

# Floodplain and Drainage Advisory Committee

## Final Summary Report with Standards and Recommendations

### Background

The Floodplain and Drainage Advisory Committee (FDAC) was formed in response to Senate Bill 64 of the 146<sup>th</sup> General Assembly. The Bill was prompted by the State's and local governments' levels of expenditures on flood and drainage related problems in recent years. Since 2000, over 200 flooded homes in Delaware have been purchased at a cost of \$50 million with another \$30 million in claims to the National Flood Insurance Program (NFIP). Another \$65 million has been spent since 1996 to resolve drainage problems associated with poor standards and inconsistent municipal codes.

Between 2007 and 2011, DNREC and the three conservation districts responded to well over 2,000 drainage concerns. In New Castle County, these concerns over a five-year period represent one concern complaint 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.

The Committee was comprised of representatives from the following agencies or organizations: Delaware Senate, Delaware House of Representatives, Delaware Farm Bureau, Delaware Association of Conservation Districts, Delaware State Bar Association, Delaware Association of Realtors, Federal Emergency Management Agency (FEMA), Delaware Hazard Mitigation Council, Home Builders Association of Delaware, Delaware League of Local Governments (three appointees, one from each county), Sussex County Association of Towns, Committee of 100, Delaware Insurance Commissioner's Office, American Council of Engineering Companies, Delaware Department of Transportation, Delaware Association of Counties (three appointees, one from each county), and Department of Natural Resources and Environmental Control (DNREC) Division of Watershed Stewardship (two appointees). Division Director Frank Piorko was selected to chair the Committee. DNREC retained Duffield Associates, Inc. (Duffield Associates) as a contractor to assist with various administrative and research tasks.

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 over a dozen 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	

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

Committee meetings were held on September 20, October 27, and November 30, 2011 and January 27, February 21, March 28, and May 4, 2012. Each meeting lasted about three hours with the exception of the May 4<sup>th</sup> meeting, which lasted over four hours. Detailed notes from each meeting were kept and are available along with presentations and other information at the following:

[www.dnrec.delaware.gov/swc/Pages/FloodplainandDrainageCodeWorkGroupCommittee.aspx](http://www.dnrec.delaware.gov/swc/Pages/FloodplainandDrainageCodeWorkGroupCommittee.aspx)

### **Categories of Standards and Recommendations**

The Standards that were developed fell into two general categories: Floodplain Standards and Drainage Standards. There were multiple scenarios within which the applicability of each standard was weighed. For example, floodplains are categorized one of three ways. Non-delineated floodplains are those which exist, but have not been mapped by FEMA. Currently, there is no NFIP direction 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 are those for which mapping exists, but are further categorized as either those with known Base Flood Elevations (BFEs) or those without known BFEs. NFIP guidance regarding areas without BFEs is open to interpretation and results in inconsistent calculations. In areas with known BFEs, unclear documentation requirements are believed to have led to non-compliant floodplain development. Standards are sought to address lack of enforcement of existing regulations and to clarify under what circumstances flood studies and mapping should be prepared, what flood study methodology is appropriate, and to which agency data should be submitted.

FEMA's NFIP includes minimum floodplain standards that a community must adhere to in order to be a part of the NFIP. 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.

Floodplains exist for both coastal and riverine floodplains but they are handled very differently. Coastal floodplains are the result of tidal actions and storm surge that cannot, for all practical purposes, be influenced by man. On the contrary, riverine floodplains can be very much impacted by man. 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. Conversely, standards such as those for "freeboard" (or floor elevations above flood elevations) 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 ensuing floodplain standards were organized as those related to mapping (flood studies, information to include on plans, etc.) and for development and building issues (freeboard, lot creation, encroachments, and structural matters). Some standards 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.

Drainage standards were organized as: 1) conveyance and easements; 2) grading; and 3) plan preparation. Concerns regarding drainage 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.

Standards for drainage were considered in the context of 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.

### **Research of Best Practices**

As part of the 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 BFE whereas New Jersey uses one foot above the State Hazard Area Design Flood elevation or two feet above the FEMA-designated 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 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 3 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.

## **Issues**

The following is a summary of major issues raised during the Committee discussions.

