship (2 representatives)

- Duffield Associates, Inc. (contractor to DNREC)
- University of Delaware Water Resources Agency (technical assistance)

Executive Summary

Background and History

Governor Jack A. Markell signed Senate Bill 64 into law on August 17, 2011. The legislation was developed in response to concerns about Delaware's vulnerability to ongoing inland and coastal flooding and drainage challenges, coastal storms and other extreme weather events, and rising sea level - all of which threaten public infrastructure, private property, and human health and safety.

With overwhelming bipartisan support, Senate Bill 64 passed with the purpose of protecting human life, health and welfare by requiring the Department to assemble a panel of experts to identify best practices and assist local governments in implementing such policies in order to prevent or minimize flood damage in the future. Specifically the Bill's purpose is to:

- Minimize flooding of water supply and sanitary sewage disposal systems;
- Maintain natural drainage;
- Reduce financial burdens imposed on the state, local community, its governmental units and its residents, by discouraging unwise design and construction of development in areas subject to flooding;
- Minimize the need for rescue and relief efforts associated with flooding and generally undertaken at the expense of the general public;
- Minimize prolonged business interruptions and damage to public facilities and other utilities, such as water and gas mains, electric, telephone and sewer lines, streets and bridges;
- Reinforce that those who build in and occupy special flood hazard areas should assume responsibility for their actions;
- Prevent or minimize the impact of development on adjacent properties within and near flood prone areas; and
- Provide that the flood storage and conveyance functions of the floodplain are maintained and minimize the impact of development on the natural and beneficial functions of the floodplain.

Over 331 square miles or 17% of the State's land mass including approximately 621 road miles and over 18,000 structures is within a mapped 100-year floodplain. Since 2000, over 200 flooded homes in Delaware have been purchased at a cost of $50 million with another $30 million in claims to FEMA's National Flood Insurance Program (NFIP).

In Delaware, local governments generally have the responsibility for land use decision making, including the approval of the developments which may occur in flood-prone locations. When homeowners have flooding problems, difficulty getting affordable flood insurance due to noncompliant construction or floodplain maps that are not accurate, DNREC typically responds to these requests for assistance.

With respect to drainage in Delaware, between 2007 and 2011, DNREC and the three Conservation Districts responded to over 2,000 requests for assistance with drainage problems at the homeowner or community level. Over a five-year period, these drainage concerns represent one for every 228, 154, and 122 housing units in New Castle, Kent, and Sussex Counties, respectively. In other words, residents of Sussex County are nearly twice as likely to have a drainage concern as residents of New Castle County. $65 million has been appropriated through the State's 21st Century Fund for drainage-related construction improvements since 1996.

The Floodplain and Drainage Advisory Committee

Senate Bill 64 established a Floodplain and Drainage Advisory Committee (Committee) with diverse stakeholders that included public interests to review best practices and national standards and recommend minimum standards for improved floodplain management and drainage within the state. DNREC Division of Watershed Stewardship Director Frank Piorko was selected as Chair of the Committee. DNREC retained Duffield Associates, Inc., as a contractor to assist with various research and administrative tasks. The Committee also examined the adequacy of existing requirements, policies and practices associated with notification to prospective property purchasers of existing flooding or drainage issues.

Current minimum standards often allow construction in flood-prone areas which, if unchanged, will continue to result in expensive publicly funded abatement projects, such as these flood gates, and increasingly unaffordable flood insurance costs.

The Committee, met seven times between September 2011 and May 2012, to provide guidance and input and act in an advisory capacity to the Department in compiling a body of Floodplain and Drainage Standards and Recommendations. All meetings received Public Notice. After months of discussion, deliberation and debate, most of the Standards and Recommendations were supported by a majority of the Committee, but several did not receive broad support. These Standards and Recommendations were not developed to be mandates on local government, but rather a compilation of best practices that may be employed, depending on local conditions and existing requirements, to improve coordination and management of flooding and drainage issues across the state.

In all, 15 Floodplain Standards and 6 Drainage Standards were sent to the Department Secretary to be considered for adoption. Ten Recommendations were also included. The difference between Standards and Recommendations is that the Recommendations are thought to be more easily accommodated by local government, or represent a task that the Department could cooperatively undertake with existing authority.

(The full set of Standards and Recommendations is included after the Executive Summary.)

Secretary's Order

Following the vote of the Committee to provide support to most of the Floodplain and Drainage Standards and Recommendations, a press release was sent out in June 2012, inviting the public to comment on the draft Standards and Recommendations. Following the public comment period, DNREC Secretary Collin P. O'Mara adopted the Floodplain and Drainage Standards and Recommendations through a Secretary's Order 2012-WS-0029 issued on August 12, 2012.

Stating that the adoption of the Standards and Recommendations were well supported by the deliberations of the Committee, the Secretary found the next step involving the outreach and review of these Standards and Recommendations by all local governments to be consistent with the charge set forth in Senate Bill 64.

It has been found that inadequate drainage standards and inconsistent local codes contribute to chronic and nuisance flooding throughout the state. Delaware landowners are impacted in the use and enjoyment of their personal property.

Department Outreach and Local Government Review

Senate Bill 64 provides that following adoption by the Secretary, within six months the three county and all municipal governments, as appropriate, shall review and prepare comments regarding their individual codes and ordinances to determine if they are consistent with the Recommendations. Such review and comments shall identify areas where existing requirements meet or exceed these Recommendations, are functionally equivalent to the Recommendations, or do not comply with the Recommendations.

In the Bill, it was stated that **t**he review and comments from local governments will also identify areas where implementation of these standards may represent a hardship to the local government, and what impediments to adoption of these Recommendations have been identified.

It was also determined in SB 64, that by no later than March 15, 2013, DNREC shall compile the results of the review, develop a draft report, reconvene the Committee to review the draft report and solicit feedback and deliver the final report to the General Assembly.

During August 2012, DNREC conducted a community outreach meeting in each county to present the floodplain and drainage standards and recommendations that the committee had voted on and were adopted by the Secretary's Order.

The community outreach meetings were as follows:

Sussex County Tuesday, August 14, 2012, at the Delaware Technical and Community College in Georgetown. 26 officials attended representing 15 communities.

Kent County Wednesday, August 15, 2012, at the Kent County Administrative Building in Dover. 13 officials attended representing 7 communities.

New Castle County Friday, August 17, 2012 at the James H. Gilliam Sr. Building in New Castle. 10 officials attended representing 7 communities.

An overview of Senate Bill 64 and its purpose was presented at the beginning of each meeting. The process that the bill requires the committee to follow was also presented. Then each of the floodplain standards and recommendations were discussed in detail, as well as the issues that led the committee to develop the standards. Also, each of the drainage standards and recommendations developed by the Department were discussed in detail. At the end of each meeting the county and community officials were asked to review and prepare comments of their local ordinances to determine if they meet, exceed, or do not comply with the adopted Department Floodplain and Drainage Standards and Recommendations.

DNREC also set up a website at:

http://www.dnrec.delaware.gov/swc/Pages/FloodplainandDrainageCodeWorkGroupCommittee.aspx

A copy of the SB 64 Bill, a copy of each presentation given to the committee members, notes from each meeting, a copy of the August community outreach presentation, and a copy of the survey each municipality was asked to fill out are available online.

Subsequent to the community meetings, a questionnaire was distributed to the three counties and all 57 municipalities in the State. Thirty eight or about 63 percent responded. The survey form asked two questions for every standard as follows:

- Responses were requested whether the government body strongly agreed, agreed, disagreed, strongly disagreed, or had no comment with any given standard; and
- The community was also asked to explain if it already meets or exceeds the standard, does not comply, or if it would be a hardship to adopt.

Findings and Conclusions

Despite significant losses and attempts to meet criteria set forth by the NFIP, DNREC has found that projects are still being built in flood-prone areas without accurate floodplain delineations, accurate topography, or base flood elevations determined. A great deal of new construction is designed to minimum NFIP criteria, which results in significant-flood risk and expensive insurance premiums.

There are many benefits to improved floodplain standards. Flood damage is significantly reduced when structures are located outside of floodplains or elevated above predicted flood levels. Improved real estate disclosure and depiction of floodplains on site plans can ensure that potential buyers are notified about flood risk and insurance requirements. Flood damage not covered by limited homeowners' insurance may be minimized and the need for expensive flood abatement projects reduced. Enforcement of these standards lowers the cost of flood insurance and reduces damages and expensive drainage solutions while also ensuring continued insurance availability by avoiding NFIP probation or suspension.

Many communities are struggling with the administration of their floodplain regulations and have complicated approaches, which cause compliance to fall through the cracks. In some communities, the subdivision approval, floodplain regulations, and building code provisions are handled by separate departments. This creates administrative challenges because key floodplain management provisions must occur during the subdivision review phase (steering houses out of high risk areas, making sure flood risks are accurately determined), as well as the individual construction phase. Many of the important building construction aspects of floodplain management such as floor elevation requirements, and foundation designs are not reviewed by building code department, if the floodplain regulations are considered a zoning issue and not a building code provision.

There is a dollar value savings in flood insurance premiums if a structure is built with "freeboard" or with the first floor elevation well above base flood elevation (BFE). Concern was expressed how a Standard that results in the raising of homes would be applied considering building height restrictions and American's with Disabilities Act requirements.

A local drainage code is often confused with stormwater management requirements at the community level. Stormwater management is planned at the onset of a land development plan, is based on statewide regulations and is under the purview of DNREC through the Delaware Sediment and Stormwater Regulations. Drainage problems that emerge are often due to blocked outlet conditions, deteriorating infrastructure, one property owner altering land grading so as to cause an adverse impact to neighboring properties, or lots being built upon with no drainage outlet.

Despite holding workshops with the local municipalities to review the draft standards, the survey results are very inconclusive regarding whether a community currently complies with the adopted standards and recommendations. A widespread range of responses were also expressed by those local governments that agreed or not with a proposed standard. In a general sense, questionnaire responses identified many of the same issues as the Committee's votes.

Inconsistencies were observed in comparing the returned community surveys with codes available online and with DNREC's observations of local floodplain and drainage practices. Some communities which participate in the National Flood Insurance Program have adopted federal floodplain regulation to participate and may be under the impression that enforcement of these regulations is done by others, possibly FEMA or DNREC. In addition, many smaller communities rely on county agencies to enforcement building codes, and may believe that the counties are enforcing floodplain requirements as part of the building code review, or when stormwater plans are reviewed. Communities need to gain a better understanding of the floodplain regulations they have adopted and should be clear about the enforcement of these regulations.

In a parallel effort, DNREC retained the Water Resources Agency at the University of Delaware (WRA) to independently research existing codes throughout the State. In many cases, the information provided was not consistent with the survey results or information the Department knows to be correct, based on community assessments. Due to the discrepancies between the community responses and the WRA assessment, it is apparent that a lack of understanding and a significant amount of confusion exists regarding assessment of local codes and ordinances by both outside and internal review.

Public funds were expended to purchase 162 homes in the Glenville subdivision in New Castle County following a severe 2003 flood. Proposed Floodplain Standards are intended to minimize or eliminate the need for similar expenditures in future years.

It is largely as a result of the inconsistent internal review of codes and ordinances provided by the local governments and the original language of SB 64 that the adopted Standards and Recommendations be largely voluntarily considered by local governments, that the Department moves forward with options for implementation. This approach is also favored by the majority of the Committee.

The Floodplain and Drainage Advisory Committee met one more time in February 2013 to discuss the survey results, draft final report and options presented by the Department for implementation of the adopted Standards and Recommendations. It was a consensus of the committee to support options as presented below.

Options for Implementation

The Department in concert with the recommendation of the Advisory Committee is strongly advocating for a strategic outreach and technical assistance campaign with local governments and their elected officials to realize the adopted Standards and Recommendations.

DNREC will conduct outreach efforts at an individual community level to assist communities to understand the benefits of adopting these standards, to increase understanding and develop local capacity. Particular emphasis will be placed on the benefits of requiring accurate flood studies, reduction of flood damage and public recovery expenditures and lower insurance costs resulting from higher floodplain and drainage standards.

Most of the education and outreach to local communities regarding floodplain management is already conducted by DNREC as the state agency which supports National Flood Insurance Program participation. FEMA provides some funding to DNREC for this education, and the 48 NFIP-participating communities in Delaware (10 of these also participate in the Community Rating System or CRS program) are generally visited about once every five years. With frequent turnover of local personnel, increased outreach and education would help local governments in their understanding of flood risks, floodplain mapping, and the responsibility for local enforcement of flood management regulations.

In order to gain better acceptance in implementing local drainage standards, it is often the inspection and enforcement that is cited as the obstacle to changes in local codes and ordinances. A strategy involving the utilization of Conservation Districts in integrating inspections for drainage code compliance with current stormwater inspections, should be developed if local governments would be more willing to participate in the adoption of local drainage codes.

Survey results and independent assessments performed for this report indicate that floodplain management guidelines are often minimal or not understood by those who enforce them and drainage standards in some cases are nearly nonexistent.

Specifically, the Department will immediately undertake the following actions:

1. Work with the Delaware Board of Realtors and the Real Property Section of the Delaware Bar Association to improve the disclosure language currently found in Delaware Property Transfer disclosure notification related to floodplains and drainage. This recommendation was unanimously supported by the Committee and the representative from the Delaware Board of Realtors.

2. Develop model Drainage Code and Floodplain Management Code Ordinance language that may be used as a template by those communities willing to incorporate one or more of the

Drainage and Floodplain Standards and Recommendations into their municipal or county codes. Model language should be peer evaluated and undergo a legal review prior to offering such language as a template. DNREC will oversee the preparation of a guideline similar to the Residential Lot Grading Guidelines from Deltona, Florida, to provide as technical guidance in municipalities statewide.

3. Develop a budget for floodplain mapping needs that are necessary statewide and continue to aggressively pursue updated floodplain mapping as funding is identified and made available.

4. Recommend that State government consider development of policies for State-owned property or State-funded projects that comply with these higher floodplain and drainage standards. The Division of Facilities Management should evaluate State-owned buildings and properties and determine flooding and drainage vulnerabilities.

5. Recommend incentives to be created for local adoption of floodplain and drainage standards. These may be tied to funding of floodplain mapping or drainage improvement projects. Grant programs that require priority ranking of projects may receive additional points for communities that exhibit the most robust standards in place.

6. Recommend that a Certified Floodplain Manager be on staff, under contract, or available for assistance at each county or municipal agency to review floodplain activities. DNREC can provide assistance by providing training to assist staff or municipal consultants in becoming Certified Floodplain Managers, and proctor the exam periodically.

7. Implement a program over the next 12 to 18 months, to work individually with each county and municipal government scheduling visits with the most appropriate staff and officials to:

    - Cooperatively review applicable codes and ordinances to determine exactly where each local government is positioned with respect to implementation of the adopted Standards and Recommendations;
    - Provide technical assistance to evaluate current language in local codes to ensure that the language is clearly written and conveys the intended requirements;
    - Develop a specific recommendation for each municipality for adopting changes to the current municipal codes and ordinances based on existing statutes and the particular connection of a community to related floodplain and drainage program needs; and
    - Provide education and outreach, as requested, to local elected officials including presentations to Town Managers, Council Members, and Mayors, as appropriate, to fully inform decision- makers of the need to consider better standards for local governments.

8. Document each local government technical assistance effort with a report after the 12 to 18 month period; and deliver that report to the General Assembly as a follow-up to this last phase of a voluntary effort to improve Floodplain and Drainage Standards state-wide. The follow-up report will detail successful implementation as well as local decisions not to adopt necessary standards at the local level.

Final Minimum Floodplain and Drainage Standards

Prepared for the Floodplain and Drainage Advisory Committee

June 11, 2012

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Final Floodplain Standards

Proposed Standard 1: Flood study required in unmapped floodplains.

Current Criteria: There are currently no NFIP minimum standards for development projects contiguous to streams where FEMA has not delineated a floodplain area.

Proposed Standard: For all new development activities which exceed 50 lots or 5 acres in locations contiguous to streams without a FEMA-delineated floodplain, with an upstream watershed greater than 1 square mile, a flood study shall be conducted in accordance with FEMA study criteria. Base flood elevations (BFEs) and floodplain delineations shall be submitted to local jurisdictions prior to record plan approval or building permit issuance. This standard does not apply to Minor Subdivisions as defined by local governments.

		Lot Scenarios			FIRM Map Scenarios		
Tidal	Non -Tidal	Recorded Lots Grandfathered	Proposed Subdivision >= 50 lots or 5 acres	Proposed Subdivision <50 lots or 5 acres	Non-Delineated Floodplain	Delineated Floodplain No BFE (Zone A)	Delineated Floodplain with BFE (Zone AE)
	✓		✓		✓		

Supporting rationale: Many streams in Delaware do not have floodplains mapped. In 2011, two publicly funded floodplain buyouts were done in unmapped floodplains where homes were damaged beyond repair. Nationally, approximately 30 percent of all flood claims come from outside the 100-year floodplain. Currently, development in these areas is often done without consideration of flood risk. The photograph below shows flooding to a home in New Castle County which is contiguous to a stream with no FEMA mapped floodplain. The home has been repeatedly flooded and was damaged beyond repair during Hurricane Irene.