### ***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 regulations as sediment and stormwater, “lines and grades” (or existing and proposed topography), and bulk grading are all included in plan submittals. In Kent County, finish 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 regulations where local capabilities are insufficient.

Some Committee members expressed concern over how standards would be applied given dissimilar government capabilities. 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, the Department believes that some responsibilities for this activity need 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 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.

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 is recommended that DNREC meet with the Board of Realtors within six months to develop improved wording on seller disclosure forms, investigate lending regulations 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 dissension 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.

The six drainage standards each passed either unanimously or with a large majority in favor. 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 finish floor elevations on the plans.

## **Evolution of Standards and Results of Votes**

Each standard and recommendation presented herein has undergone significant debate and language revisions in order to gain widespread acceptance by the Committee and impart flexibility for local governments, if adopted.

For instance, early versions of some floodplain standards sought restrictions for properties “adjacent” to floodplains but several Committee members believed “adjacent” to be too nebulous. Therefore, the term was either dropped in favor of the more clearly defined word “contiguous” or the standard was abandoned. Some phrases like “adequate width” regarding easements were intentionally left vague such that the counties and municipalities can interpret as they see fit. Finally, standards do not seek to prescribe what Minor and Major Subdivisions are, so local government definitions will continue to be utilized.

Some Committee members thought that a definition of “topographic plan” was needed to more clearly specify a requirement for contours or just spot elevations as well as “drainage conveyance”. One member believed “willful” and “negligent” should not be included in Drainage Standard 2 even though they are used in the Tax Ditch Law since standards and laws are different. Several members thought additional discussion would have been helpful regarding the recommendations and that several of the standards should have been recommendations instead.

As previously stated, the standards generally fall into discrete categories and within these categories they often progress from more restrictive to less restrictive. For example, 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. Standard 12 was the only standard soundly defeated by the Committee but Standard 13 narrowly passed (please see below for results of all votes). Progressing from the question of whether or not to allow lots containing floodplains is Standard 14 prohibiting floodplain encroachments unless compensatory storage is provided. A vast majority of Committee members supported this standard. Assessing all three of the standards together, the Committee opined that lots containing floodplains are acceptable so long as the floodplains are not encroached upon once development occurs. However, restrictions on subdividing lots could result in State control over local land use.

Similarly, standards regarding freeboard and structures evolved from the lot creation standards as well. Floodplain Standards 7 and 7A require 18 inches and 12 inches of freeboard respectively and Subsequent Standard 8 requires 18 inches of freeboard for manufactured homes. The Committee was evenly split on Standards 7 and 7A but was generally supportive of Standard 8. As was previously noted, there was disagreement whether or not the additional costs for providing freeboard would be offset by lowered risk and / or flood insurance payments. In the case of manufactured homes, the case was made that these types of structures typically sustain much larger damages as a function of overall home value than other types of residential structures when flooded to the first floor height. This resulted in a more favorable vote by the Committee.

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. All six drainage standards passed with a plentiful majority but the level of support dropped a little as the standards became more restrictive.

The following is a summary of the votes on each standard and recommendation.

<b>Floodplain Standards</b>																
	Standard 1	Standard 2	Standard 3	Standard 4	Standard 5	Standard 6	Standard 7	Standard 7A	Standard 8	Standard 9	Standard 10	Standard 11	Standard 12	Standard 13	Standard 14	Standard 15
Yea's	14	14	16	17	17	16	8	9	12	13	17	16	6	9	13	14
No's	3	3	1	0	0	1	8	8	5	4	0	1	11	7	3	3
Abstain	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1	0

<b>Floodplain Recommendations</b>							
	Recommendation 1	Recommendation 2	Recommendation 3	Recommendation 4	Recommendation 5	Recommendation 6	Recommendation 7
Yea's	15	15	13	13	14	15	15
No's	0	0	1	1	1	0	0
Abstain	1	1	2	2	1	1	1

<b>Drainage Standards and Recommendations</b>									
	Standard 1	Standard 2	Standard 3	Standard 4	Standard 5	Standard 6	Recommendation 1	Recommendation 1	Recommendation 1
Yea's	17	15	14	15	13	14	12	17	13
No's	0	2	3	2	4	3	2	0	2
Abstain	0	0	0	0	0	0	3	0	2

## **Summary and Process Moving Forward**

Following the public notice and public comment period, the Secretary will consider all public comments prior to finalizing and adopting the Floodplain and Drainage Proposed Standards and Recommendations. Within six months of the adoption of minimum standards, the three county governments 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 minimum standards. Such review and comments shall identify areas where existing requirements meet or exceed these recommendations and standards, do not comply with the standards or are functionally equivalent. The review and comments from local governments will also identify areas where implementation of these standards would represent a hardship to the local government, and what impediments to adoption of these standards have been identified.