Proposed Standard 2: Flood Study required in Zone A (no BFE) FEMA mapped floodplains.

Current Criteria: The NFIP minimum standards require "base flood elevation data" to be included with all development proposals which exceed either 5 acres or 50 lots. The term "base flood elevation data" is not defined and has been interpreted to allow a wide range of submittals which do not reflect actual calculations of flood risk.

Proposed Standard: For all new development activities which exceed 50 lots or 5 acres in FEMA mapped floodplain areas without a base flood elevation, a flood study shall be conducted in accordance with FEMA study criteria. Base flood elevations and floodplain delineations shall be submitted to FEMA and approved prior to record plan approval so that official maps can be revised with these BFE's and floodplain delineations. This standard does not apply to Minor Subdivisions as defined by local governments.

		Lot Scenarios			FIRM Map Scenarios		
Tidal	Non -Tidal	Recorded Lots Grandfathered	Proposed Subdivision >= 50 lots or 5 acres	Proposed Subdivision <50 lots or 5 acres	Non-Delineated Floodplain	Delineated Floodplain No BFE (Zone A)	Delineated Floodplain with BFE (Zone AE)
	✓		✓			✓	

Supporting Rationale: CFR 44 60.3 requires NFIP-participating communities to require "base flood elevation data" to be submitted as part of development proposals which exceed 5 acres or 50 lots. "Base flood elevation data" is an ambiguous term which can include many types of data that FEMA will not accept. If FEMA cannot accept the data, then no corrections will be made to the floodplain map, property owners may have to determine base flood elevations on a lot-by-lot basis for building homes. Neither banks nor insurance companies can accept base flood elevation data that FEMA has not accepted, increasing insurance costs. The images below show the huge difference between a Zone A FEMA floodplain map (left) and an accurate floodplain map revised after a study was performed. Estimating a base flood elevation through point-on-the boundary or other means using the map on the left would almost certainly produce an inaccurate result.

Proposed Standard 3: Only FEMA approved floodplain and BFE data shall be shown on record plans and development documents.

Current Criteria: There are currently no NFIP minimum standards defining the source of base flood elevations or floodplain delineations which are depicted on building permit or development documentation.

Proposed Standard: In all areas with delineated floodplains, record plans and development documents shall show the floodplain delineation from a flood study approved by FEMA (with BFE where applicable). Flood studies submitted to FEMA for map revisions must be approved prior to the recordation stage for subdivisions.

		Lot Scenarios			FIRM Map Scenarios		
Tidal	Non -Tidal	Recorded Lots Grandfathered	Proposed Subdivision >= 50 lots or 5 acres	Proposed Subdivision <50 lots or 5 acres	Non-Delineated Floodplain	Delineated Floodplain No BFE (Zone A)	Delineated Floodplain with BFE (Zone AE)
✓	✓	✓	✓	✓		✓	✓

Supporting Rationale: Frequently, preparers of these site plans have modified the FEMA floodplain boundary on site plans to fit new topography, or to reflect new information. If these revised floodplain depictions have not gone through FEMA's review, then the information cannot be used by insurance companies, banks, or code enforcement departments. It is critical that prospective buyers and design professionals use official regulatory flood information, not unofficial depictions based on new data that has not undergone FEMA review.

Proposed Standard 4: Use accepted base flood elevations in building permit application documents.

Current Criteria: There are currently no NFIP minimum standards defining the source of base flood elevations or floodplain delineations which are depicted on building permit application documents.

Proposed Standard: All building permit application documents in a floodplain shall reference only base flood elevation and/or floodplain delineation developed in flood studies which have been reviewed and approved by appropriate county or municipal agency, or the Federal Emergency Management Agency where applicable.

		Lot Scenarios			FIRM Map Scenarios		
Tidal	Non -Tidal	Recorded Lots Grandfathered	Proposed Subdivision >= 50 lots or 5 acres	Proposed Subdivision <50 lots or 5 acres	Non-Delineated Floodplain	Delineated Floodplain No BFE (Zone A)	Delineated Floodplain with BFE (Zone AE)
✓	✓	✓	✓	✓		✓	✓

Supporting Rationale: Communities participating in the NFIP are required to verify that the floodplain information used to permit construction in the floodplain is accurate. FEMA BFEs should be used in Zone AE floodplains. In Zone A floodplains where FEMA has not determined BFE's, BFE data from other sources may be used such as a preliminary flood study, or appropriate calculation from the permit applicant's surveyor or engineer. In all cases, the community having responsibility for floodplain management must review all submitted BFE data.

Proposed Standard 5: Floodplain information included on permitting documentation.

Current Criteria: The NFIP does not stipulate the administrative permitting process for floodplain development, although 44 CFR 60.3 (the NFIP Regulations) does require that a permit be issued for all development in a floodplain.

Proposed Standard: Floodplain information including Floodplain Map used, effective flood zone delineations, base flood elevations, and proposed lowest floor elevations shall be required on record plans and development documents for all new development activities or substantially improved structures (as defined by local governments) within a FEMA floodplain.

		Lot Scenarios			FIRM Map Scenarios		
Tidal	Non -Tidal	Recorded Lots Grandfathered	Proposed Subdivision >= 50 lots or 5 acres	Proposed Subdivision <50 lots or 5 acres	Non-Delineated Floodplain	Delineated Floodplain No BFE (Zone A)	Delineated Floodplain with BFE (Zone AE)
✓	✓	✓	✓	✓		✓	✓

Supporting Rationale: Development activities in floodplains in NFIP-participating communities require the dissemination and collection of building and development information which may not be required for development outside the floodplain. These data include:

- Flood map and flood zone for the property
- Floor elevation is required for the site
- Special flood protection required for utilities
- Foundation requirements
- Grading requirements and many others.

It has been the Department's experience that there is a direct relationship between non-compliant floodplain development and unclear permitting documentation. Having permitting documentation that is specifically geared towards floodplain regulations increases the likelihood that requirements are passed along to the permit applicant, and that requirements are clear.

Proposed Standard 6: Require use of elevation and flood proofing certificates.

Current Criteria: The NFIP does not require the use of Elevation Certificates or Flood proofing Certificates.

Proposed Standard: FEMA Elevation certificates shall be completed properly for both pre and post-construction for all new structures and substantially improved structures (as defined by local governments) in the floodplain. For all new structures to be dry-flood proofed, a FEMA Flood proofing Certificate form shall be completed both pre and post construction.

		Lot Scenarios			FIRM Map Scenarios		
Tidal	Non -Tidal	Recorded Lots Grandfathered	Proposed Subdivision >= 50 lots or 5 acres	Proposed Subdivision <50 lots or 5 acres	Non-Delineated Floodplain	Delineated Floodplain No BFE (Zone A)	Delineated Floodplain with BFE (Zone AE)
✓	✓	✓	✓	✓		✓	✓

Supporting Rationale: The Elevation Certificate was specifically created and is widely used to collect compliance data about buildings in floodplain in NFIP-participating communities. Elevation certificate are already required for flood insurance policies to be written for new buildings, and for property owners who request Letters of Map Amendments or Map Revisions based on fill. It has been the Department's experience that a significant contributing factor to non-compliant development is failure to use pre-construction and/or post construction elevation certificates. Improperly completed elevation certificates are also a major problem which is much harder for communities to address after the fact.

Proposed Standard 7: Require 18 inches of freeboard.

Current Criteria: The NFIP minimum standards currently do not require any freeboard for first floors elevations.

Proposed Standard: All new construction or substantially improved structures (as defined by local governments) located within a FEMA mapped floodplain shall have the lowest floor, including basement, and all equipment and machinery elevated to or above 18 inches above the base flood elevation. In lieu of elevation, non-residential structures may provide dry-floodproofing such that the lowest floor of the building and all utilities are protected to a minimum height of 18 inches above BFE.

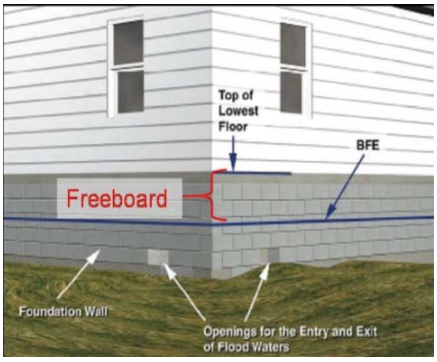
Examples of savings on NFIP1 with freeboard

		Annual savings in NFIP premiums	Savings over 30-year mortgage		Annual savings in NFIP premiums	Savings over 30-year mortgage
Zone V[2]	1' freeboard	$2,565 (33%)	$76,950	Zone A[3]	$725 (46%)	$21,750
	2' freeboard	$4,310 (56%)	$129,300		$984 (63%)	$29,520
	3' freeboard	$5,160 (67%)	$154,800		$1,074 (68%)	$32,220

[1] NFIP premiums based on October 2010 rates for a one-floor residential structure with no basement built after a FIRM was issued for the community (post-FIRM rates differ from pre-FIRM rates). $500 deductible/$250,000 coverage for the building/$100,000 for contents.

[2] Zone V: This Flood Insurance Rate Map (FIRM) designation refers to coastal areas that are subject to the highest levels of wave energy and flooding.

[3] Zone A: Also a FIRM designation, these areas are subject to flooding but with less wave energy than Zone V (i.e., wave heights less than 3 feet).



		Lot Scenarios			FIRM Map Scenarios		
Tidal	Non -Tidal	Recorded Lots Grandfathered	Proposed Subdivision >= 50 lots or 5 acres	Proposed Subdivision <50 lots or 5 acres	Non-Delineated Floodplain	Delineated Floodplain No BFE (Zone A)	Delineated Floodplain with BFE (Zone AE)
✓	✓	✓	✓	✓		✓	✓

Supporting Rationale: A significant amount of flood damage will occur to most structures if water reaches the first floor of the house, even if the floor is not overtopped. Also, flood studies have a significant amount of uncertainty and flood levels are likely increasing in many areas. Freeboard is the single most important factor in reducing flood damage, and lowering flood insurance costs. The insurance graphic illustrates that 18" freeboard results in a $984/year savings in AE Zone floodplains and $4310/year for VE Zone floodplains.

Proposed Standard 7 (Alternate): Require one foot of freeboard.

Current Criteria: The NFIP minimum standards currently do not require any freeboard for first floors elevations.

Proposed Standard: All new construction or substantially improved structures (as defined by local governments) located within a FEMA mapped floodplain shall have the lowest floor, including basement, and all equipment and machinery elevated to or above one foot above the base flood elevation. In lieu of elevation, non-residential structures may provide dry-floodproofing such that the lowest floor of the building and all utilities are protected to a minimum height of one foot above BFE.

Examples of savings on NFIP[1] with freeboard

		Annual savings in NFIP premiums	Savings over 30-year mortgage		Annual savings in NFIP premiums	Savings over 30-year mortgage
Zone V[2]	1' freeboard	$2,565 (33%)	$76,950	Zone A[3]	$725 (46%)	$21,750
	2' freeboard	$4,310 (56%)	$129,300		$984 (63%)	$29,520
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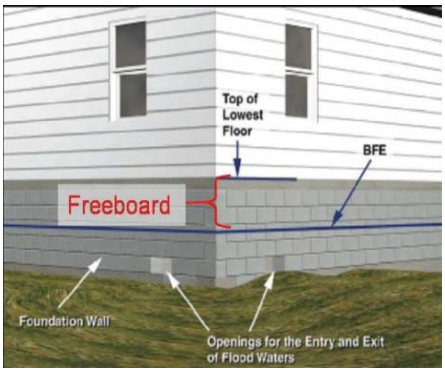
[1] NFIP premiums based on October 2010 rates for a one-floor residential structure with no basement built after a FIRM was issued for the community (post-FIRM rates differ from pre-FIRM rates). $500 deductible/$250,000 coverage for the building/$100,000 for contents.

[2] Zone V: This Flood Insurance Rate Map (FIRM) designation refers to coastal areas that are subject to the highest levels of wave energy and flooding.

[3] Zone A: Also a FIRM designation, these areas are subject to flooding but with less wave energy than Zone V (i.e., wave heights less than 3 feet).



		Lot Scenarios			FIRM Map Scenarios		
Tidal	Non -Tidal	Recorded Lots Grandfathered	Proposed Subdivision >= 50 lots or 5 acres	Proposed Subdivision <50 lots or 5 acres	Non-Delineated Floodplain	Delineated Floodplain No BFE (Zone A)	Delineated Floodplain with BFE (Zone AE)
✓	✓	✓	✓	✓		✓	✓

Supporting Rationale: A significant amount of flood damage will occur to most structures if water reaches the first floor of the house, even if the floor is not overtopped. Also, flood studies have a significant amount of uncertainty and flood levels are likely increasing in many areas. Freeboard is the single most important factor in reducing flood damage, and lowering flood insurance costs. The insurance graphic illustrates that one foot freeboard results in a $725/year savings in AE Zone floodplains and $2565/year for VE Zone floodplains.

Proposed Standard 8: Require 18 inches of freeboard for Manufactured Homes

Current Criteria: The NFIP minimum standards currently do not require any freeboard for first floors elevations of manufactured homes and allow new or replacement manufactured homes placed in older manufactured home communities to be placed on 36” piers even when base flood elevation is more than 36” above grade.

Proposed Standard: All new or substantially improved (as defined by local governments) manufactured homes located within a FEMA mapped floodplain shall have the lowest floor, including basement, and all equipment and machinery elevated to or above 18 inches above the base flood elevation.

		Lot Scenarios			FIRM Map Scenarios		
Tidal	Non -Tidal	Recorded Lots Grandfathered	Proposed Subdivision >= 50 lots or 5 acres	Proposed Subdivision <50 lots or 5 acres	Non-Delineated Floodplain	Delineated Floodplain No BFE (Zone A)	Delineated Floodplain with BFE (Zone AE)
✓	✓	✓	✓	✓		✓	✓

Supporting Rationale: Significant flood damage will occur to manufactured homes if water reaches the first floor of the house, even if the floor is not overtopped. Most manufactured homes place ductwork below the lowest flood and use flooring materials which are susceptible to water damage. Flood studies have a significant amount of uncertainty and flood levels are likely increasing in many areas. Freeboard is the single most important factor in reducing flood damage to manufactured homes, and lowering flood insurance costs.

Proposed Standard 9: Shallow fill above BFE will not exempt a structure from floodplain regulations.

Current Criteria: Current criteria is to treat land removed from the floodplain by filling no differently than any other land which is outside the floodplain.

Proposed Standard: Fill placed in the floodplain which results in land having an elevation less than 18 inches above base flood elevation will not result in a relaxation of floodplain standards.

LETTER OF MAP REVISION BASED ON FILL DETERMINATION DOCUMENT (REMOVAL)

ATTACHMENT 1 (ADDITIONAL CONSIDERATIONS)

TABLE (CONTINUED)

SUBDIVISION	STREET	OUTCOME WHAT IS REMOVED FROM THE SFHA	FLOOD ZONE	1% ANNUAL CHANCE FLOOD ELEVATION (NAVD 88)	LOWEST ADJACENT GRADE ELEVATION (NAVD 88)	LOWEST LOT ELEVATION (NAVD 88)
Americana Bayside, Phase 11	Wild Rose Circle	Property	X (shaded)	5.2 feet	--	5.3 feet
Americana Bayside, Phase 11	Wild Rose Circle	Property	X (shaded)	5.2 feet	--	5.3 feet
Americana Bayside, Phase 11	Wild Rose Circle	Property	X (shaded)	5.2 feet	--	5.4 feet
Americana Bayside, Phase 11	Wild Rose Circle	Property	X (shaded)	5.2 feet	--	5.3 feet
Americana Bayside, Phase 11	Wild Rose Circle	Property	X (shaded)	5.2 feet	--	5.6 feet
Americana Bayside, Phase 11	Coneflower Circle	Property	X (shaded)	5.2 feet	--	5.3 feet

		Lot Scenarios			FIRM Map Scenarios		
Tidal	Non -Tidal	Recorded Lots Grandfathered	Proposed Subdivision >= 50 lots or 5 acres	Proposed Subdivision <50 lots or 5 acres	Non-Delineated Floodplain	Delineated Floodplain No BFE (Zone A)	Delineated Floodplain with BFE (Zone AE)
✓	✓	✓	✓	✓		✓	✓

Supporting Rationale: FEMA may amend or revise floodplain maps to remove land from the floodplain when the property owner shows that grade has been elevated to or above the base flood elevation. Through this LOMR process, land may be removed from all floodplain regulation despite being almost exactly at the level of the base flood. There is a great deal of uncertainty in flood models, and flood heights are increasing in many areas. The photograph shows a basement filled with waters on a lot located immediately outside of the floodplain and elevated only 0.3 feet above BFE. The table above shows an example of lots which have been removed from the floodplain after having been filled to an elevation as little as 0.1 foot above base flood elevation.

Proposed Standard 10: Hydrostatic venting required.

Current Criteria: The NFIP minimum standards currently require hydrostatic venting by requiring enclosures below BFE "shall be designed to automatically equalize hydrostatic flood forces on exterior walls by allowing for the entry and exit of floodwaters". This proposed standard does not exceed existing minimum NFIP criteria.

Proposed Standard: Hydrostatic vents shall be required within one foot of grade for all new construction or substantially improved structures (as defined by local governments) with enclosures below the lowest floor located in FEMA mapped floodplains excluding V-zones if the lowest adjacent grade to the structure is below the BFE. One square inch of openings must be provided for every square foot of enclosure.

For example, 1400 sq. foot footprint
Means 1400 sq. inches of venting or
11 standard 128 sq. inch vents

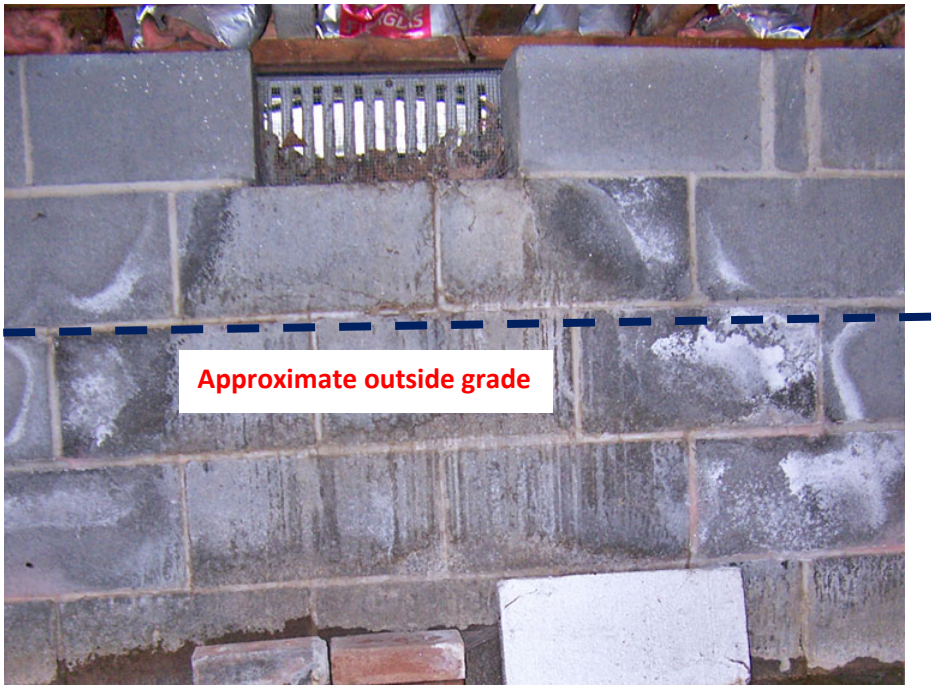
		Lot Scenarios			FIRM Map Scenarios		
Tidal	Non -Tidal	Recorded Lots Grandfathered	Proposed Subdivision >= 50 lots or 5 acres	Proposed Subdivision <50 lots or 5 acres	Non-Delineated Floodplain	Delineated Floodplain No BFE (Zone A)	Delineated Floodplain with BFE (Zone AE)
✓	✓	✓	✓	✓		✓	✓

Supporting Rationale: Properly designed and installed hydrostatic venting (flood openings) is one of the single most cost-effective ways of lowering the price of flood insurance. CFR 44 60.3 requires all NFIP participating communities to requires flood openings for enclosures below BFE. Despite this, many homes are still built without proper flood openings, leading to unnecessarily expensive flood insurance premiums. This proposed standard does not exceed existing minimum NFIP criteria; however lack of enforcement is common.

Proposed Standard 11: Prohibit below-grade crawl spaces or enclosures

Current Criteria: The NFIP minimum standards prohibit "basements" and define basements as means any area of the building having its floor subgrade (below ground level) on all sides. Technically this would prohibit below grade crawl spaces, although it may be unclear whether the dirt grade in a crawl space is a "floor".

Proposed Standard: If areas below the lowest floor of an elevated building are enclosed with areas usable for parking, storage, or building access, or are constructed with a crawl space, the elevation of the floor of the enclosure or crawl space floor or grade must be at or above lowest adjacent grade on at least one side of the building.



Inside below grade crawl space. The dashed line represents the approximate outside grade. Entry point of surface water visible. This type of construction, with inside grade below outside grade can lead to moisture and mold problems and is prohibited by the NFIP. Few communities explicitly prohibit this practice.

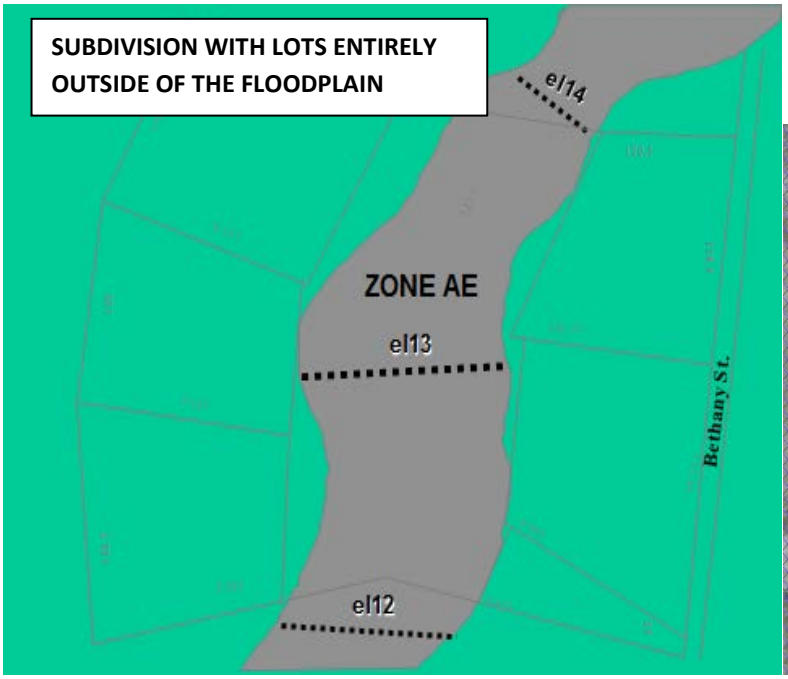
		Lot Scenarios			FIRM Map Scenarios		
Tidal	Non -Tidal	Recorded Lots Grandfathered	Proposed Subdivision >= 50 lots or 5 acres	Proposed Subdivision <50 lots or 5 acres	Non-Delineated Floodplain	Delineated Floodplain No BFE (Zone A)	Delineated Floodplain with BFE (Zone AE)
✓	✓	✓	✓	✓		✓	✓

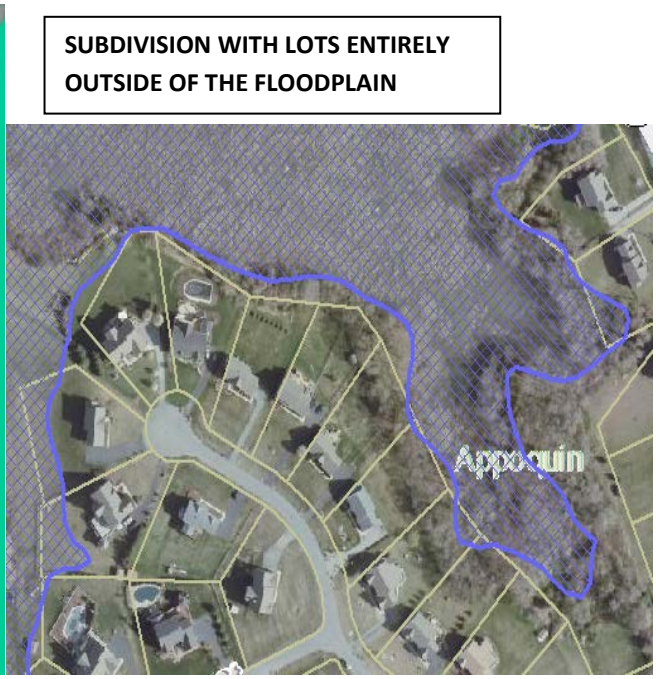
Supporting Rationale: Below grade crawl spaces and enclosures provide a collection point for floodwaters. Flood insurance premiums can be drastically more expensive for buildings with below grade enclosed areas. Technically the NFIP prohibits this practice but it frequently occurs due to a lack of specificity in community floodplain regulations.

Proposed Standard 12: Newly subdivided floodplain shall remain deed restricted open space.

Current Criteria: The NFIP does not prohibit new buildings, development or lots from being built in floodplains.

Proposed Standard: Mapped floodplains in all lands being newly subdivided shall be located in a lot or lots dedicated as public or private open space and deed restricted to prohibit development. No lot intended for development shall contain any portion of the mapped floodplain. This standard does not apply to Minor Subdivisions as defined by local governments.





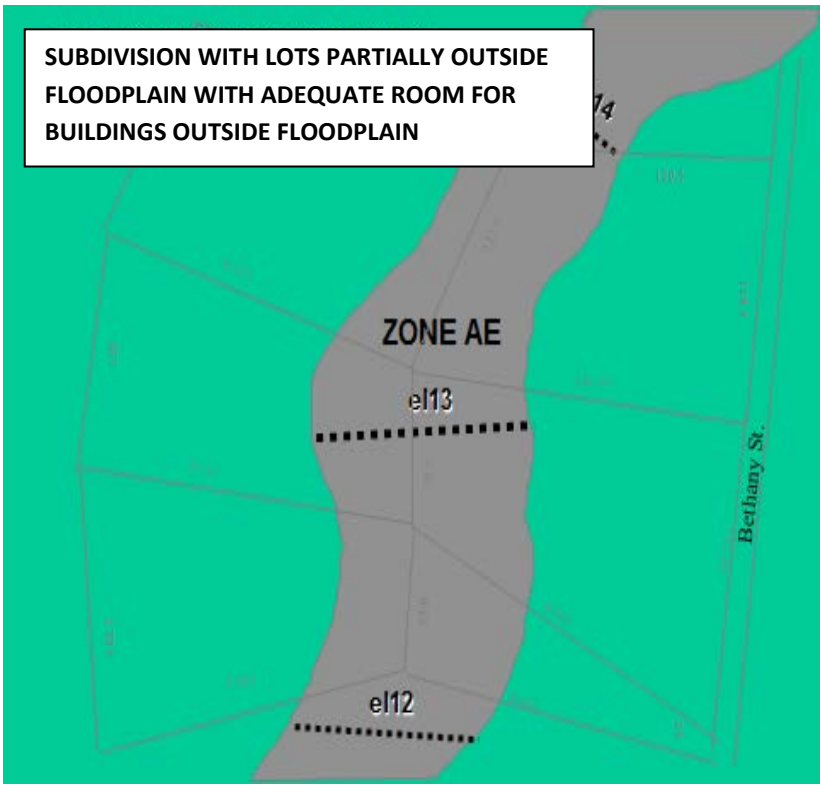
		Lot Scenarios			FIRM Map Scenarios		
Tidal	Non - Tidal	Recorded Lots Grandfathered	Proposed Subdivision >= 50 lots or 5 acres	Proposed Subdivision <50 lots or 5 acres	Non-Delineated Floodplain	Delineated Floodplain No BFE (Zone A)	Delineated Floodplain with BFE (Zone AE)
	✓		✓	✓		✓	✓

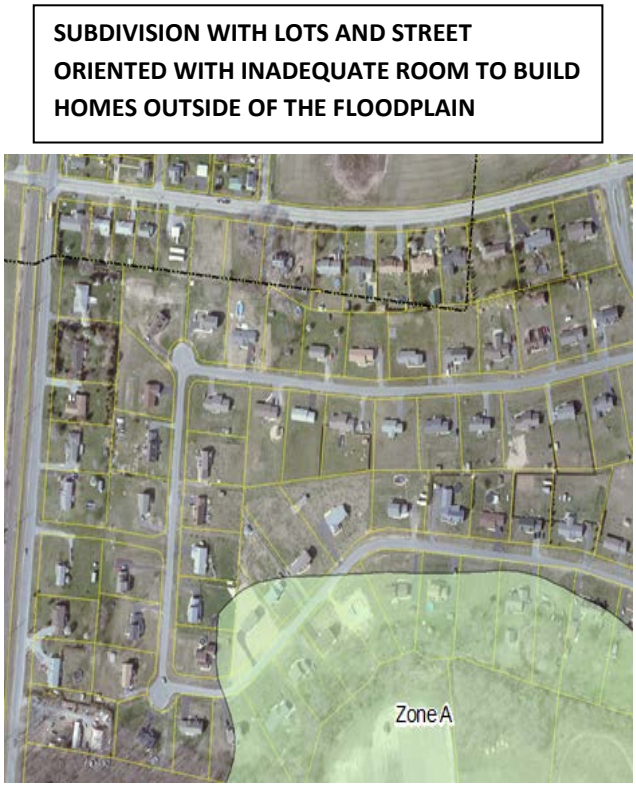
Supporting Rationale: This standard prohibits new lots to be created which impact the floodplain, and requires the floodplain to be placed in deed restricted open space. Keeping new buildings and lots outside the floodplain is the ideal way to reduce flood risk. Any building in the floodplain has some risk of being damaged, and keeping floodplains in open space is the most effective way to minimize impacts to adjacent properties. Flood insurance is quite expensive for any buildings in the floodplain, and is often required by lenders when any portion of the lot is in the floodplain. Keeping new lots and buildings out of the floodplain will achieve a very high level of flood protection, reduce community impacts, and is already in practice is certain parts of Delaware.

Proposed Standard 13: Prohibit new non-water dependent structures in floodplains on new lots.

Current Criteria: The NFIP does not prohibit new buildings, development or lots from being built in floodplains.

Proposed Standard: New lots in major subdivisions, as defined by local governments, may be located in the floodplain as long as sufficient room outside the floodplain exists for future construction activities. All new structures within mapped floodplains shall be prohibited except buildings with water-dependent use. This standard does not apply to Minor Subdivisions as defined by local governments.





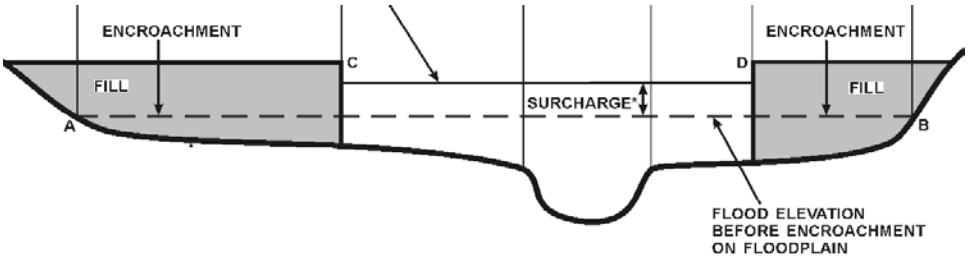
		Lot Scenarios			FIRM Map Scenarios		
Tidal	Non -Tidal	Recorded Lots Grandfathered	Proposed Subdivision >= 50 lots or 5 acres	Proposed Subdivision <50 lots or 5 acres	Non-Delineated Floodplain	Delineated Floodplain No BFE (Zone A)	Delineated Floodplain with BFE (Zone AE)
	✓		✓	✓		✓	✓

Supporting Rationale: Keeping new buildings outside the floodplain is a widely accepted way to reduce flood risk and is a standard which already exists in many areas in Delaware. Any building in the floodplain has some risk of being damaged, and creates some impact to adjacent properties. Flood insurance is quite expensive for any buildings in the floodplain. Keeping buildings out of the floodplain will achieve a high level of flood protection, and reduce impacts.

Proposed Standard 14: Prohibit encroachments that would cause more than 0.1 foot of rise without compensation.

Current Criteria: In Zones AE with a floodway/flood fringe mapped, the NFIP allows encroachments in the flood fringe which result in up to one foot of flood increase in the base flood event. In floodplains where no floodway/flood fringe has been mapped no new construction, substantial improvements, or other development (including fill) shall be permitted within Zones A1-30 and AE on the community's FIRM, unless it is demonstrated that the cumulative effect of the proposed development, when combined with all other existing and anticipated development, will not increase the water surface elevation of the base flood more than one foot at any point within the community.

Proposed Standard: In non-tidal areas with delineated floodplains, encroachment in all floodplains that would increase flood heights by 0.1 foot or more is prohibited. Compensatory storage may be used to mitigate the effects of floodplain development actions to meet the requirement that flood height increase does not exceed 0.1 foot at any location.