In order to assist county and municipal governments in completing this review and assessment, the Department will schedule three workshops this summer and fall to introduce the Standards and Recommendations to the local municipal agencies and present a framework for assistance with this task.

At the completion of the six month review and report by the county and municipal governments, a draft report will be prepared for Committee review and Committee input will be provided prior to the final report completion. The final report will be delivered to the General Assembly no later than March 15, 2013.

The attached Proposed Standards and Recommendations represent the collective effort of the Floodplain and Drainage Advisory Committee, and represent an extensive amount of work from a dedicated group of volunteers.

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# 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.

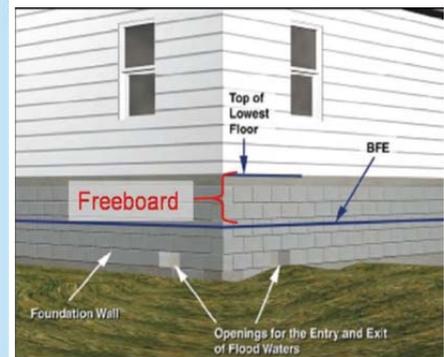
**Examples of savings on NFIP1 with freeboard**

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

<sup>1</sup> 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.

<sup>2</sup> 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.

<sup>3</sup> 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.

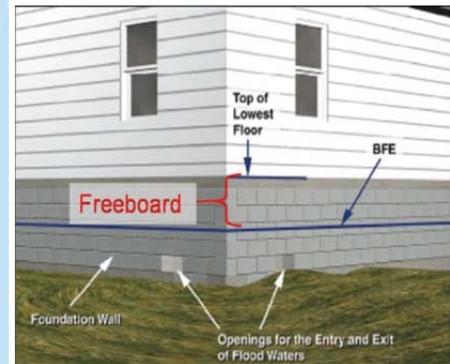
**Examples of savings on NFIP1 with freeboard**

	Annual savings in NFIP premiums	Savings over 30-year mortgage		Annual savings in NFIP premiums	Savings over 30-year mortgage	
Zone V <sup>2</sup>	1' freeboard	\$2,565 (33%)	\$76,950	Zone A <sup>3</sup>	\$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

<sup>1</sup> 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.

<sup>2</sup> 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.

<sup>3</sup> 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.

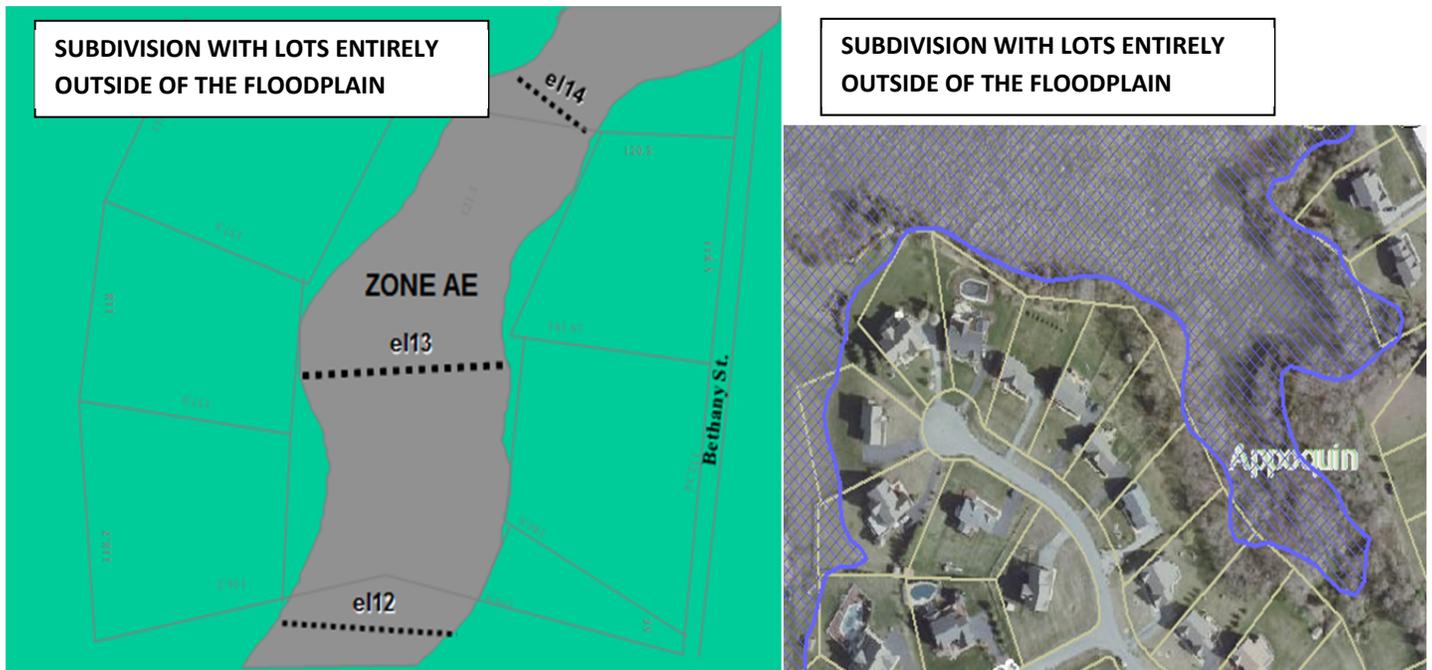
		Lot Scenarios			FIRM Map Scenarios		
Tidal	Non -Tidal	Recorded Lots Grandfathered	Proposed Subdivision >= 50 lots or 5 acres	Proposed Subdivision <50 lots or 5 acres	Non-Delineated Floodplain	Delineated Floodplain No BFE (Zone A)	Delineated Floodplain with BFE (Zone AE)
✓	✓	✓	✓	✓		✓	✓

**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.



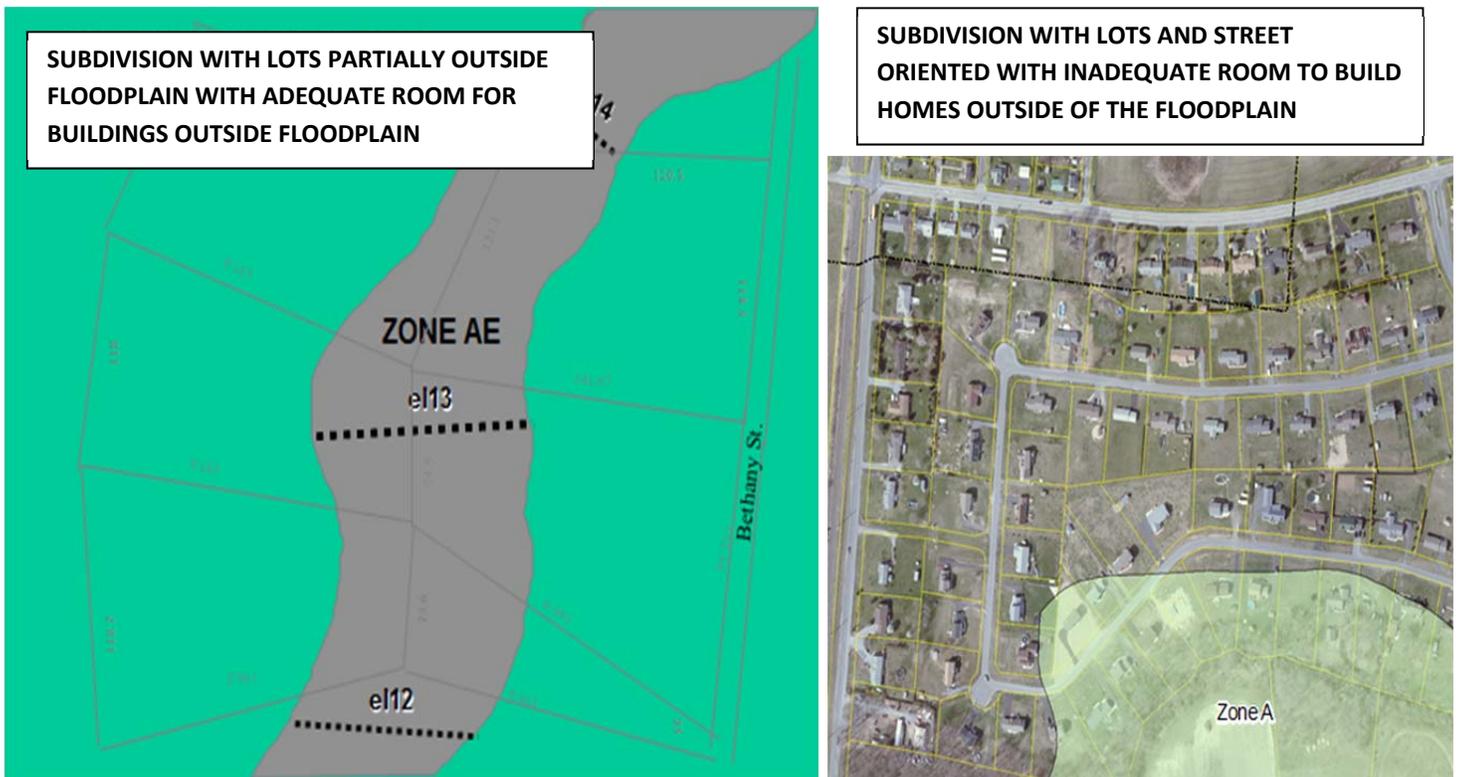
		Lot Scenarios			FIRM Map Scenarios		
Tidal	Non - Tidal	Recorded Lots Grandfathered	Proposed Subdivision >= 50 lots or 5 acres	Proposed Subdivision <50 lots or 5 acres	Non-Delineated Floodplain	Delineated Floodplain No BFE (Zone A)	Delineated Floodplain with BFE (Zone AE)
	✓		✓	✓		✓	✓