		Lot Scenarios			FIRM Map Scenarios		
Tidal	Non -Tidal	Recorded Lots Grandfathered	Proposed Subdivision >= 50 lots or 5 acres	Proposed Subdivision <50 lots or 5 acres	Non-Delineated Floodplain	Delineated Floodplain No BFE (Zone A)	Delineated Floodplain with BFE (Zone AE)
	✓	✓	✓	✓		✓	✓

Supporting Rationale: Current criteria allow encroachments to increase flood heights by up to one foot resulting in potentially severe impacts to neighboring properties. In most non-tidal floodplains (and in some cases tidal floodplains), obstructions to water flow or encroachments which reduce the flood storage capacity of a channel or floodplain, will result in higher flood heights. In many streams with detailed flood studies, FEMA has determined how much potential flood increase will occur due to encroachments, and it can exceed one foot in the base flood event. Many community floodplain regulations allow development to occur which will be impacted by these increases in flood heights. In addition, allowing floodplain encroachments violates the common law of avoiding actions which will negatively impact your neighbors and community. The illustration above shows the impact "surcharge" of encroachment. Allowing a small (0.1 foot) impact of encroachment will enable projects to be designed which might not be practical under a "no-rise" standard, but still ensure a minimum impact to neighboring properties, or public infrastructure.

Proposed Standard 15: Incorporate FEMA technical bulletins in local floodplain regulations.

Current Criteria: The NFIP does not require participating communities to explicitly adopt the technical bulletins in ordinance or codes. The NFIP does require compliance with these technical bulletins in NFIP communities.

Proposed Standard: For all new development and new structures or substantially improved structures (as defined by local governments), activities in the floodplain shall be performed in a manner which is consistent with the following FEMA Technical Bulletins:

TB 11-01	Crawlspace Construction
TB 10-01	Ensuring That Structures Built on Fill In or Near Special Flood Hazard Areas Are Reasonably Safe From Flooding
TB 5-2008	Free-of-Obstruction Requirements
TB 9-2008	Design and Construction Guidance for Breakaway Walls
TB 1-2008	Openings in Foundation Walls and Walls of Enclosures
TB 2-93	Flood-Resistant Materials Requirements
TB 3-93	Non-Residential Flood proofing Requirements and Certification
TB 4-93	Elevator Installation for Buildings Located in Special Flood Hazard Areas
TB 6-93	Below-Grade Parking Requirements for Buildings Located in Special Flood Hazard Areas
TB 7-93	Wet Flood proofing Requirements for Structures Located in Special Flood Hazard Areas
TB 8-93	Corrosion Protection for Metal Connectors in Coastal Areas

		Lot Scenarios			FIRM Map Scenarios		
Tidal	Non -Tidal	Recorded Lots Grandfathered	Proposed Subdivision >= 50 lots or 5 acres	Proposed Subdivision <50 lots or 5 acres	Non-Delineated Floodplain	Delineated Floodplain No BFE (Zone A)	Delineated Floodplain with BFE (Zone AE)
✓	✓	✓	✓	✓		✓	✓

Supporting Rationale: Per FEMA: "The Federal Emergency Management Agency Technical Bulletins provide guidance concerning building performance standards of the NFIP, contained in Title 44 of the U.S. Code of Federal Regulations at Section 60.3. The bulletins are intended for use primarily by state and local officials responsible for interpreting and enforcing NFIP regulations and by members of the development community, such as design professionals and builders. New bulletins, as well as updates of existing bulletins, are issued periodically, as necessary. The bulletins do not create regulation; rather, they provide specific guidance for complying with the minimum requirements of existing NFIP regulations."

Additional Floodplain Recommendations

Recommendation #1: DNREC shall make it a priority to modernize floodplain maps.

Recommendation #2: Lending banks are currently required to review maps in FEMA's map service center and require flood insurance at closing if the loan is secured by property in a Special Flood Hazard Area. If the seller's disclosure did not properly disclose flooding or floodplain issues, this insurance requirement at closing will often be when a buyer is first made aware that the property is in a floodplain. DNREC should meet with the Board of Realtors within six months to develop improved wording on seller disclosure forms, should investigate lending regulations to determine whether flood zone determinations are required in advance of settlement, and if so how far in advance.

Recommendation #3: A Certified Floodplain Manager should be on staff, under contract, or available for assistance at each agency to review floodplain activities. DNREC can provide assistance by providing training to assist staff in becoming Certified Floodplain Managers, and proctor the exam periodically.

Recommendation #4: Memoranda of Agreement (MOA) should be encouraged between counties or other larger governments and smaller cities or towns for enforcement of floodplain regulations where local capabilities are insufficient.

Recommendation #5: A separate plan review or building permit process specific to floodplain regulation should be required for all development or construction activities in floodplains. Site plan notes and building permit application documents should include floodplain information including but not limited to floodplain map used, flood zone, base flood elevation, lowest floor elevations, utility and machinery elevations.

Recommendation #6: Communities should adopt floodplain maps by utilizing "effective map as last revised" terminology so that new or updated maps from FEMA are automatically adopted as they are issued by FEMA.

Recommendation #7: Communities should review their codes for wording which undermines NFIP requirements or makes them difficult to understand. For example, phrases such as "no land below the level of the 100-year flood may be developed unless it complies with all applicable floodplain regulation" could remove high sand dune areas in a V-Zone from floodplain regulations which would be unwise, and would not be allowed under the minimum NFIP requirements.

Final

Drainage

Standards

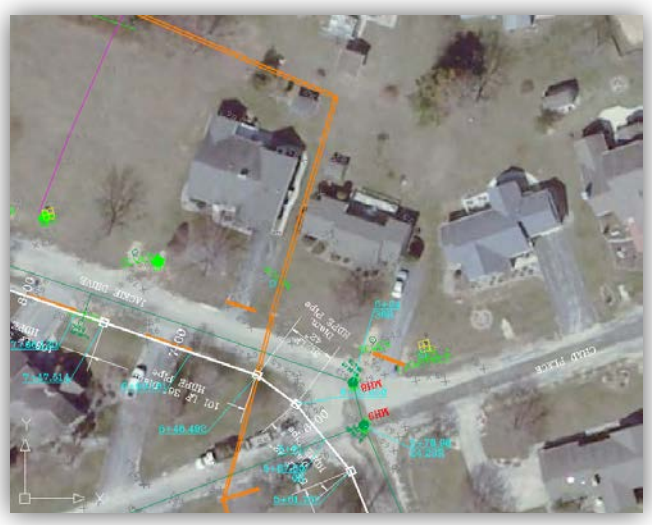
Proposed Standard 1: Easements

Current Criteria: There is no current statewide standard. In many jurisdictions there are no or minimal easement requirements.

Proposed Standard: Easements of an adequate width as determined by local governments shall be required over drainage conveyance systems within any proposed subdivision. Easements shall clearly designate responsible parties. The maintenance responsibilities shall be included as part of the easement language.

Lot Scenarios				
Previously Recorded Lots	**Minor Subdivision**	**Major Subdivision**	**Single Parcel Commercial**	**Multiple Parcel Commercial**
	✓	✓		✓

Supporting Rationale: All drainage conveyance systems including open ditches and storm drains will need maintenance. Requiring easements over conveyance systems will allow future maintenance to be completed much more cost effectively. Additionally, declaring who is responsible for maintenance up front prevents surprises in the future.



There is a failing storm drain between two homes that are about 15’ feet apart making repairs and or replacement expensive and difficult.

Proposed Standard 2: Obstructions

Current Criteria: There is no current statewide standard. In many jurisdictions there are no restrictions on the blocking of drainage conveyances.

Proposed Standard: The willful or negligent obstruction of any drainage conveyance shall be prohibited.

Lot Scenarios				
Previously Recorded Lots	**Minor Subdivision**	**Major Subdivision**	**Single Parcel Commercial**	**Multiple Parcel Commercial**
✓	✓	✓	✓	✓

Supporting Rationale: When one party willfully or negligently blocks a drainage conveyance system causing water to pond onto upstream lands, in many parts of the state, there is no recourse for the adversely impacted party other than civil litigation. This is costly and lengthy process that many people cannot afford to undertake. This language is similar the Tax Ditch Law (7 Del. C. §4186) which has been an effective state law since 1951.

Proposed Standard 3: Conveyance Systems

Current Criteria: There is no current statewide standard. It was mentioned at the February meeting that many jurisdictions already use this standard or something similar.

Proposed Standard: Drainage Conveyance systems within proposed subdivisions shall meet the minimum 10-year storm event.

Lot Scenarios				
Previously Recorded Lots	**Minor Subdivision**	**Major Subdivision**	**Single Parcel Commercial**	**Multiple Parcel Commercial**
	✓	✓		✓

Supporting Rationale: This will ensure that all new drainage conveyance systems will meet a consistent standard and provide at least protection in the 10 year storm. The DelDOT standard is already a statewide minimum that has been through a public process. It was pointed out at the February meeting that this is currently the standard in many counties and municipalities across the state.

From DelDOT's "Standards and Regulations for Subdivision Streets and State Highway Access"

5.7.2.2 Storm Sewers

The following criteria shall be used for storm sewers:

- A 10-year storm frequency shall be used.
- For sump conditions a 25-year storm frequency shall be used.
- The hydraulic gradient shall be no higher than one foot below the top of the grate for ten-year storms and just below the top of the grate for 25-year storms.

5.7.2.4 Parallel Ditching

The following criteria shall be used for parallel ditching:

- A 5-year storm frequency.
- The depth of the water in the ditch shall not be higher than six inches below the edge of the proposed shoulder.

Proposed Standard 4: Lot Grading

Current Criteria: There is no current statewide standard. Most jurisdictions do not have any lot grading requirements.

Proposed Standard: Lot grading shall be accomplished to ensure adequate drainage away from buildings and accessory structures without creating an adverse impact to adjacent structures or lands.

Lot Scenarios				
Previously Recorded Lots	**Minor Subdivision**	**Major Subdivision**	**Single Parcel Commercial**	**Multiple Parcel Commercial**
✓	✓	✓	✓	✓

Supporting Rationale: This standard will provide a level of detail that will assure permitting officials and adjacent property owners alike that the proposed building will be constructed in a manner that will minimize drainage problems that are a result of poor grading. It will also prevent landowner B from building up their property and draining water onto landowner A whose house is already built and the property graded.

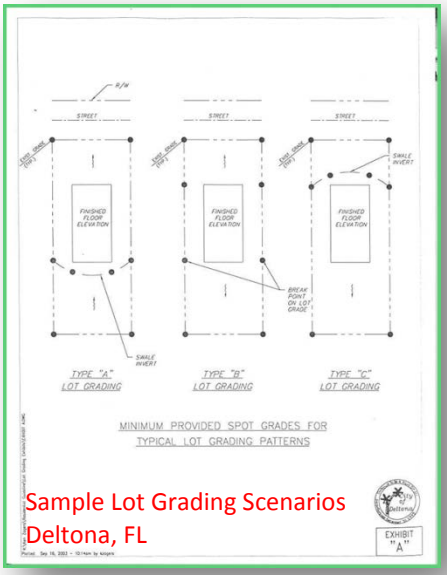
Proposed Standard 5: Topographic Plan

Current Criteria: There is no current statewide standard. Most jurisdictions do not have any topographic plan requirements.

Proposed Standard: A topographic plan submittal shall be required for all construction activity greater than 5,000 square feet. This submittal shall be required for all building permits exceeding the threshold. Information shall include finished floor elevation and grading to a point of positive conveyance. Finished floor elevations shall be higher than the road elevation unless adequate drainage away from structures, protection of mechanical systems, and no adverse impacts to adjacent structures can be demonstrated.

Lot Scenarios				
Previously Recorded Lots	**Minor Subdivision**	**Major Subdivision**	**Single Parcel Commercial**	**Multiple Parcel Commercial**
✓	✓	✓	✓	✓

Supporting Rationale: This standard simply means that grading should be done in manner that drains water away for the structure without negatively impacting that structure or other structures or lands. This will be a first step in preventing future problems with better planning and construction techniques.



Proposed Standard 6: As-Builts

Current Criteria: There is no current statewide standard. Most jurisdictions do not have any as-built requirements.

Proposed Standard: An as-built submittal shall be required for any construction with an approved topographic plan. Information to be shown shall include floor elevation, road elevation, and a sufficient number of ground elevations to clearly demonstrate adequate drainage away from structures, protection of mechanical systems, and no adverse impacts to adjacent structures or lands.

Lot Scenarios				
Previously Recorded Lots	**Minor Subdivision**	**Major Subdivision**	**Single Parcel Commercial**	**Multiple Parcel Commercial**
✓	✓	✓	✓	✓

Supporting Rationale: This standard will require as-builts to make sure that homes are graded in accordance with the approved topographic plan. This will provide assurance that the property is graded in a way that that prevents damage to the property being constructed as well as adjacent structures or lands. A timely as-built will allow problems to be corrected while the contractor is still onsite.

Additional Drainage Recommendations

Recommendation #1: The review of existing drainage patterns should be included not only in the subdivision planning process but in the building permit process as well.

Recommendation #2: Permanent easements conveyed to a public entity should be considered whenever public dollars are spent to correct a drainage deficiency.

Recommendation #3: DNREC should oversee the preparation of a guideline similar to the Residential Lot Grading Guidelines from Deltona, Florida. County or municipal governments could then incorporate the guidelines into their codes and ordinances.

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Acronyms and Definitions

Acronyms

CFM – Certified Floodplain Manager. A national program for professional certification administered by the Association of State Floodplain Managers. Per ASFPM, the program "recognizes continuing education and professional development that enhance the knowledge and performance of local, state, federal, and private-sector floodplain managers."

CRS – Community Rating System. A voluntary program for NFIP-participating communities. The goals of the CRS are to reduce flood losses, to facilitate accurate insurance rating, and to promote the awareness of flood insurance. The CRS has been developed to provide incentives for communities to go beyond the minimum floodplain management requirements to develop extra measures to provide protection from flooding. The incentives are in the form of premium discounts.

FIRM – Flood Insurance Rate Map. An official map of a community on which the Administrator has delineated both the special hazard areas and the risk premium zones applicable to the community. FIRMs are also available digitally, and are called Digital Flood Insurance Rate Maps (DFIRM).

LOMR – Letter of Map Revision. LOMRs are generally based on the implementation of physical measures that affect the hydrologic or hydraulic characteristics of a flooding source and thus result in the modification of the existing regulatory floodway, the effective Base Flood Elevations, or the Special Flood Hazard Area. The LOMR officially revises the Flood Insurance Rate Map or Flood Boundary and Floodway Map, and sometimes the Flood Insurance Study report.

NFIP – National Flood Insurance Program. A federal program managed by FEMA. The NFIP has 3 components: Flood Insurance, Floodplain Management, and Flood Hazard Mapping.

Definitions

100-year Event – hydrologic event having a 1 percent chance of happening in any given year.

25-year Event – hydrologic event having a 4 percent chance of happening in any given year.

Adverse Impact – a negative impact resulting from a construction or development activity that may include, but is not limited to, increased risk of flooding; degradation of water quality; increased sedimentation; reduced groundwater recharge; negative impacts on aquatic habitat; and threatened public health and safety.

Base Flood – the flood which has a one percent chance of being equaled or exceeded in any given year (also known as a 100-year flood). This term is used in the NFIP to indicate the minimum level of flooding to be used by a community in its floodplain management regulations.

Base Flood Elevation (BFE) – the elevation corresponding to the base flood.

Drainage Conveyance – the transport of runoff in open channels or through enclosed pipes.

Drainage Management – assuring the adequate passage of surface water away from structures and towards major waterways (rivers and bays) over 24 to 48 hours.

Easement – a grant or reservation by the Owner of land for the use of such land by others for a specific purpose or purposes and which must be included in the conveyance of land affected by such easement.

Floodplain – the lowland and relatively flat areas adjoining inland and coastal waters including, at a minimum, that area subject to a one percent or greater chance of flooding in any given year.

Freeboard – a factor of safety usually expressed in feet above a flood level for purposes of floodplain management. Freeboard is not required by NFIP standards, but communities are encouraged to adopt at least a one-foot freeboard. Freeboard results in significantly lower flood insurance rates due to lower flood risk.

Hydraulics – physical science and technology of the static and dynamic behavior of fluids.

Hydrology – scientific study of the properties, distribution, and effects of water on the earth's surface, in the soil and underlying rocks, and in the atmosphere.

Impervious Surface – means a surface which either prevents or retards the entry of water into the soil. Increases in impervious surface generally result in increases in runoff unless proper measures are taken.

Lines and Grades – prepared plan usually depicting existing and proposed contours, building elevations, stormwater conveyances, property lines and easements, etc., intended to demonstrate no adverse impacts.

Regulatory Floodway – the area regulated by Federal, state or local requirements to provide for the discharge of the base flood so the cumulative increase in water surface elevation is no more than a designated amount (not to exceed one foot as set by the NFIP).

I. Background and History

Governor Jack A. Markell signed Senate Bill 64 into law on August 17, 2011. The legislation was developed in response to concerns about Delaware's vulnerability to ongoing inland and coastal flooding and drainage challenges, coastal storms and other extreme weather events, and rising sea level - all of which threaten public infrastructure, private property, and human health and safety.