**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 in 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.



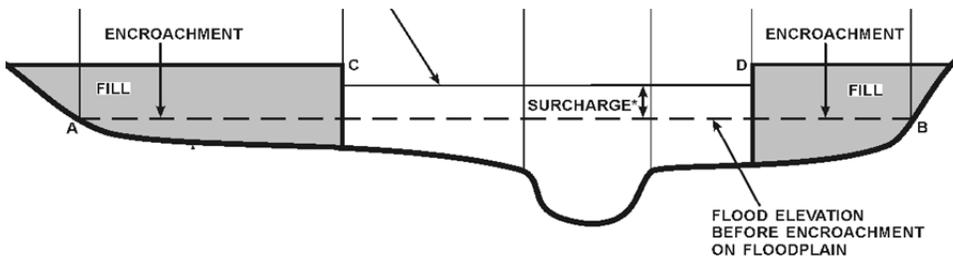
		Lot Scenarios			FIRM Map Scenarios		
Tidal	Non -Tidal	Recorded Lots Grandfathered	Proposed Subdivision >= 50 lots or 5 acres	Proposed Subdivision <50 lots or 5 acres	Non-Delineated Floodplain	Delineated Floodplain No BFE (Zone A)	Delineated Floodplain with BFE (Zone AE)
	✓		✓	✓		✓	✓

**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 disclose flood risks at closing but this often does not occur. 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.

# **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.



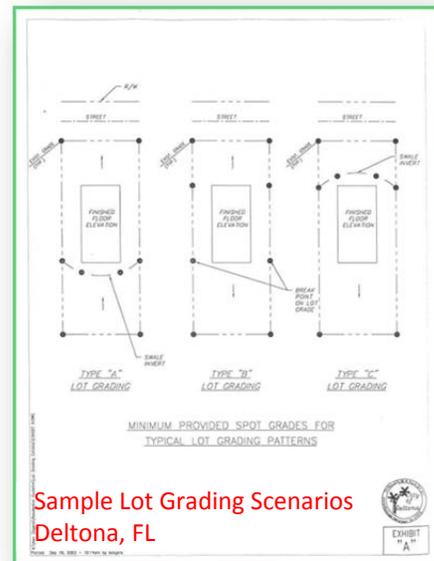
## Proposed Standard 5: Topographic Plan

**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 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.