With overwhelming bipartisan support, Senate Bill 64 passed with the purpose of protecting human life, health and welfare by requiring the Department to assemble a panel of experts to identify best practices and assist local governments in implementing such policies in order to prevent or minimize flood damage in the future. Specifically the Bill's purpose is to:

- Minimize flooding of water supply and sanitary sewage disposal systems;
- Maintain natural drainage;
- Reduce financial burdens imposed on the state, local community, its governmental units and its residents, by discouraging unwise design and construction of development in areas subject to flooding;
- Minimize the need for rescue and relief efforts associated with flooding and generally undertaken at the expense of the general public;
- Minimize prolonged business interruptions and damage to public facilities and other utilities, such as water and gas mains, electric, telephone and sewer lines, streets and bridges;
- Reinforce that those who build in and occupy special flood hazard areas should assume responsibility for their actions;
- Prevent or minimize the impact of development on adjacent properties within and near flood prone areas; and
- Provide that the flood storage and conveyance functions of the floodplain are maintained and minimize the impact of development on the natural and beneficial functions of the floodplain.

The Bill (please see Appendix A) was prompted by Delaware's unique characteristics and the State's and local governments' levels of expenditures on floodplain and drainage related problems in recent years. While rain events are the origins of problems for both, floodplain issues are confined to areas adjacent to streams or the coast and generally occur infrequently but at high cost. Drainage issues happen throughout the State regardless of location and often result from less intense, more frequent rain events. Though typically not as catastrophic as floodplain damages, on a cumulative basis, widespread drainage issues even at a lesser cost per incident cost can require major expenditures as well. Construction in flood-prone and poorly drained areas continues to occur. Current minimum standards allow these activities and development practices which, if unchanged, will continue to result in expensive publicly funded abatement projects and increasingly unaffordable flood insurance costs.

Delaware is the lowest state in the United States with a mean elevation of just 60 feet above sea level. Over 331 square miles or 17% of the State's land mass including approximately 621 road miles and over 18,000 structures is within a mapped 100 year floodplain. Since 2000, over 200 flooded homes in Delaware have been purchased at a cost of $50 million with another $30 million in claims to FEMA's National Flood Insurance Program (NFIP). Even though 30% of flood damages nationally occur to structures which are not in a FEMA-mapped floodplain, few if any standards existing for development immediately adjacent to the floodplains or outside mapped floodplains. The NFIP includes generic floodplain guidelines that a community must adhere to in order to be a part of the program. Because every state and community is different, the minimum standards are set low, but communities are encouraged to enact higher standards when needed to better protect people and property. Furthermore, the NFIP expects communities to at least consider additional measures in planning for floodplain management and development.

With respect to drainage, between 2007 and 2011, DNREC and the three conservation districts responded to well over 2,000 concerns. In New Castle County, these concerns over a five-year period represent one concern for every 228 housing units or 198 parcels. In Kent and Sussex Counties, these representations are one for every 154 housing units or 201 parcels and one for every 122 housing units or 131 parcels, respectively. $65 million has been appropriated through the 21st Century Fund for drainage-related issues since 1996. 500 projects remain to be completed with an estimated cost $58 million yet only $9 million remains in the Fund. Over 350 new project requests were added to the 21st Century Fund List Statewide in the past four years with no additional funding.

In Delaware, local governments generally have the responsibility for land use decision making, including the approval of the developments which may occur in flood-prone locations. When homeowners have flooding problems, difficulty getting affordable flood insurance due to noncompliant construction or floodplain maps that are not accurate, DNREC typically responds to these requests for assistance.

As part of the FDAC process, DNREC and its consultant researched practices in neighboring states and in other parts of the Country. Commonalities were found as were differences in approaches and degree of regulation.

For example, regarding the issue of freeboard, Maryland uses one foot above base flood elevation (BFE) whereas New Jersey uses one foot above the State Hazard Area Design Flood elevation or two feet above the BFE. Pennsylvania on the other hand defers to the NFIP standard which is zero. Kansas and North Carolina each use one foot while South Carolina has no requirement (in other words zero required freeboard). Similarly, Maryland and New Jersey both have significant restrictions on the placement of fill in the floodway fringe (outer portions of the floodplain) but Pennsylvania again defers to NFIP which allows fill so long as certain conditions are met.

Many communities in Delaware already require freeboard. For example, New Castle County requires 18 inches of first floor freeboard above the base flood elevation. In the Town of Henlopen Acres, all new construction and substantial improvements of residential structures

need to have the lowest floor, including basements, elevated to a minimum of three feet above the base flood elevation (BFE plus freeboard).

Unlike floodplain requirements, which are usually regulated at the state level, research of drainage issues was difficult as this is more often a local government issue. However, the Committee was presented with examples from the Residential Lot Grading Guidelines developed in Deltona, Florida. This guidance manual includes templates that schematically depict grading for dozens of scenarios.

The following is a summary of major issues raised during the process of developing this report.

Physical and Governance Differences between Counties and Municipalities

The breadth of services offered by the three counties varies, but their responsibilities can include: regulating new and existing development; plan review, permits, and inspections; coordination with home owner associations (HOAs); standards for source water protection; minor capital improvements; and maintenance and inspections of non-tidal streams. There is also a conservation district in each county and their areas of services vary somewhat too.

While there are similarities between the counties, there are also differences. Much of New Castle County is in the Piedmont, characterized by rolling hills and riverine floodplains. Kent and Sussex Counties as well as southern New Castle County are in the Coastal Plain with generally flat topography and coastal floodplains. New Castle County tends to have more comprehensive development rules as sediment and stormwater, “lines and grades” (or existing and proposed topography), and bulk grading are all included in plan submittals. In Kent County, finished floor elevations are included but lines and grades are not required. In Sussex County, neither finish floor elevations nor lines and grades submittals are required. Development definitions vary too. Most governments use terms such as “Major Development” and “Minor Development,” but the number of lots and / or number of acres in either can be different.

Responsibilities of the 57 municipalities in Delaware also vary. Larger cities tend to provide a greater range of services than do smaller towns and would probably be better able to incorporate certain standards. The Committee considered the impact standards could have on smaller communities. One of the floodplain recommendations is for Memoranda of Understanding (MOUs) to be encouraged between counties or other larger governments and smaller cities or towns for enforcement of floodplain standards where local capabilities are insufficient.

Standards that result in a higher level of scrutiny of plans or calculations could also result in the need for adequately trained reviewers to be on the receiving end. It was also pointed out that qualified consultants would be needed as well. Furthermore, without further guidance, the end result could be different processes being used by different consultants and therefore lack of conformity. The recommendation for a Certified Floodplain Manager (CFM) to be on staff was considered to be too onerous to smaller towns by some. Others thought a CFM should have informed the Committee about their role in the process.

Expenditures versus Risk

While DNREC does perform mapping, current NFIP regulations require flood studies be performed in conjunction with land development proposals in certain instances. The Department believes that some responsibilities for this activity need to continue to fall on private entities since neither FEMA nor states can always have accurate up-to-date maps readily available when development is proposed. Some FDAC Committee members believed that this shifts costs to people who have no control over the process and could result in an unfair situation if the first one developing in an area ends up paying for a study while those following would reap benefits at no cost. It is essentially a philosophical versus practical conversation as reliance solely on a government entity will result in voids. DNREC and the Federal government do not have the funds to map the entire State's floodplains and update them in every instance where future floodplain land development is proposed or watershed changes occur.

FEMA representatives noted the debate is really about front-end versus back-end costs. Expenditures on the front-end, usually with private but sometimes public funds can reduce risk. On the back-end, governments at multiple levels, solely with public funds, are asked to come in and help after floods. Some felt costs borne by governments need to be balanced with the benefits of economic activity. A recurring theme at Committee meetings was the desire for DNREC to more aggressively perform mapping and this is reflected in the recommendation that says DNREC shall make it a priority to modernize floodplain maps. There was near unanimous support for aggressive State action to perform watershed studies resulting in modernized maps that would eliminate the need for expensive, individual studies. Many felt watershed studies should be done on a prioritized basis and cost allocated on a pro-rated basis to developments as they occur.

Some in the regulated community were not comfortable with standards that could result in more reliance on FEMA for review of technical data. It was noted that the FEMA time line adds months to what some consider an already lengthy plan review time period which adds costs to projects. Some said that flexibility is needed. If a community already prohibits development in riparian areas, requiring a flood study may be unnecessary. Over-reliance on FEMA can result in too much power to people without local accountability.

Regarding freeboard, information was presented to the Committee demonstrating that there is a dollar value savings in flood insurance premiums, if a structure is built with the first floor elevation well above BFE. Without disagreeing, it was also stated that the additional expense of elevating a structure could put some home buyers out of the market. Also, raising floor elevations could make compliance with the Americans with Disabilities Act more expensive and hinder efforts to redevelop in historic areas. The Committee was split on endorsing the freeboard standards. It was suggested that an Economic Impact Study be considered before implementation of many of the standards. Such a study would help demonstrate what some members felt are minimal costs, but great benefits over time and garner support from the private sector.

Some Committee members felt freeboard should be promoted within the construction industry. However, others believed home buyers should be educated about the benefits of freeboard

such that they can decide if it is worth the investment. Let the market determine if benefits outweigh costs. More than one Committee member felt freeboard may conflict with local government codes specifically regarding height limits. More than one Committee member said the manufactured home industry should be given opportunity to comment before special freeboard requirements are put into place affecting that type of home whereas others believe that freeboard is most important in this case. Also, this standard is important since the property owner is usually different than the manufactured home owner. Lack of flood insurance claims brings into question the need for any freeboard standards.

While prescribing situations when development could or could not occur may be appropriate, the Committee also thought conversations should be focused more on acceptance of responsibility and getting information and disclosures out to property owners. DNREC stated that they have received calls from homeowners after settlement stating that their lending institution is now requiring them to get flood insurance even though their loan was previously approved without insurance. Home buyers should know if they are in a mapped floodplain. It was recommended that DNREC meet with the Board of Realtors within six months to develop improved wording on seller disclosure forms and investigate lending practices to determine whether flood zone determinations are required in advance of settlement.

Resolution of Property Disputes

Currently, in most situations where one property owner may be aggrieved by another, the court system is usually the only answer. For example, if the owner of a property adjacent to an existing house chooses to place fill on his or her property such that drainage flows towards the existing house, there is little the lower home owner can do but take the neighbor to court. Similarly, if one property drains onto another property, the downstream owner can place an obstruction in the conveyance, again leaving the upstream property owner with few options other than court. Some of the drainage standards seek to minimize such occurrences by establishing technical guidelines and clarifying responsible parties.

There was some dissention among Committee members regarding the role of government in these cases. Some opined that government shouldn't be an arbiter and that the rightful place to resolve disputes is in the courts. Counter arguments noted people in general prefer to avoid legal situations and would prefer government intervention. DNREC presented language in the tax ditch law that gives legal authority from obstructing drainage in a tax ditch.

One unresolved issue regards enforcement. While a standard may prescribe what can or cannot happen on a particular property, it is not known at this time how local governments will enforce the requirements.

Previously Recorded and Unrecorded Future Lots

DNREC noted that there are tens of thousands of previously recorded lots Statewide. Regarding floodplains, there is a need to minimize risk for those lots as well as for future lots not yet recorded. With respect to drainage, it was noted that it is usually more expensive to fix problems on lots in developments where roads and infrastructure have already been placed

than if the issues were addressed before plan approval. In other words, there are both community-level and lot-level issues to be considered.

Much of the floodplain discussions revolved around FEMA's "50 / 5 rule," which is a threshold which states that certain studies must be performed for projects in excess of 50 lots or 5 acres. The state of Maryland recently changed their regulations to 5 lots or 5 acres. There was disagreement regarding whether Delaware should adopt standards, based on this FEMA guidance due to the different topographic conditions throughout the state and the belief such a standard could drive-up development costs.

Two scenarios can result in drainage problems with previously recorded lots. First is development of a single lot when adjacent lots have already been developed. Second is a large development with multiple builders working at different times. There typically are fewer problems on major subdivisions with a single builder.

It was noted that engineers often don't know the details about the types of houses being proposed when they are preparing plans and can't always put the finished floor elevations on the plans.

II. The Floodplain and Drainage Advisory Committee

Senate Bill 64 established a Floodplain and Drainage Advisory Committee (Committee) with diverse stakeholders that included public interests to review best practices and national standards and recommend minimum standards for improved floodplain management and drainage within the state. DNREC Division of Watershed Stewardship Director Frank Piorko was selected as Chair of the Committee. DNREC retained Duffield Associates, Inc., as a contractor to assist with various research and administrative tasks. The Committee also examined the adequacy of existing requirements, policies and practices associated with notification to prospective property purchasers of existing flooding or drainage issues.

The Committee, met seven times between September 2011 and May 2012, to provide guidance and input and act in an advisory capacity to the Department in compiling a body of Floodplain and Drainage Standards and Recommendations. All meetings received Public Notice. Detailed notes from each meeting were kept and are available in Appendix B.

Though a majority of representatives were in attendance at each meeting, some attended sporadically or asked to have another person appointed in their place resulting in lack of continuity. However, a core group attended most or all meetings, which resulted in spirited discussions and lively debates. Representatives from the following agencies and organizations voted on 22 standards and nearly a dozen recommendations:

• Delaware Association of Conservation Districts	• Committee of 100
• Delaware Association of Realtors	• Delaware Insurance Commissioner's Office
• Federal Emergency Management Agency	• American Council of Engineering Companies
• Delaware Emergency Management Agency	• Delaware Department of Transportation
• Home Builders Association of Delaware	• Delaware Association of Counties (3)
• Delaware League of Local Governments (2)	• DNREC Division of Watershed Stewardship (2)
• Sussex County Association of Towns	

After months of discussion, deliberation and debate, most of the Standards and Recommendations were supported by a majority of the Committee, but several did not receive broad support. These Standards and Recommendations were not developed to be mandates on local government, but rather a compilation of best practices that may be employed, depending on local conditions and existing requirements, to improve coordination and management of flooding and drainage issues across the state.

In all, 15 Floodplain Standards and 6 Drainage Standards were sent to the Department Secretary to be considered for adoption. Ten Recommendations were also included. The difference between Standards and Recommendations is that the Recommendations are thought to be more easily accommodated by local government, or represent a task that the Department could cooperatively undertake with existing authority.

The full set of Standards and Recommendations is included after the Executive Summary.

III. Secretary's Order

Following the vote of the Committee to provide support to most of the Floodplain and Drainage Standards and Recommendations, a press release was sent out in June 2012, inviting the public to comment on the draft Standards and Recommendations. Following the public comment period, DNREC Secretary Collin P. O'Mara adopted the Floodplain and Drainage Standards and Recommendations through a Secretary's Order 2012-WS-0029 issued on August 12, 2012. Please see Appendix C.

Stating that the adoption of the Standards and Recommendations were well supported by the deliberations of the Committee, the Secretary found the next step involving the outreach and review of these Standards and Recommendations by all local governments to be consistent with the charge set forth in Senate Bill 64.

IV. Proposed Standards and Recommendations

Standards that were developed are intended to be a guideline for subsequent State or local ordinances or amendments to existing ordinances, whereas recommendations are more general policy endorsements.

The Standards fell into two general categories: Floodplain Standards and Drainage Standards. Complete descriptions of each as well as current criteria, applicability under certain scenarios, supporting rationale, and in many cases accompanying exhibits can be found between the Executive Summary and Table of Contents.

Floodplain Standards and Recommendations

Multiple scenarios were used to help clarify the conditions within which the applicability of each standard would apply. For example, floodplains exist for both coastal (or tidal) and riverine (non-tidal) floodplains but they are handled very differently. Coastal floodplains are the result of tidal actions and storm surge where flood heights are generally not impacted by filling or other land-altering activities. Riverine floodplains can be very much impacted by man and filling or obstructions can increase flood heights on adjacent properties. Through the use of checkmarks (✓), applicability of each standard with regards to coastal and / or riverine floodplains was shown. Similarly, applicability to existing recorded (or grandfathered) lots and small or large subdivisions (using FEMA criteria of 50 lots / 5 acres) was shown. Finally, the checkmark designation was also used to show applicability to floodplains, which are categorized one of three ways below:

- Non-delineated floodplains. These are floodplains which exist but have not been mapped by FEMA. Currently, there are no NFIP regulations for development activities adjacent to unmapped streams, but nationally approximately 30 percent of flood insurance claims are for properties outside of the mapped 100-year floodplain;
- Delineated floodplains without identified Base Flood Elevations (BFEs). NFIP guidance regarding areas without BFEs is open to interpretation and results in inconsistent calculation of flood risk for new development; and
- Delineated floodplains with identified Base Flood Elevations (BFEs). In areas with identified BFEs, unclear documentation requirements are believed to have led to non-compliant floodplain development.

The floodplain standards were organized as those related to mapping and documentation (Standards 1-6 and 15) and those regarding development and building issues (Standards 7-14). The mapping and documentation standards listed below are sought to address situations that lack NFIP criteria or clarify criteria that does exist. They pertain to enforcement of existing regulations, what circumstances flood studies and mapping should be prepared, what flood study methodology is appropriate, and to which agency data should be submitted. It is noted that standards 1 and 2 do not apply to tidal floodplains. Standard 15 is intended to correct an ambiguity in the NFIP. The program requires participating communities to comply with these

technical bulletins but does not require these communities to explicitly adopt them in codes or ordinances.

Floodplain Standard 1	Flood Studies required in unmapped floodplains
Floodplain Standard 2	Flood Study required in Zone A (no BFE) FEMA mapped floodplains
Floodplain Standard 3	Only FEMA approved floodplain and BFE data shall be shown on record plans and development documents
Floodplain Standard 4	Use accepted base flood elevation in building permit application documents
Floodplain Standard 5	Floodplain information included on permitting documentation
Floodplain Standard 6	Require use of elevation and flood proofing certificates
Floodplain Standard 15	Incorporate FEMA technical bulletins in local floodplain regulations

The remaining floodplain standards related more to development and building issues. Some of these need to be weighed in the context of other standards. For example, standards 7 and 7A consider freeboard while standard 14 addresses encroachments. Currently and consistent with FEMA policies, encroachments can occur in some jurisdictions as long as the base flood elevation is not raised by more than one foot. Without a freeboard standard or reduction in encroachment impacts, buildings adjacent to or near encroached locations could have a foot of water above the floor elevation in flood events if their first floor is set at the pre-encroachment BFE which is shown on floodplain maps. Standards such as those for freeboard and for basements / crawl spaces and venting (which equalize hydrostatic loads on exterior walls) were considered for both tidal as well as riverine areas. The below standards are above and beyond NFIP criteria.

Floodplain Standard 7	Require 18 inches of freeboard
Floodplain Standard 7A	Require 12 inches of freeboard
Floodplain Standard 8	Require 18 inches of free board for manufactured homes
Floodplain Standard 9	Shallow fill above BFE will not exempt a structure from floodplain regulations

Regarding building construction, the following standards are intended to clarify NFIP criteria which already exist but are not uniformly enforced. In general, they both seek changes to building design and construction practices that, if enacted, lower the costs of flood insurance.

Floodplain Standard 10	Hydrostatic venting required
Floodplain Standard 11	Prohibit below-grade crawl spaces or enclosures

The next set of standards addresses creation of lots within floodplains and building of structures in flood-prone areas. Standard 12 would mandate that mapped non-tidal floodplains in all lands being newly subdivided be located in a lot or lots dedicated as public or private open space and deed restricted to prohibit development. Standard 13 allows new lots to be located partially in non-tidal floodplains as long as future construction activities will occur on the portion of the lot that lies outside of the floodplain. Progressing from the question of whether or not to allow lots containing floodplains is Standard 14 prohibiting floodplain encroachments unless compensatory storage is provided. They each are above and beyond current NFIP criteria.

Floodplain Standard 12	Prohibit subdividing of land in the floodplain
Floodplain Standard 13	Prohibit new non water dependent structures in floodplains in newly subdivided lands
Floodplain Standard 14	Prohibit encroachments that would cause more than 0.1 foot of rise without compensation

Whereas standards 7-11 apply in floodplains, standards 12-14 apply in non-tidal floodplains only. Due to the breadth of coastal floodplains and the inability to influence flood elevations, lot creation and "encroachment" (or fill placed in a floodplain which could raise flood elevations) restrictions were not considered appropriate for these areas.

There were also multiple recommendations related to floodplains which received unanimous or near unanimous support from the Committee. These are as follows:

Recommendation 1	DNREC shall make it a priority to modernize floodplain maps.
Recommendation 2	Lending banks are currently required to review maps in FEMA's map service center and require flood insurance at closing if the loan is secured by property in a Special Flood Hazard Area. If the seller's disclosure did not properly disclose flooding or floodplain issues, this insurance requirement at closing will often be when a buyer is first made aware that the property is in a floodplain. DNREC should meet with the Board of Realtors within six months to develop improved wording on seller disclosure forms, should investigate lending regulations to determine whether flood zone determinations are required in advance of settlement, and if so how far in advance.
Recommendation 3	A Certified Floodplain Manager should be on staff, under contract, or available for assistance at each agency to review floodplain activities. DNREC can provide assistance by providing training to assist staff in becoming Certified Floodplain Managers, and proctor the exam periodically.
Recommendation 4	Memoranda of Agreement (MOA) should be encouraged between counties or other larger governments and smaller cities or towns for enforcement of floodplain regulations where local capabilities are insufficient.
Recommendation 5	A separate plan review or building permit process specific to floodplain regulation will be required for all development or construction activities in floodplains. Site plan notes and building permit application documents will include floodplain information including but not limited to floodplain map used, flood zone, base flood elevation, lowest floor elevations, utility and machinery elevations.
Recommendation 6	Communities should adopt floodplain maps by utilizing "effective map as last revised" terminology so that new or updated maps from FEMA are automatically adopted as they are issued by FEMA.
Recommendation 7	Communities should review their codes for wording which undermines NFIP requirements or makes them difficult to

understand. For example, phrases such as "no land below the level of the 100-year flood may be developed unless it complies with all applicable floodplain regulation" could remove high sand dune areas in a V-Zone from floodplain regulations which would be unwise, and would not be allowed under the minimum NFIP requirements.

Drainage Standards and Recommendations

Drainage standards were organized as those related to conveyance and easements (Standards 1 and 2), grading (Standards 3 and 4), and plan preparation (Standards 5 and 6). Issues leading to drainage standards included difficulties maintaining open and enclosed conveyances due to lack of sufficient width for construction equipment and absence of a clearly defined responsible party, adequacy of conveyance sizes, grading which at times results in inadequate drainage on lots and / or adverse impacts on adjacent lots, and lack of consistency in design plan and as-built plan preparation.

As with floodplain standards, drainage standards for drainage were considered in multiple contexts using checkmark (✓) designations. These contexts were minor subdivisions, major subdivisions, and multiple parcel commercial subdivisions, as well as for previously recorded lots. For example, the standards regarding easements and conveyance systems would not apply to previously recorded lots as provisions for these would have had to be included at the time of recordation. However, standards related to lot grading and plan preparation would apply to all lots as they would have little or no impact on the configurations at the time of recordation. The drainage standards are as follows:

Drainage Standard 1	Adequate easements required
Drainage Standard 2	Obstructions prohibited
Drainage Standard 3	Conveyance systems meet 10-year storm event
Drainage Standard 4	Lot grading away from buildings
Drainage Standard 5	Topographic plan submittals
Drainage Standard 6	As-Built plan submittals

Drainage standards also increased prescriptively. Standard 1 mandates that easements be provided over drainage conveyance systems whereas Standard 2 prohibits the willful or negligent obstruction of conveyances. Standard 3 sets the minimum design storm for conveyance system design. Likewise, Standard 4 seeks to ensure that lot grading results in drainage away from buildings and structures while also not creating an adverse impact to adjacent structures or lands. Standard 5 further articulates requirements for plan preparation in advance of construction to demonstrate that Standard 3 would be met, while Standard 6 would require post-construction as-built plans to be prepared to show Standard 3 was met.

Three drainage recommendations were also provided:

Recommendation 1 The review of existing drainage patterns should be included not only in the subdivision planning process but in the building permit process as well.

Recommendation 2	Permanent easements conveyed to a public entity should be considered whenever public dollars are spent to correct a drainage deficiency.
Recommendation 3	DNREC should oversee the preparation of a guideline similar to the Residential Lot Grading Guidelines from Deltona, Florida. County or municipal governments could then incorporate the guidelines into their codes and ordinances.

Results of Committee votes for the Standards and Recommendations are presented in Appendix D. These represent the collective effort of the Floodplain and Drainage Advisory Committee, and represent an extensive amount of work from a dedicated group of volunteers.

V. Department Outreach and Local Government Review

Senate Bill 64 provides that following adoption by the Secretary, within six months the three county and all municipal governments, as appropriate, shall review and prepare comments regarding their individual codes and ordinances to determine if they are consistent with the Recommendations. Such review and comments shall identify areas where existing requirements meet or exceed these Recommendations, are functionally equivalent to the Recommendations, or do not comply with the Recommendations.

In the Bill, it was stated that **t**he review and comments from local governments will also identify areas where implementation of these standards may represent a hardship to the local government, and what impediments to adoption of these Recommendations have been identified.

It was also determined in SB 64, that by no later than March 15, 2013, DNREC shall compile the results of the review, develop a draft report, reconvene the Committee to review the draft report and solicit feedback and deliver the final report to the General Assembly.

During August 2012, DNREC conducted a community outreach meeting in each county to present the floodplain and drainage standards and recommendations that the committee had voted on and were adopted by the Secretary's Order.

The community outreach meetings were as follows:

Sussex County Tuesday, August 14, 2012, at the Delaware Technical and Community College in Georgetown. 26 officials attended representing 15 communities.

Kent County Wednesday, August 15, 2012, at the Kent County Administrative Building in Dover. 13 officials attended representing 7 communities.

New Castle County Friday, August 17, 2012 at the James H. Gilliam Sr. Building in New Castle. 10 officials attended representing 7 communities.

An overview of Senate Bill 64 and its purpose was presented at the beginning of each meeting. The process that the bill requires the committee to follow was also presented. Then each of the floodplain standards and recommendations were discussed in detail, as well as the issues that led the committee to develop the standards. Also, each of the drainage standards and recommendations developed by the Department were discussed in detail. At the end of each meeting the county and community officials were asked to review and prepare comments of their local ordinances to determine if they meet, exceed, or do not comply with the adopted Department Floodplain and Drainage Standards and Recommendations.

DNREC also set up a website at:

http://www.dnrec.delaware.gov/swc/Pages/FloodplainandDrainageCodeWorkGroupCommittee.aspx

Subsequent to the community meetings, a questionnaire (please see Appendix E) was distributed to the three counties and all 57 municipalities in the State. Thirty eight or about 63 percent responded. The survey form asked two questions for every standard as follows:

- Responses were requested whether the government body strongly agreed, agreed, disagreed, strongly disagreed, or had no comment with any given standard; and
- The community was also asked to explain if it already meets or exceeds the standard, does not comply, or if it would be a hardship to adopt.

Spaces were included such that comments could be provided for each standard. A summary of the questionnaire results is provided in Appendix F and the WRA report is provided in Appendix G.

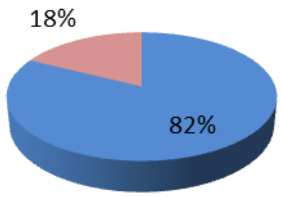
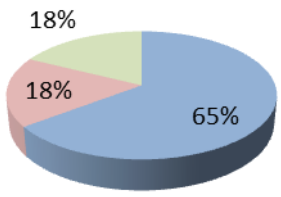
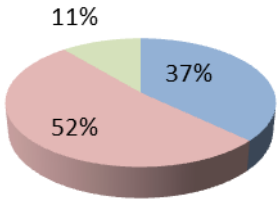
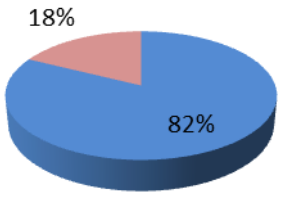
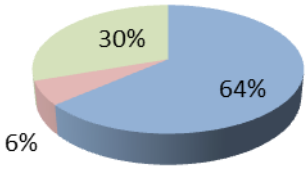
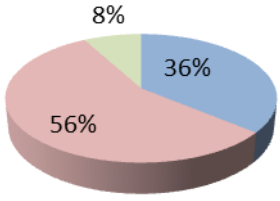
The following counties and municipalities attended the outreach meetings and / or completed the survey:

Community	Mtg	Srvy	Community	Mtg	Srvy	Community	Mtg	Srvy
Sussex County			**Kent County**			**New Castle County**		
Bethany Beach	✓	✓	Bowers Beach	✓	✓	Arden		
Bethel			Camden	✓	✓	Ardencroft		
Blades		✓	Cheswold		✓	Ardentown		✓
Bridgeville	✓	✓	Clayton			Bellefonte		
Dagsboro		✓	Dover	✓	✓	Delaware City	✓	✓
Delmar		✓	Farmington		✓	Elsmere		✓
Dewey Beach	✓	✓	Felton			Middletown	✓	
Ellendale			Frederica			Newark	✓	✓
Fenwick Island	✓	✓	Harrington	✓	✓	New Castle City	✓	✓
Frankford		✓	Hartly			New Castle County	✓	✓
Georgetown		✓	Houston			Newport		
Greenwood			Kent County	✓	✓	Odessa		
Henlopen Acres	✓	✓	Kenton			Townsend	✓	✓
Laurel		✓	Leipsic			Wilmington	✓	
Lewes	✓	✓	Little Creek					
Millsboro		✓	Magnolia					
Millville	✓	✓	Milford	✓	✓			
Milton	✓	✓	Smyrna	✓	✓			
Ocean View	✓	✓	Viola					
Rehoboth Beach	✓	✓	Woodside					
Seaford	✓	✓	Wyoming					
Selbyville	✓	✓						
Slaughter Beach	✓	✓						
South Bethany	✓	✓						
Sussex County	✓	✓						

VI. Assessment of Committee Votes and Survey Results

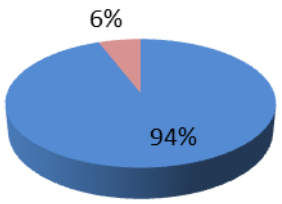
Committee votes and community responses are provided in Appendices F and G and summarized below.

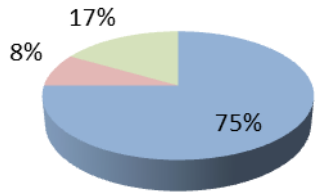
Committee members voted in favor of or in opposition to each standard. In some instances, members abstained from some votes and these were noted as well. Responders to the community surveys were asked to provide more quantitative answers to the level of community agreement and current status of compliance. Not every responder provided an answer to every question and these blank responses together with "no comment" responses to the meet / exceed / not comply / hardship question were excluded from the totals.

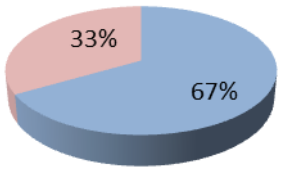
Committee votes	Community agreement	Community status
Yea's	Strongly agree/Agree	Exceed or meet
No's	Disagree/Strongly disagree	Don't comply
Abstain	No comment	Create hardship
Floodplain Standard 1 - Flood Studies required in unmapped floodplains		
		
Floodplain Standard 2 - Flood Study required in Zone A (no BFE) FEMA mapped floodplains		
		

Committee votes	Community agreement	Community status
Yea's	Strongly agree/Agree	Exceed or meet
No's	Disagree/Strongly disagree	Don't comply
Abstain	No comment	Create hardship

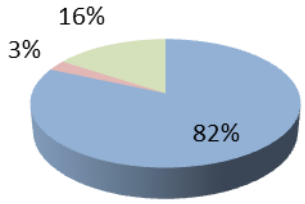
Floodplain Standard 3 - Only FEMA approved floodplain and BFE data shall be shown on record plans and development documents

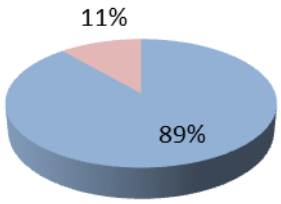




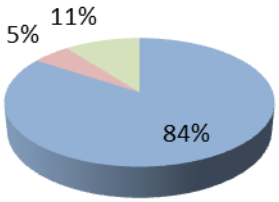


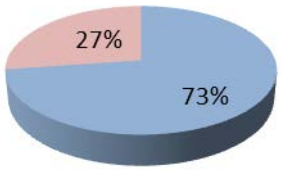
Floodplain Standard 4 - Use accepted base flood elevation in building permit application documents



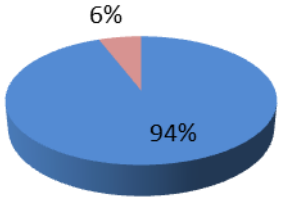


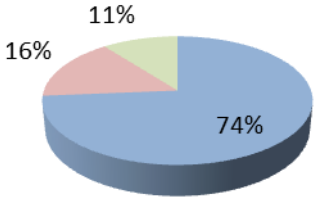
Floodplain Standard 5 - Floodplain information included on permitting documentation

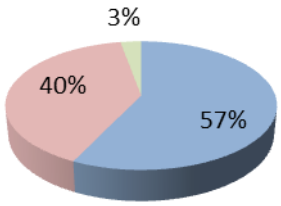




Floodplain Standard 6 - Require use of elevation and flood proofing certificates

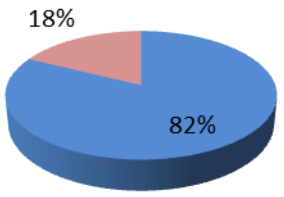


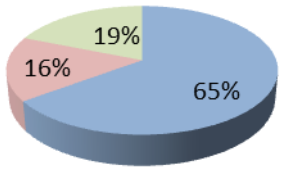


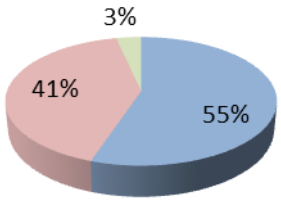


Committee votes	Community agreement	Community status
Yea's	Strongly agree/Agree	Exceed or meet
No's	Disagree/Strongly disagree	Don't comply
Abstain	No comment	Create hardship

Floodplain Standard 15 - Incorporate FEMA technical bulletins in local floodplain regulations







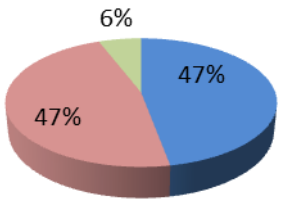
These Standards were generally supported by the Committee as well as the municipalities although with some caveats as noted in the submitted comments below. Standards 1 and 2 indicate a good opportunity as many agreed with the approach but most don't currently comply. However, the high number of "No comments" may indicate that a lot of responders may not have understood the Standard very well. Standards 3 through 6 present more scattered results. However, these Standards were generally supported by the Committee. Floodplain Standard 15 was generally supported by the Committee as well as the municipalities.

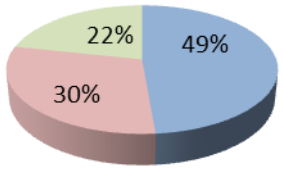
Numerous comments were submitted by the municipalities including:

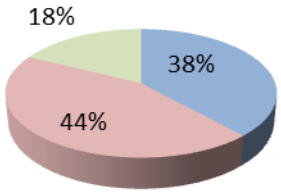
- If this standard is deemed as necessary, these studies should be performed by the State using State dollars and not place the burden on single property owners. (Standard #1).
- [County] does not object to this standard provided; however, that this does not impede the County's ability to utilize the point on boundary method of determining base flood elevation. (Standard #3).
- If Flood Elevation has not been established this requirement should be waived until an accurate flood elevation can be established by a study performed and paid for by FEMA. (Standard #4).
- We don't need any more steps in our overall process. (Standard #4).
- Proposed lowest floor elevations are not shown on Record Plans due to the difficulty revising them. They are shown on grading plans. You could have a general note defining lowest floor elevation. (Standard #5).
- This restriction would require familiarity with FEMA's Technical Bulletins, which may or may not change over time. Even if we agree with any of FEMA's Technical Bulletins that have already been published, what happens if we do not agree with one that is published in the future? (Standard #15) {Note: Responder appears to be unaware that compliance with the Technical Bulletins is a requirement of the NFIP.}

Committee votes	Community agreement	Community status
Yea's	Strongly agree/Agree	Exceed or meet
No's	Disagree/Strongly disagree	Don't comply
Abstain	No comment	Create hardship

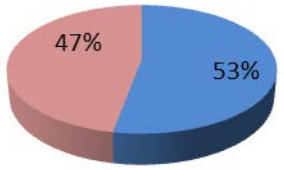
Floodplain Standard 7 - Require 18 inches of freeboard

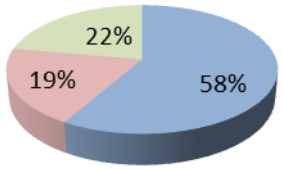


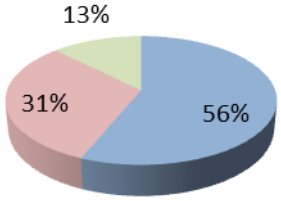




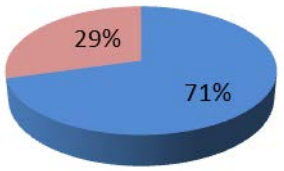
Floodplain Standard 7A - Require 12 inches of freeboard

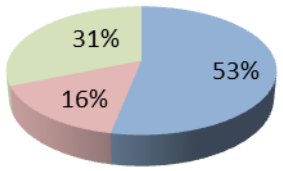


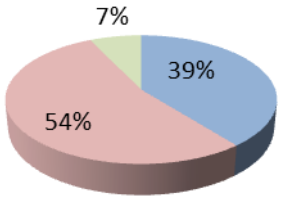




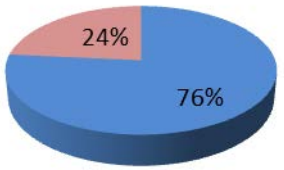
Floodplain Standard 8 - Require 18 inches of free board for manufactured homes

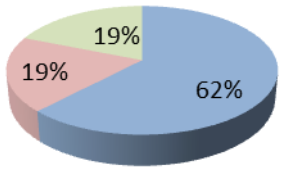


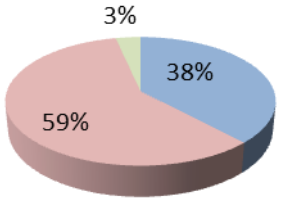




Floodplain Standard 9 - Shallow fill above BFE will not exempt a structure from floodplain regulations







While opposition to Standards 7 and 7A was about equal to their support, the municipalities seemed to generally favor them but with notable disagreement. Both standards generated significant "No comment" responses from the municipalities potentially indicating lack of comprehension. It is recommended that DNREC initiate a government official and public outreach and education program before these Standards are further considered. This could include preparation of a list of communities that have coastal or tidal floodplains only as well as a list of communities that have no floodplains at all and / or do not participate in the NFIP to clarify circumstances they apply. Particular emphasis should be placed on demonstrating the benefits of higher freeboard through reduced flood loss claims and lower insurance premiums. DNREC should also consider how these Standards could be implemented without conflicting with height restrictions in building codes.

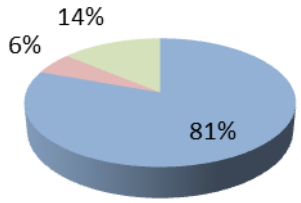
Floodplain Standards 8 and 9 were generally supported by the Committee and the municipalities but in both instances with notable oppositions or "No comments". DNREC should consider the development of additional information or Fact Sheets to further explain the Standards and their rationale.

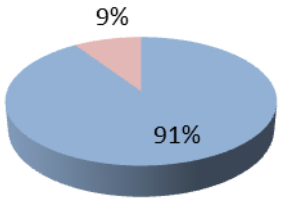
Numerous comments were submitted by the municipalities including:

- While the financial benefits of reduced insurance costs are understood, staff cannot presume [elected officials will] support for increased regulation. (Standard #7).
- This only increases the potential for a greater rise in the flood elevation for everyone in the watershed (Standard #7). {Note: Responder apparently confused building height with fill.}
- Existing height restriction of 30' would create further hardship on property owner. (Standard #7).
- Restrict the height of home. (Standard #7).
- Would impact maximum height permitted. (Standard #7).
- Raising the height of new or substantially improved structures requires more steps. On lots as small as the ones in [City], the homes would have to be decreased in square footage to meet the zoning requirements. (Standard #7).
- Present limits for building height & roof slope would limit elevated houses (on pilings) to one elevated floor. (Standard #7).
- Why would you relax any floodplain standards? So, we agree with no relaxation of the floodplain standards. (Standard #8).
- If FEMA and DNREC are particularly concerned that the standard is too low for issuing a LOMR due to fill, perhaps the more effective approach is to change the criteria for approving the Map Revision. The proposed standard is an excellent recommendation but should not be made a requirement. (Standard #9).

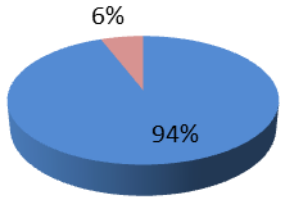
Committee votes	Community agreement	Community status
Yea's	Strongly agree/Agree	Exceed or meet
No's	Disagree/Strongly disagree	Don't comply
Abstain	No comment	Create hardship

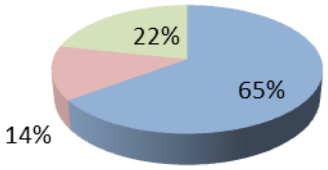
Floodplain Standard 10 - Hydrostatic Venting required

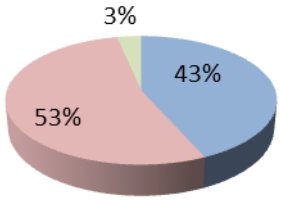




Floodplain Standard 11 - Prohibit below-grade crawl spaces or enclosures





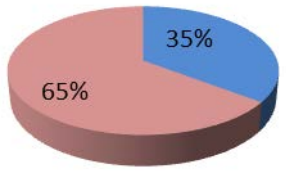


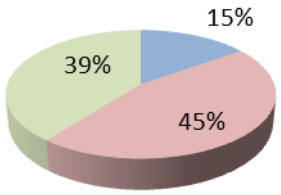
Floodplain Standards 10 and 11 were generally supported by the Committee as well as the municipalities with little dissention. It is observed that while a majority of communities strongly agree or agree with Standard 11, a majority also do not currently comply. Submitted comments included:

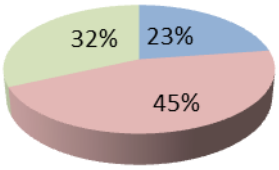
- Generally agree with the proposed standard if a base flood elevation has been accurately established and can be easily obtained from a study performed by FEMA. However, if a flood elevation has not been established, this requirement shall be waived until such time as an accurate flood elevation can be established by a study performed and paid for by FEMA. (Standard #10).
- Town follows IBC 2009 Code. These items are required in building code. (Standard #10).
- CRS requires this. (Standard #10).
- This would prohibit any development of lots within entire town. (Standard #11). {Note: Responder may not have understood question.}

Committee votes	Community agreement	Community status
Yea's	Strongly agree/Agree	Exceed or meet
No's	Disagree/Strongly disagree	Don't comply
Abstain	No comment	Create hardship

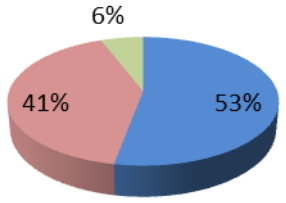
Floodplain Standard 12 - Prohibit subdividing of land in the floodplain

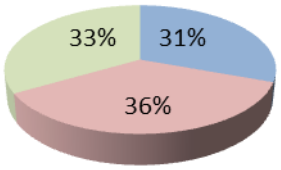


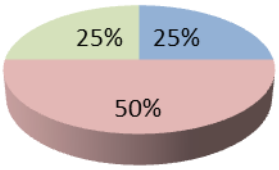




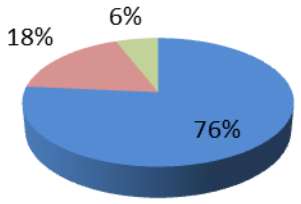
Floodplain Standard 13 - Prohibit new non water dependent structures in floodplains in newly subdivided lands

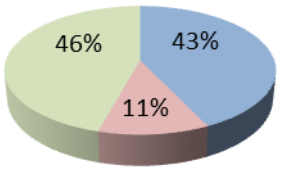


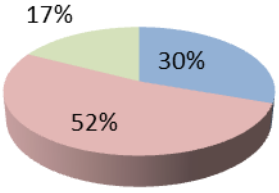




Floodplain Standard 14 - Prohibit encroachments that would cause more than 0.1 foot of rise without compensation







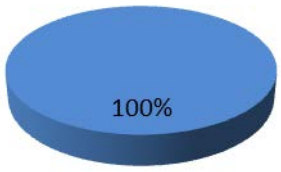
Standard 12 was the only one proposed that failed in the Committee vote and Standard 13 barely passed. Both received more "disagree / strongly disagree" scores than "strongly agree / agree" scores from the municipalities. While Standard 14 was generally supported by the Committee and municipalities, nearly half of the survey responses were "No comment" again potentially indicating lack of understanding. Before proceeding with these three Standards, DNREC should consider initiating a government official and public outreach and education program that explains the benefits of prohibiting non water dependent structures in floodplains and encroachments that cause a rise in water surface elevation.

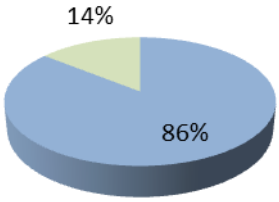
Submitted comments included the following:

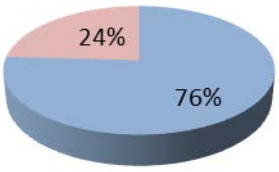
- This standard is too restrictive for no reason. (Standard #12).
- While generally this might be a responsible position, our city has been keeping the riverine tidal floodwaters at bay for over 360 years. (Standard #12).
- Any structure not just buildings with water dependent use) could be allowed within a FEMA delineated floodplain as long as the elevation of the finished floor was above base flood elevation. (Standard #13).

Committee votes	Community agreement	Community status
Yea's	Strongly agree/Agree	Exceed or meet
No's	Disagree/Strongly disagree	Don't comply
Abstain	No comment	Create hardship

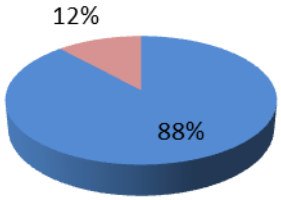
Drainage Standard 1 - Adequate easements required

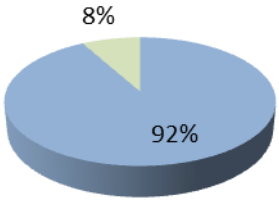


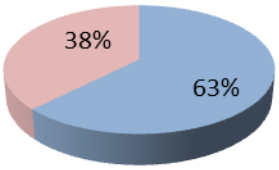




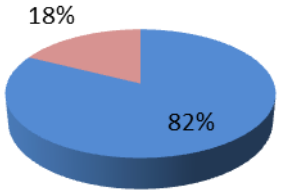
Drainage Standard 2 - Obstructions prohibited

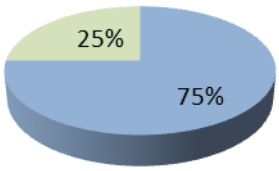


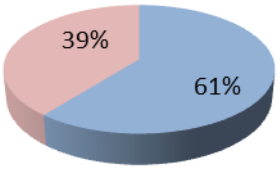




Drainage Standard 3 - Conveyance systems meet 10-year storm event

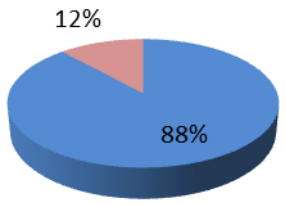


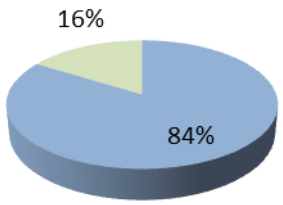


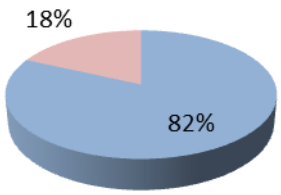


Committee votes	Community agreement	Community status
Yea's	Strongly agree/Agree	Exceed or meet
No's	Disagree/Strongly disagree	Don't comply
Abstain	No comment	Create hardship

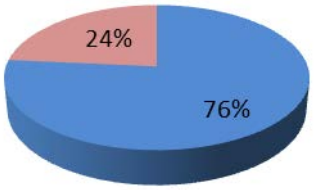
Drainage Standard 4 - Lot grading away from buildings

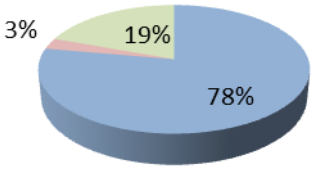


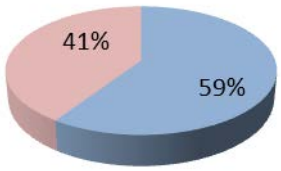




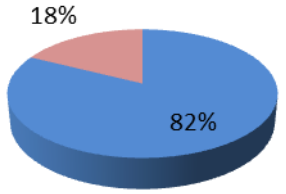
Drainage Standard 5 - Topographic plan submittals

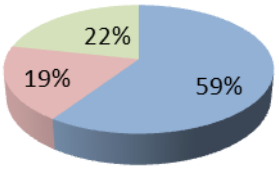


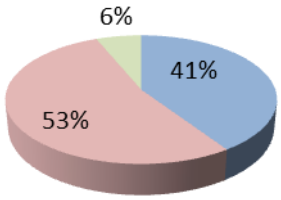




Drainage Standard 6 - As-Built plan submittals







All six drainage standards passed with a plentiful majority but the level of support dropped a little as the standards became more restrictive. Each of these standards was generally accepted by the Committee as well as the municipalities although support for the topographic plan and as-built plan preparation was not as widespread. Some who supported these latter two Standards, based on written comments, believed it appropriate if certain conditions could be defined. Among the comments submitted by the municipalities were the following:

- The question becomes, however, to whom are the easements in favor…and should be specified on future record plans. (Standard #1).

- Since average lots in [City] are 5,000 sq. ft. I would recommend smaller threshold. (Standard #5).
- Town requires as a policy, but it is not specified in the Town Ordinance. (Standard #6).
- Added expense. If area is in question then require it; however, if elevation and swales are visible then topo is not required. (Standard #6).
- [County] requires as-built of floor elevation and submission of elevation certificates for structures in floodplain…also inspects final grading for all building permits. (Standard #6).
- An as-built topographic plan would not be practical in [City]. (Standard #6).
- Addressing such requirements based on the site conditions of individual projects appears to be a reasonable approach in [County]. (Standard #6).

VII. Findings and Conclusions

Despite significant losses and attempts to meet criteria set forth by the NFIP, DNREC has found that projects are still being built in flood-prone areas without accurate floodplain delineations, accurate topography, or base flood elevations determined. Without comprehensive flood studies, individual property owners are forced to pay for flood studies first to get a building permit, and again to correct inaccurate map when flood insurance proves to be unaffordable. Costs of incorrectly rated flood insurance and individual surveys can greatly exceed the up-front flood study cost. A better strategy is sought that would establish a standard for flood studies prior to the subdividing of lots. This would take a burden off homeowners, disclose flood risks to prospective buyers, and result in site plans showing results of flood studies and FEMA maps being revised to show accurate floodplain.

Similarly, a great deal of new construction is designed to minimum NFIP criteria which results in significant flood risk and expensive insurance premiums. For example, first floor elevations equal to base flood elevation levels with no freeboard not only provides no factor of safety, but can result in structural damage to floor joists if a flood of that magnitude occurs. Another problem is filling and encroachment in and out of floodplains which creates adverse flood and drainage impacts on neighbors. Standards are being pursued to ensure that development activities do not exacerbate flooding and drainage problems elsewhere.

There are many benefits to improved floodplain standards. Flood damage is significantly reduced when structures are located outside of floodplains or elevated above predicted flood levels. Improved real estate disclosure and depiction of floodplains on site plans can ensure that potential buyers are notified about flood risk and insurance requirements. Flood damage not covered by limited homeowners' insurance may be minimized and the need for expensive flood abatement projects reduced. Enforcement of these standards lowers the cost of flood insurance and reduces damages and expensive drainage solutions while also ensuring continued insurance availability by avoiding NFIP probation or suspension.

Many communities are struggling with the administration of their floodplain regulations, and have complicated approaches which cause compliance to fall through the cracks. In some communities, the subdivision approval, floodplain regulations, and building code provisions are handled by separate departments. This creates administrative challenges because key floodplain management provisions must occur during the subdivision review phase (steering houses out of high risk areas, making sure flood risks are accurately determined) as well as the individual construction phase. Many of the important building construction aspects of floodplain management such as floor elevation requirements, and foundation designs are not reviewed by building code department if the floodplain regulations are considered a zoning issue and not a building code provision.

A local drainage code is often confused with stormwater management requirements at the community level. Stormwater management is planned at the onset of a land development plan, is based on statewide regulations and is under the purview of DNREC through the Delaware Sediment and Stormwater Regulations. Drainage problems that emerge are often due to

blocked outlet conditions, deteriorating infrastructure, one property owner altering land grading so as to cause an adverse impact to neighboring properties, or lots being built upon with no drainage outlet.

Despite holding workshops with the local municipalities to review the draft standards, the survey results are very inconclusive regarding whether a community currently complies with the adopted standards and recommendations. A widespread range of responses were also expressed by those local governments that agreed or not with a proposed standard. In a general sense, questionnaire responses identified many of the same issues as the Committee's votes.

Inconsistencies were observed in comparing the returned community surveys with codes available online and with DNREC's observations of local floodplain and drainage practices. Some communities which participate in the National Flood Insurance Program have adopted federal floodplain regulation to participate and may be under the impression that enforcement of these regulations is done by others, possibly FEMA or DNREC. In addition, many smaller communities rely on county agencies to enforcement building codes, and may believe that the counties are enforcing floodplain requirements as part of the building code review, or when stormwater plans are reviewed. Communities need to gain a better understanding of the floodplain regulations they have adopted and should be clear about the enforcement of these regulations.

In a parallel effort, DNREC retained the Water Resources Agency at the University of Delaware (WRA) to independently research existing codes throughout the State. WRA provided information about 41 local governments. Of the 38 questionnaire responses, all but three were also addressed by WRA. In many cases, the two did not agree when assessing whether or not a certain standard was already being enforced or complied with.

In many cases, the information provided was not consistent with the survey results or information the Department knows to be correct, based on community assessments. In a general sense, questionnaire responses identified many of the same issues as the Committee's votes. However, due to the discrepancies between the community responses and the WRA assessment, it is apparent that a lack of understanding and a significant amount of confusion exists regarding these subjects.

For example, in three cases, the responder simply stated "no comment" to every question. In other cases, it appears that insufficient effort was put forth to really understand the current status of some standards. One municipality stated it already meets or exceeds 20 of the 22 standards, but WRA found it is currently complying with just five. Another indicated it meets or exceeds 19 standards whereas WRA found it complies with eight. In some instances, mostly coastal communities, responses may not have considered that a particular standard applied to non-tidal floodplains only.

Data interpretation resulted in other findings. Multiple communities indicated they either agree or strongly agree with nearly all standards but currently meet or exceed less than half of

them. This assessment of findings would indicate that there is desire for promulgation for many of the standards.

In another example, currently there are no NFIP minimum standards defining the source of base flood elevations or floodplain delineations which are depicted on building permit or development documentation. Floodplain Standards 3 and 4 are intended to correct this deficiency. It is believed that most coastal communities have only adopted the FEMA minimums requirements. DNREC staff reviewed codes from ten Sussex County communities and found that six of them do not meet proposed Standard 3 and five of them do not meet proposed standard 4. However, according to the survey results, 67 percent of communities think they meet proposed standard 3 and 87 percent think they meet proposed Standard 4. Furthermore, the UDWRA report shows that nearly every community in Sussex County meets both of these two proposed standards.

Similarly, DNREC staff reviewed codes from five of the nine communities that the UDWRA report states meet proposed Standard 14 and found that none actually do. This is primarily due to misinterpretation of standard applicability in the floodway or flood fringe. Looking at the survey results, 30 percent of communities feel they comply with this standard.

The survey results and independent assessments indicate that current floodplain management guidelines are fairly minimal and are poorly understood by those who enforce them. Drainage standards in some cases are nearly non-existent. Many communities are ill-equipped to monitor and regulate floodplains and drainage issues given their existing capabilities and resources.

Due to the discrepancies between the community responses and the WRA assessment, it is apparent that a lack of understanding and a significant amount of confusion exists regarding assessment of local codes and ordinances by both outside and internal review.

It is largely as a result of the inconsistent internal review of codes and ordinances provided by the local governments and the original language of SB 64 that the adopted Standards and Recommendations be largely voluntarily considered by local governments, that the Department moves forward with options for implementation. This approach is also favored by the majority of the Committee.

The Floodplain and Drainage Advisory Committee met one more time in February 2013 to discuss the survey results, draft final report and options presented by the Department for implementation of the adopted Standards and Recommendations. The discussion focused on a possible lack of understanding of the Standards as well as the current regulations the municipalities have regarding floodplains and drainage. They agreed more outreach was needed so that enforcement by local governments would be more uniform.

The Committee was asked to comment on the draft final report. There was one comment that the homeowner bears the brunt of the decisions made by a developer or previous owner, and the State and local government are the ones left to remedy the issues at the expense of public funds. Thus the mandatory adoption of standards that received the Committee's majority

support was favored, or at the very least the mandatory adoption of the six Drainage Standards. Other comments made by Committee members were in support of making the Standards voluntary, because they feel the greater issue is lack of enforcement and lack of implementation knowledge. Several Committee members felt that because some of the Floodplain Standards are clarifying the NFIP minimum standards, having mandatory regulations would not address the floodplain and drainage problems as adequately as more outreach with voluntary adoption.

It was a consensus of the committee to support options as presented in Section VIII. These were developed after review of the implementation alternatives described below.

Floodplain and Drainage Standards Implementation

There are several approaches available for implementation of Standards presented herein.

Enforcement through State Regulation

Enable enforcement of Floodplain and Drainage Standards through State regulation, review, and enforcement. DNREC would develop regulatory language which contains these standards, and provide education to communities and the public. Communities desiring to enforce these higher standards locally could do so.

Mandatory Local Enforcement

Require adoption of Floodplain and Drainage Standards by communities within 24 months with local enforcement. DNREC would make model Floodplain and Drainage Ordinances available to communities who desire assistance. Communities would have time to present to DNREC instances where enforcement is not feasible or would create undue hardship. DNREC would provide educational outreach to assist in local enforcement and understanding.

Voluntary Option

Encourage the voluntary adoption of Floodplain and Drainage Standards. DNREC would conduct education programs concerning the benefits of adopting these standards to increase understanding and local capacity. Particular emphasis would be placed on the benefits of requiring accurate flood studies, reduction of flood damage and public recovery expenditures and lower insurance costs resulting from higher floodplain and drainage standards.

Combination Option

Require adoption and enforcement of selected Standards which are generally accepted to have significant benefits, generated little or no negative comments, and where communities showed existing capacity to enforce. Under this option, certain other Standards that had more limited support or evidence of uncertainty would not be required but communities wishing to implement other Standards would be encouraged.

Required Standards are as follows:

Floodplain Standard 2	Flood Study required in Zone A (no BFE) FEMA mapped floodplains
Floodplain Standard 3	Only FEMA approved floodplain and BFE data shall be shown on record plans and development documents
Floodplain Standard 4	Use accepted base flood elevation in building permit application documents
Floodplain Standard 5	Floodplain information included on permitting documentation
Floodplain Standard 6	Require use of elevation and flood proofing certificates
Floodplain Standard 7A	Require 12 inches of freeboard
Floodplain Standard 10	Hydrostatic venting required
Floodplain Standard 11	Prohibit below-grade crawl spaces or enclosures
Floodplain Standard 15	Incorporate FEMA technical bulletins in local floodplain regulations
Drainage Standard 1	Adequate easements required
Drainage Standard 2	Obstructions prohibited
Drainage Standard 3	Conveyance systems meet 10-year storm event
Drainage Standard 4	Lot grading away from buildings
Drainage Standard 5	Topographic plan submittals
Drainage Standard 6	As-Built plan submittals

Standards 7 and 7a ensure substantially reduced flood risk and economic benefit of more affordable flood insurance with minor impact on construction costs and virtually no change in effort for communities to enforce. Freeboard is widely used by communities already, with no evidence of difficulty, and the Standard as written can be inserted directly into local codes verbatim. Furthermore, the 2009 version of the International Building Code requires 12 inches freeboard in certain flood zones, such as V-Zones and Coastal A-Zones. These zones are extensive in Kent and Sussex Counties. This building code is already in effect in many communities and others will be updating to the 2009 version eventually.

Encouraged Standards are as follows:

Floodplain Standard 1	Flood Studies required in unmapped floodplains
Floodplain Standard 7	Require 18 inches of freeboard
Floodplain Standard 8	Require 18 inches of free board for manufactured homes
Floodplain Standard 9	Shallow fill above BFE will not exempt a structure from floodplain regulations
Floodplain Standard 12	Prohibit subdividing of land in the floodplain
Floodplain Standard 13	Prohibit new non water dependent structures in floodplains in newly subdivided lands
Floodplain Standard 14	Prohibit encroachments that would cause more than 0.1 foot of rise without compensation

Standard 7A would not be needed if Standard 7 were adopted.

Incentive Option

Create incentives for local adoption of Floodplain and Drainage Standards. Incentives can be offered, such as providing higher State cost share in 21st Century Fund or other publicly funded drainage projects, higher priority for FEMA funded hazard mitigation projects, or consideration when conducting floodplain mapping projects in communities which have adopted and successfully enforced higher local floodplain and drainage standards.

Floodplain and Drainage Recommendations

Floodplain and Drainage Recommendations were provided in Section III and between the Executive Summary and Table of Contents. Three of the Floodplain Recommendations and one of the Drainage Recommendations advocate actions by DNREC. These could be undertaken as follows by Legislative Directive or Secretary's Order:

Floodplain Recommendation 1	DNREC will continue to make modernizing floodplain maps a priority on an on-going basis.
Floodplain Recommendation 2	DNREC will meet with the Board of Realtors within six months to develop improved wording on seller disclosure forms and investigate lending regulations.
Floodplain Recommendation 3	DNREC will develop a training program for Certified Floodplain Managers within 12 months.
Drainage Recommendation 3	DNREC will develop a guideline similar to that used in Deltona, Florida within 12 months.

The remaining Floodplain and Drainage Recommendations could be adopted by local governments within 12 months with the exception of Floodplain Standard 3 and Drainage Standard 3. These two would be adopted within 24 months to allow time for DNREC actions specified above.

VIII. Options for Implementation

The Department in concert with the recommendation of the Advisory Committee is strongly advocating for a strategic outreach and technical assistance campaign with local governments and their elected officials to realize the adopted Standards and Recommendations.

DNREC will conduct outreach efforts at an individual community level to assist communities to understand the benefits of adopting these standards, to increase understanding and develop local capacity. Particular emphasis will be placed on the benefits of requiring accurate flood studies, reduction of flood damage and public recovery expenditures and lower insurance costs resulting from higher floodplain and drainage standards.

Most of the education and outreach to local communities regarding floodplain management is already conducted by DNREC as the state agency which supports National Flood Insurance Program participation. FEMA provides some funding to DNREC for this education, and the 48 NFIP-participating communities in Delaware (10 of these also participate in the Community Rating System or CRS program) are generally visited about once every five years. With frequent turnover of local personnel, increased outreach and education would help local governments in their understanding of flood risks, floodplain mapping, and the responsibility for local enforcement of flood management regulations.

In order to gain better acceptance in implementing local drainage standards, it is often the inspection and enforcement that is cited as the obstacle to changes in local codes and ordinances. A strategy involving the utilization of Conservation Districts in integrating inspections for drainage code compliance with current stormwater inspections, should be developed if local governments would be more willing to participate in the adoption of local drainage codes.

Specifically, the Department will immediately undertake the following actions:

1. Work with the Delaware Board of Realtors and the Real Property Section of the Delaware Bar Association to improve the disclosure language currently found in Delaware Property Transfer disclosure notification related to floodplains and drainage. This recommendation was unanimously supported by the Committee and the representative from the Delaware Board of Realtors.

2. Develop model Drainage Code and Floodplain Management Code Ordinance language that may be used as a template by those communities willing to incorporate one or more of the Drainage and Floodplain Standards and Recommendations into their municipal or county codes. Model language should be peer evaluated and undergo a legal review prior to offering such language as a template. DNREC will oversee the preparation of a guideline similar to the Residential Lot Grading Guidelines from Deltona, Florida, to provide as technical guidance in municipalities statewide.

3. Develop a budget for floodplain mapping needs that are necessary statewide and continue to aggressively pursue updated floodplain mapping as funding is identified and made available.

4. Recommend that State government consider development of policies for State-owned property or State-funded projects that comply with these higher floodplain and drainage standards. The Division of Facilities Management should evaluate State-owned buildings and properties and determine flooding and drainage vulnerabilities.

5. Recommend incentives to be created for local adoption of floodplain and drainage standards. These may be tied to funding of floodplain mapping or drainage improvement projects. Grant programs that require priority ranking of projects may receive additional points for communities that exhibit the most robust standards in place.

6. Recommend that a Certified Floodplain Manager be on staff, under contract, or available for assistance at each county or municipal agency to review floodplain activities. DNREC can provide assistance by providing training to assist staff or municipal consultants in becoming Certified Floodplain Managers, and proctor the exam periodically.

7. Implement a program over the next 12 to 18 months, to work individually with each county and municipal government scheduling visits with the most appropriate staff and officials to:

    - Cooperatively review applicable codes and ordinances to determine exactly where each local government is positioned with respect to implementation of the adopted Standards and Recommendations;
    - Provide technical assistance to evaluate current language in local codes to ensure that the language is clearly written and conveys the intended requirements;
    - Develop a specific recommendation for each municipality for adopting changes to the current municipal codes and ordinances based on existing statutes and the particular connection of a community to related floodplain and drainage program needs; and
    - Provide education and outreach, as requested, to local elected officials including presentations to Town Managers, Council Members, and Mayors, as appropriate, to fully inform decision- makers of the need to consider better standards for local governments.

8. Document each local government technical assistance effort with a report after the 12- to 18-month period; and deliver that report to the General Assembly as a follow-up to this last phase of a voluntary effort to improve Floodplain and Drainage Standards state-wide. The follow-up report will detail successful implementation as well as local decisions not to adopt necessary standards at the local level.

APPENDIX A

SENATE BILL 64

APPENDIX B

COMMITTEE MEETING NOTES

APPENDIX C

SECRETARY'S ORDER

APPENDIX D

COMMITTEE VOTES

APPENDIX E

COMMUNITY SURVEY FORM

APPENDIX F

RESULTS OF COMMUNITY SURVEYS

APPENDIX G

UNIVERSITY OF DELAWARE
WATER RESOURCES AGENCY ASSESSMENT